Peter O'Connor
Wolfram Höpken
Ulrike Gretzel
Editors

Information and Communication Technologies in Tourism 2008

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Ulrike Gretzel (eds.)

Information and Communication Technologies in Tourism 2008

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Dr. Peter O'Connor
Institut de Management Hotelier International
Ecole Supérieure des Sciences Economiques et Commerciales
Business School, Cergy-Pontoise, France

Dr. Wolfram Höpken
eTourism Competence Center Austria, Innsbruck, Austria

Dr. Ulrike Gretzel
Department of Recreation, Park, and Tourism Sciences
Texas A&M University, College Station, Texas, U.S.A.

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Preface

In 1993, academics from universities in Austria, Germany and Switzerland collaborated with the Tyrolean Tourist Board to organise a conference focusing on the interface between tourism and technology. This fledgling conference, which they called ENTER, has steadily matured into the world's premier global conference on Information and Communication Technologies (ICT) in Travel and Tourism. ENTER is unique in that it brings industry practitioners and representatives from national and regional tourist boards together with academics and researchers working on the cutting edge of this rapidly developing subject area. Both sets of constituents actively learn from each other, producing a knowledge sharing experience much richer than traditional industry-focused or purely academic conferences. This year, in an effort to further develop this cross pollination, authors of refereed research papers were asked to put special emphasis on the industry applications of their work. Reinforced through the review process, this approach will help to further bring the two communities together and enhance knowledge transfer and cross-fertilization.

The primary purpose of the ENTER 2008 Research Track is to disseminate high quality research findings on new theories, methodologies and applications in the field of information and communications technologies in travel and tourism. As such, these conference proceedings represent the more current developments in the global corpus of state-of-the-art research in this arena, tying in with the overall conference theme of "eTourism: The View from the Future". This year's Research Track continues to raise the bar in terms of quality. Over seventy research papers were submitted and subject to the double-blind review process. The fifty-one that were successful include a variety of diverse studies – e.g. theoretical, empirical, experimental, case studies and policy – addressing a myriad of different topics, themes, disciplines and approaches, so that any conference participant or reader of these proceedings will find several studies meeting their interests and expectations.

Recognising that the quality of the ENTER's Research Track depends heavily on reviewers' time and expertise, the Research Track Chairs would like to thank each of the members of the Research Program Committee. With the growing number of papers being received each year, heavy demands are placed on these individuals – often in a short time frame – and they deserve far more recognition than they currently receive. On behalf of the ENTER community, we would like to take this opportunity to thank them for their hard work and commitment. Lastly, the most important stakeholders of the ENTER conference are the authors themselves, many of whom return year after year to present, discuss and debate their research. Thank you for your efforts and your continued support, and we look forward to a fruitful conference this year in Innsbruck.

Peter O'Connor, Wolfram Höpken and Ulrike Gretzel

Innsbruck, 2008

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Adaptive Recommender Systems for Travel Planning

Tariq Mahmood[a], Francesco Ricci[b], Adriano Venturini[c], and Wolfram Höpken[d]

[a] Department of Information and Communication Technology
University of Trento, Italy
tariq@itc.it

[b] Faculty of Computer Science
Free University of Bozen-Bolzano, Italy
fricci@unibz.it

[c] ECTRL Solutions
Trento, Italy
venturini@ectrlsolutions.com

[d] Etourism Competence Center Austria
Innsbruck, Austria
wolfram.hoepken@etourism-austria.at

Abstract

Conversational recommender systems have been introduced in Travel and Tourism applications in order to support interactive dialogues which assist users in acquiring their goals, e.g., travel planning in a dynamic packaging system. Notwithstanding this increased interactivity, these systems employ an interaction strategy that is specified *a priori* (at design time) and is followed quite rigidly during the interaction. In this paper we illustrate a new type of conversational recommender system which uses Reinforcement Learning techniques in order to autonomously learn an adaptive interaction strategy. After a successful validation in an off-line experiment (with simulated users), the approach is now applied within an online recommender system which is supported by the Austrian Tourism portal (Austria.info). In this paper, we present the methodology behind the adaptive conversational recommender system and a summarization of the most important issues which have been addressed in order to validate the approach in an online context with real users.

Keywords: Conversational Recommender Systems, Reinforcement Learning, Markov Decision Process, Travel Planning, Information Presentation and Delivery.

1 Introduction

Recommender systems are intelligent E-commerce applications that assist users in their information-seeking tasks by offering personalized product recommendations during an interaction session (Adomavicius and Tuzhilin, 2005). Travel recommender systems are aimed at supporting the critical travel planning decisions that the traveler will face before travel or while on-the-move (Fesenmaier et al., 2006). These systems acquire the user needs and wants, either explicitly (by asking) or implicitly (by mining the users' online activity logs), and suggest various products and services like destinations to visit, points of interest, events or activities. The main objective of a

travel recommender system is to ease the information search process of the traveler and to convince (persuade) her of the appropriateness of the proposed services. In recent years, a number of travel recommender systems have been designed and some of them are now operational in major tourism portals (Venturini & Ricci, 2006).

Traditional recommenders support quite simple and non-interactive search processes: at each stage of the traveler's interaction session, they only execute one type of action, i.e., decide which product(s) to recommend to the user. In order to support more real (natural) and interactive processes, *conversational* recommender systems (Bridge et al., 2006) have been recently proposed. These systems support a dialogue where, at each stage, the system can select one from amongst a set of available system actions, e.g., recommend some product or ask the user for some information. The particular action selected by the system is specified by its *recommendation strategy*. For instance, imagine that a conversational system is queried for hotels that would suit the user preferences. It could employ the following two strategies (among many others): 1) *ask the user in detail about her preferences, and use this information to extract a small product subset*, or 2) *propose a set of products to the user, and exploit the user feedback in order to refine future recommendations*. In fact, these two conversational strategies were initially included in the DieToRecs system (Fesenmaier et al., 2003) and are now part of the Trip@dvice technology (Ricci et al., 2006). Conversational systems typically employ a rigid strategy, i.e., one which is determined at design time and hard-coded into the system. For instance, Trip@dvice allows the user to select one of these two strategies, but then she must rigidly follow the steps prescribed by the chosen strategy. A major limitation of this approach is that there could be a large number of conversational but rigid strategies for a given recommendation task, such as travel planning with multiple service types. Furthermore, the process of selecting a strategy is based on intuition and on the previous experience of the system designers, which by no means guarantees that the chosen strategy would really suit the users. Hence, the designers have to evaluate several strategies in order to discover an (almost) *optimal* one. This is an infeasible process, considering the necessary expense in terms of budget, effort, time etc. These limitations necessitate that conversational systems should be capable of determining *by themselves* the best strategy for assisting the users.

We tackle these requirements by proposing a new type of Case-Based conversational recommender system that, rather than following a rigid interaction design, offers a range of information and decision support functions and, during the interaction, is able to improve an initial strategy and adopt an optimal one (Mahmood and Ricci, 2007a). The optimal strategy basically maximizes a reward function that models how much benefit the user gets from each interaction step.

In (Mahmood and Ricci, 2007a), we presented the more technical details of such a technology and we described the results of an evaluation, based on human/computer simulation. In that evaluation, when a search for a travel service (e.g. a hotel) returns too many options, the system should decide whether to ask the user for additional

service features in order to retrieve a smaller set of services, or to let the user autonomously take this decision and manually change the query. Our results show that the recommender system can improve an initial strategy that, in a rigid way, asks the user for additional features only when the result set size is greater than a given threshold. In fact, we show that different optimal strategies are learnt, depending on the system estimate of the cost of each interaction step (reward), i.e., the dissatisfaction of the user in not having, yet, acquired her goal.

Although these results are encouraging, they were obtained under a limited setting, i.e., there is only one situation in which the system must learn to make a decision, and the system's action set comprises only two actions. Moreover, we have carried out this evaluation *off-line*, i.e., in simulated interactions. In order to address these limitations, we have applied our approach within the Travel Planner tool (TP) that we built for the Austrian tourism web portal (Austria.info), in the context of the etPackaging project funded by Austrian Network for E-Tourism (ANET). This paper describes the general model of our adaptive recommender system and its application to the TP tool. Moreover, it describes the changes made to a previously designed recommender (which is conversational but not adaptive) and in particular, the interaction points where the new system is designed to be adaptive. The paper also describes the evaluation plan that we designed in order to further validate our approach with real users. Hence, the major contribution of this paper is a generally-applicable model for a truly adaptive travel recommender system and its case study application to the Austria.info portal.

The paper is organized as follow. Section 2 describes our adaptive model. Then, section 3 illustrates our proposal for incorporating our adaptive approach within TP. Further on, section 4 illustrates our proposed system architecture for learning the optimal policy, along with a brief description of the on-line evaluation methodology. Finally, section 5 discusses our future work.

2 Learning Personalized Interaction Strategies for Conversational Recommenders

Our proposed recommendation model, shown in Figure 1, basically comprises two entities, namely the *Information System* (*IS*) and the *Recommendation Agent* (*RA*). The *IS* is the non-adaptive entity whose function is entirely controlled by the user, and serves simple user requests like displaying a query result, showing most popular selections etc. The *RA* is the adaptive entity which actively assists the user by providing her with the relevant information at appropriate stages of the interaction session. This process of assistance is dictated by the system's optimal recommendation strategy.

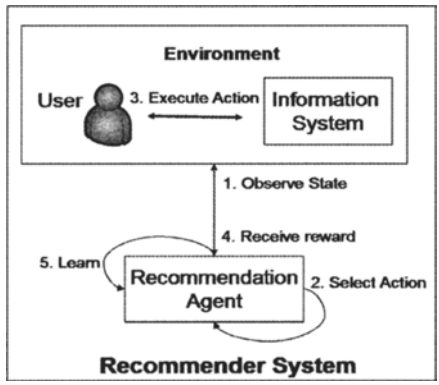

Fig. 1. General recommendation model

In our model, we learn the optimal strategy by using techniques from Reinforcement Learning (RL), which is based on the mathematical framework of Markov Decision Processes (MDP) (Sutton & Barto, 1998). In the context of RL, we shall use the term *optimal policy* rather than "optimal strategy", where a policy simply specifies how the strategy is implemented in terms of the system's action selection rules. In order to learn the optimal policy through RL, we consider the *RA* as a decision-making Agent which must achieve a goal, i.e., learn the optimal policy. It does so by executing some trial-and-error interactions with the user, who is part of the Agent's Environment. Specifically, at each stage, and after the user has taken some action, the Agent observes the current situation, or *state*, of the system (step 1 in Figure 1). The observed system state could include information about the current state of the user (e.g., her goals and preferences), the on-going interaction (e.g., how many products the user has already viewed), or even about the state of the Agent itself (e.g., if it has already executed a recommendation action). This is the information which the Agent needs in order to learn the optimal policy.

In one or more system states, multiple system actions could be available to the Agent for execution (steps of the conversation). For instance, as we mentioned in Section 1, there could be situations where the system is uncertain whether it is better to push a hotel recommendation or still propose some options. We label these states as the *System Decision Points* (SDPs). In the SDPs, the Agent tries out (selects) the different system actions during the interaction (Step 2 in Figure 1). For each action execution (Step 3) (and the corresponding user response), the Agent receives a numerical reward (reinforcement signal) from the Environment (Step 4), informing it whether its previous action was acceptable for the user or not. The magnitude and the sign of this reward is determined by the level of user acceptability, e.g., a large positive reward (+10) could be assigned for most favorable actions, e.g., when a suggestion accepted by the user, and a large negative reward could be assigned for least favorable ones (-10), e.g., when the user quits. As the interaction proceeds, the Agent exploits the received rewards in order to learn to avoid the unacceptable actions and to take

acceptable ones (Step 5). This is performed in the *policy iteration* algorithm where basically the action that maximizes the immediate reward plus the expected discounted value of the next state defines the new optimal action in that state (Sutton and Barto, 1998). In order to compute the expected discounted value of the next states, the state-to-state transition probabilities learned during the interactions are used. The RL policy iteration procedure guarantees that this process shall eventually lead the Agent to learn the optimal action at each SDP, i.e., learn the optimal policy. We note that in the *non-SDP* states, only a single action is available for execution, which we consider as the optimal action.

3 Adaptive Travel Planning Recommendations

In this section, we shall illustrate our proposed approach for incorporating the adaptive recommendation methodology within the *TP* tool. The Travel Planning tool is supported by the Trip@dvice technology. Trip@dvice enables a user to select travel components from catalogues (hotels, attractions, events) and bundle them in a new plan, or select an existing travel plan and customize it according to specific needs (delete or add travel components). As stated previously, our approach is based on learning the optimal action at one or more SDPs which the Agent could encounter as the user navigates through the system during her interaction session.

The basic model of the users' navigation flow is shown in Figure 2. Here, a *view state* represents any particular web page which the user could view during her session (e.g. a query input form). In each view state, the user could take one or more *user actions*, which lead the navigation into a system state (e.g., submit a query or go back to a previous interaction state).

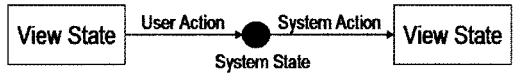

Fig. 2. User navigation model

The system state could be either a SDP or a non-SDP state, and is hence used for selecting the next *system action*, which (when executed) results in a new web page being shown to the user. For instance, suppose that in the query input view state, the user submits a query. Then, the ensuing system state is a SDP because here, the system must decide how to continue the conversation and what information to present in the next view state, e.g., ask for more preferences or execute the query.

Currently, we are employing the Trip@dvice CBR methodology (Ricci et al., 2006) in order to compute the relevant product recommendations for the users (i.e., rank higher products selected in similar sessions). It offers two product search functions: 1) Seeking for Inspirations (*SeekInsp*), where the user is prompted with a list of product proposals (in a loop) until she selects some product, and 2) Query Search (*QrySrch*), where the user constrains a logical query to a product catalogue in order to retrieve

some product. The rigid conversational policy of Trip@dvice dictates the current non-adaptive navigation flow of the user through the *TP*. The flow comprises a single SDP which depicts the situation where the user has submitted a query to a product catalogue, and the system has retrieved a large number of products. Trip@dvice's policy specifies to always suggest additional features to the user when the result set size is greater than a certain threshold. In order to learn a better (optimal) policy we have proposed three additional SDPs to be incorporated within the non-adaptive flow, along with a more detailed system action set. Due to space limitations, we only show the navigation flow at the four SDPs (See Figure 3 and Figure 4) instead of the complete adaptive navigation flow (Mahmood et al., 2007c).

We will now describe the flow in Figure 3. The user enters the system through a *Welcome Page*. In this page, if she selects the *QrySrch* function (User Action *SlctQrySrch*), the system enters in *SDP1*, where it should decide whether to show the different search categories (destinations, events etc.) to the user in the view state *ViewSrchOpts* (system action *ShowOpts*) or to ask her initially for some travel characteristics (system action *AskChars*) before showing her the various service categories. Specifically, the user enters her characteristics in the view state *SpecChars* (User Action *EnterChars*). The system then enters in a non-SDP system state (black circle labeled 1), from where the only possible system action is to execute *ShowOpts*. Furthermore, if the user selects the *SeekInsp* function (User Action *SlctSeekInsp*), the system enters in *SDP2* where it should decide whether to show her the list of product proposals in the view state *ViewProposals* (system action *ShowProps*) or to initially ask her for some travel characteristics (system action *AskChars*) before showing the complete travel plan proposals. Here, once the user has entered her characteristics in *SpecChars*, the system enters a non-SDP state (black circle labeled 2), in which the only possible system action is *ShowProps*.

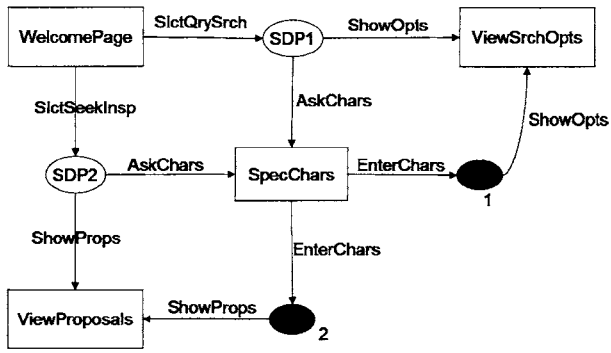

Fig. 3. Decision points after '*Query Search*' or '*Seeking for Inspiration*' user requests

We will now describe the flow in Figure 4. If the user constrains and submits a specific search query to a catalogue (e.g. hotels), the system encounters *SDP3* (Figure 4). If the query's result set size is greater than some threshold, the system should

decide whether to suggest product features for reducing (or tightening) this result set in the view state *ViewTightFtrs* (system action *SuggTight*) or to execute the query and show all the retrievals (system action *Exec*). On the other hand, if the result set size is empty, i.e., no hotel satisfies the query conditions, the system should decide whether to suggest to the user to relax some of the current query constraints in the View State *ViewRelaxFtrs* (system action *SuggRelax*), or to automatically relax one constraint (selected by the system and not involving the user) from the query (system action *autoRelax*) in order to produce a result set.

Finally, in the situation where a list of products is ready to be shown to the user, the system encounters *SDP4* (Figure 4), where it must decide to show one amongst four possible result pages:

- *ShowRP1*, i.e., show the page *ViewRP1*, in which the system simply shows the recommended products result list,
- *ShowRP2*, i.e., show the page *ViewRP2*, in which the system, besides showing the products result list, also requests the user to enter some (more) travel characteristics (in order to compute better recommendations),
- *ShowRP3*, i.e., show the page *ViewRP3*, in which the system, besides showing the products result list, also pushes the user to make some related searches on other types of products (cross selling),
- *ShowRP*, i.e., show the page *ViewRP4*, in which the system, besides showing the products result list, also pushes the user to add the top-ranked product to her shopping basket and to make some related searches on other product types.

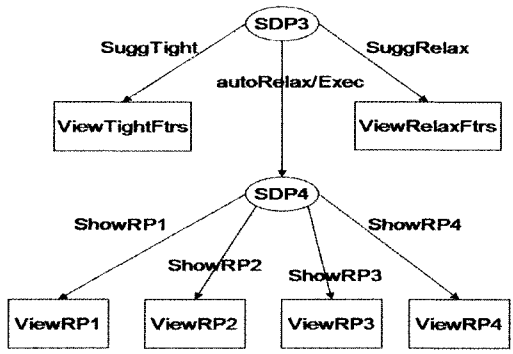

Fig. 4. Decision points after the user requests a query execution

In the complete adaptive navigation flow, we modeled a total of twenty view states and four system decision points. We have also implemented this flow as a Petri Net (Reisig & Rozenberg, 1998), which is a graphical formalism for systems specification. In the Petri Net terminology, we model the *view state*, *user action*, *system state*, and the *system action* as the *place*, *input place*, *transition*, and *output place* respectively. This representation is useful to track the navigation streams of the

users (generated during the evaluation of our approach) and acquire diverse information about them (the general navigation model of the users, the unique navigation paths adopted by the users, most frequent paths) through graph mining tools such as the ProM framework (Dongen et al., 2005).

4 System Design and Evaluation

In this section, we shall illustrate the system architecture that we designed and built in order to incorporate our approach within the *TP* tool (Mahmood et al., 2007d) and the evaluation strategy required to test the proposed model. The architecture, according to the proposed recommendation model (Figure 1), consists of two main entities, namely the *Recommendation Agent*, which contains the functionality for learning the optimal policy, and the *Environment*, which represents the user and the Information System (see Figure 1), and contains the API which allows the Recommendation Agent to interact with objects that are *outside* it's domain, in order to acquire the data necessary for learning the optimal policy, e.g., the user action taken at some interaction stage, the system state hence reached, etc. Let us now consider the Environment and the Recommendation Agent entities in detail.

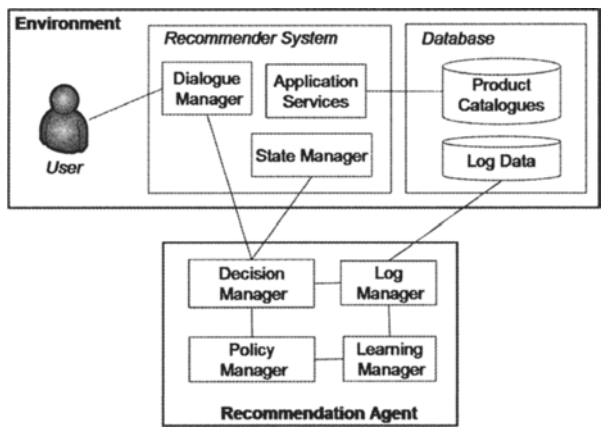

Fig. 5. System architecture

Within the Environment the *user* makes her requests to the *Recommender System* in order to satisfy one or more of her navigation/information goals. These requests are passed to the *Dialogue Manager* component of the system, which handles these requests and interacts with the *Application Services* component according to the system business logic (exploiting data from the *Product Catalogues*). The *State Manager* computes the system state after each user request, and asks the Recommendation Agent for the applicable system action in every SDP. Moreover, it notifies the Recommendation Agent of state changes so that the Agent can acquire and store (in the *Log Data* component), at each stage of the user's session, the user action taken, the information related to the ensuing system state, the system action

executed in this state, and the resulting view state (web page) which is produced by the Dialogue Manager. Within the Recommendation Agent, the *Decision Manager* is the interface to the Information System providing the requested system action to be executed in a SDP. It interacts with the *Policy Manager* component, which stores the current (optimal) policy of the Agent. Furthermore, the Decision Manager also logs all the relevant data at each stage (*Log Manager*). This data is then exploited by the *Learning Manager* in order to learn the optimal policy.

This innovative approach to travel recommendation requires a specific and new evaluation methodology. We designed an approach based on the development of two alternative variants of the travel recommender system: a non-adaptive and an adaptive version. The first variant basically follows a set of default (rigid) interaction policies, offering to the user the designed views with a hard-coded logic. The second variant follows an interaction policy that is the result of the learning procedures. We want to test some hypotheses about the performance of these variants based on a set of dependent measures. Our hypotheses are based on the user's search and product choice behaviour, and their satisfaction with the behaviour (policy) of the system. In the evaluation, we must select a group of participants (meeting certain requirements) which will be randomly assigned to two experimental groups, and each group is asked to evaluate one of the variants of our recommender system. The evaluation proceeds in two phases. In a *training phase*, conducted initially with the first experimental group, the recommender variant employs a set of alternative hand-crafted policies. This variant forms our baseline system. In this phase, the Log Manager logs all the relevant sequential data (user action, system state information, system action, view state), which are then exploited by the Learning Manager component in order to learn the optimal policy for the adaptive flow of the *TP*. Then, in a *Testing phase*, conducted after the training phase, the second experimental group evaluates the recommender variant that employs the optimal policy.

During each phase, participants are asked to perform some tasks in the general context of '*planning a vacation in the region of Tirol, Austria*'. A series of performance measures must be recorded, some of them automatically, during the interaction (through the Log Data component), and some by asking the user to fill out a questionnaire after each interaction session. The aim of the evaluation is to test our hypotheses by determining the improvement in these measures from the training phase to the testing phase. Important measures of success are the total reward acquired by the recommendation agent (using a particular policy) and the rate of success of the system. Acting in this way, during the system evaluation we can discover the state variables that are more useful in finding an optimal policy. In fact, as the result of a preliminary simulation experiment has shown, the learned policy depends on the user and session model (Mahmood and Ricci, 2007b). In other words, the best interaction policy is influenced by the knowledge of the user, captured during the human-computer interaction and then used by the recommendation agent.

5 Conclusions and Future Work

In this paper, we have addressed some important issues related to the design of a radically new concept of recommender system for travel and tourism applications. To our knowledge, our approach is the first one which is dedicated to learning interaction strategies for conversational systems, and this paper reports on the first concrete application of such an approach in a real on-line recommender system. The proposed model has been validated in a series of off-line experiments based on real-user interaction data acquired with the NutKing Recommender system (Ricci et al., 2006). For lack of space we refer the reader to (Mahmood and Ricci, 2007a; Mahmood and Ricci, 2007b) for details about the results of such experiments.

Currently (November 2007), we have completed the system implementation phase, the off-line evaluation (Mahmood and Ricci, 2007a; Mahmood and Ricci, 2007b), the usability evaluation, and we are now going to perform the on-line system validation as described above with a travel planner system that we developed for Austria.info. The proposed model still requires further analysis for a number of reasons. First of all, as we mentioned above, a critical aspect of our approach is the modelling of user-related information (demography, user goal, etc.) that should be included in the system state representation. This information is either acquired explicitly (asking the user) or implicitly (mining the interaction log). The exploitation of this implicit method is mandatory, as users usually refrain from replying to system questions. But, considering that online user behaviour is typically unpredictable and erroneous the quality of such implicit information could be questionable. For this reason we want to study reliable methods for determining which information is relevant for inclusion in the system state. This would extend the results presented in (Mahmood and Ricci, 2007b), based on simulations. Moreover, we need better methods to estimate the numerical reward values that should be assigned by the Recommendation Agent to a new state, which is the effect of the user reply. These values should be as close as possible to the user satisfaction, and this again is typically inferred by observing the user activity. Notwithstanding these difficulties, the results of the off-line evaluation confirm that system policy can be improved using this model and this methodology has the potential to facilitate and speed the development of successful conversational travel recommender systems.

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A Comparative Study of Continuous and Discrete Visualisation of Tourism Information

Sudarshan Venkataiah[a],
Nalin Sharda[a], and
Mohan Ponnada[a]

[a] School of Computer Science and Mathematics
Victoria University, Australia
nalin.sharda@vu.edu.au
{sudarshan.gorrepati, mohan.ponnada}@students.vu.edu.au

Abstract

This paper presents a comparative analysis of Continuous versus Discrete Visualisation of tourism information. With remarkable web development in the recent years, a broad range of tourism information is distributed over millions of websites. This is a boon as well as a problem for the user. When information on a tour is needed, the user has to explore various web sites and collate discrete chunks of information, we call this Discrete Visualisation. To solve this problem we are developing an Intelligent Visual Travel Recommender System (IVTRS) that finds information form relevant web sites and presents it as a video clip, i.e. Continuous Visualisation. This paper presents an overview of the architecture and the prototype of an IVTRS that presents Continuous Visualisation. A usability study was conducted – using a prototype – with eight users comprising beginner, intermediate as well as advanced users. This study demonstrated that users found Continuous Visualisation easier to work with and to obtain the required information.

Keywords: Intelligent Visual Travel Recommender System (IVTRS), Visualisation, Discrete Visualisation, Continuous Visualisation, Usability Study.

1 Introduction

Information technology (IT) has become an important catalyst for the modern tourism industry. Information dissemination ability has been enhanced with the advent of the Internet and the World Wide Web (Web). However, with the proliferation of tourism web sites and services, it has become difficult to effectively locate useful information (Ponnada, Jakkilinki & Sharda, 2006). Such problems are often exacerbated due to poorly designed user interfaces (Stangenberg, 2000).

Most of the information gathered over the web is in the form of discrete chunks of digital media content -- including text, audio, photos and video clips. Visualising information by accessing a series of individual media elements is termed *Discrete Visualisation*. We are working on developing systems that can combine such individual chunks of digital media into a *Continuous Visualisation*, i.e. a continuous audio visual presentation, almost like a video clip. Two such Continuous Visualisation systems have been proposed for eTourism: Intelligent Visual Travel

Recommender System (IVTRS) (Ponnada, Jakkilinki & Sharda, 2006), and Tourism Blog Visualiser (Sharda & Ponnada, 2007).

The aim of the research project reported in this paper was to compare users' responses to Discrete and Continuous Visualisation. We created prototypes of the proposed Discrete and Continuous Visualisation systems using the Mozilla framework (Jevsikova, Dagiene & Grigas, 2004). Mozilla is a collection of software tools for creating open source web application, see http://www.mozilla.org/about [Sept., 2007]. These prototypes were used to carry out usability investigations for getting users' feedback on Discrete and Continuous Visualisation methodologies.

Section two introduces the concepts underpinning the development of a Continuous Visualisation system called the Intelligent Visual Travel Recommender System (IVTRS), and briefly describes the prototype built for its usability testing. Section three expounds Discrete and Continuous Visualisation systems, and section four introduces our usability testing methodology. Section five gives results and analysis of the usability testing, comparing Discrete and Continuous Visualisation. Conclusions and opportunities for further work are given in section six.

2 Travel Recommender Systems

A Travel Recommender System (TRS) provides recommendations to prospective travellers for tours they wish to undertake (Berka & Plößnig, 2004). A basic TRS accepts user inputs for a proposed tour and provides recommendations for travel itineraries based on user preferences (Ricci, 2002). The TRS retrieves information from various sources and combines these to recommend an itinerary. However, the user still needs to browse through individual web pages for the destinations and the related activities on the itineraries to build a mental picture of the complete trip.

Users find it difficult to visualise their complete itinerary, because information on destination, transportation, accommodation, entertainment, and attractions are not fused into a seamless presentation; this is called Discrete Visualisation. This mode of visualisation requires the user to navigate different web pages, and within individual web pages use slider bars and other means to locate the required information. Such navigational activities interrupt the visualisation process (Hurst, Gotz & Lauer, 2004), and make it difficult for the user to build a holistic visual picture of the entire trip.

It is possible to build a tourism information system that overcomes this limitation and allows the traveller to enter the destination, choices of transport, and accommodation etc; and then view information about the entire tour as a continuous audio visual presentation (Ponnada, Jakkilinki & Sharda, 2006), i.e. Continuous Visualisation.

By adding a layer of intelligence, this system can be enhanced to become an Intelligent Visual Travel Recommender System (IVTRS) (Sharda & Ponnada, 2007). Figure 1 shows the overall architecture underpinning the IVTRS.

The IVTRS can be viewed as a system with three layers:

i) Augmented Web Layer
ii) Intelligence and Visualisation Layer
iii) Presentation Layer

The Augmented Web layer stores tourism data as Sharable Content Objects (SCOs) based on the Sharable Content Object Reference Model (SCORM). The SCORM standard was proposed as standard data format for storing e-Learning content on the Web; for details see http://www.adl.org [Dec. 9, 2005]. The SCORM standard can be use for creating e-Tourism applications as well (Sharda & Ponnada, 2007). Tourism information stored on the web as SCOs can be located by the Content Object Repository Discovery and Registration/Resolution Architecture (CORDRA): a companion standard of SCORM.

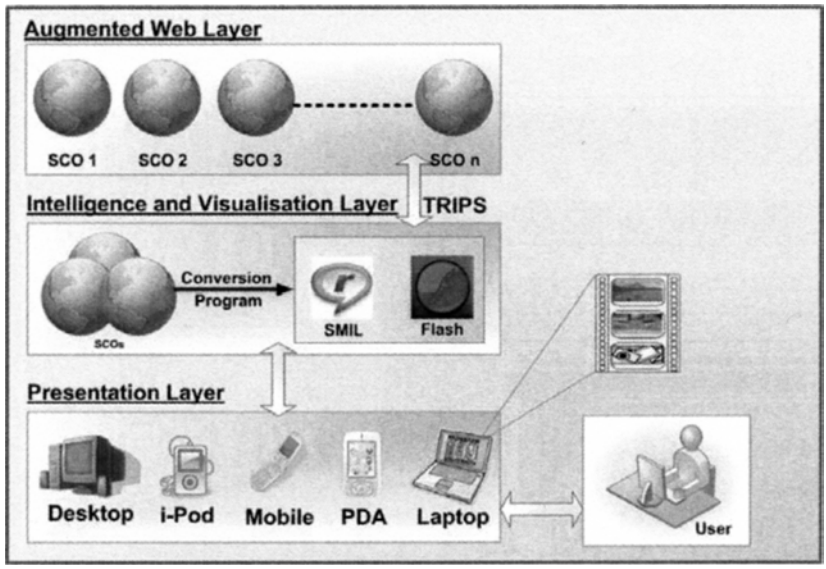

Fig. 1. Intelligent Visual Travel Recommender System (IVTRS) Architecture

The Intelligence part of the middle layer provides the reasoning engine of this system, and can be built by using either of the following technologies: Expert Systems, Semantic Web, or Artificial Neural Networks. In our projects we have used Semantic Web Technology (Sharda & Ponnada, 2007). The Visualisation part of the middle layer takes the relevant SCOs from the Augmented Web layer and converts these into audio-visual presentations. A collection of SCOs can be converted into a video clip, either using the SMIL (Synchronized Multimedia Integration Language) standard, or delivered as a Flash presentation. In our projects we have used the SMIL standard, as it provides greater flexibility in modifying the presentation based on user specified parameters (Ponnada & Sharda, 2007).

The Presentation Layer is responsible for the Human-Computer Interaction (HCI) processes. It consists of an interface where the user can enter queries and display preferences. The SMIL presentation video can be sent to a variety of user devices. The display parameters (e.g. resolution, frame rate, background colour) can be adjusted to suit the display device being used. For example, video with lower resolution and frame rate should be sent to mobile devices such as i-Pod, Mobile Phone and PDA (Personal Digital Assistant).

Originally we developed the Continuous Visualisation methodology for enhancing a TRS into an IVTRS; however, its underlying concepts can also be used for developing a tourism Blogs (Web logs) visualiser. 'The purpose of the Blog Visualiser is to search the Web for the most relevant Blogs (in response to a query), collate information from these, and present it as a continuous presentation, almost like a video clip' (Sharda & Ponnada, 2007).

3 Discrete and Continuous Visualisation

Before fully developing these innovative visualisation systems, it is necessary to get user feedback on the efficacy of Continuous Visualisation as compared to that of Discrete Visualisation. To this end, prototypes of Discrete and Continuous Visualisation systems were built using the Mozilla framework. The purpose of these prototypes was to emulate Continuous and Discrete Visualisation scenarios, and get user feedback on both.

Fig. 2. Discrete Visualisation of Information

Figure 2 gives a conceptual view of Discrete Visualisation of tourism information. Users enter queries using search oriented interfaces. Search engines such as Google may be used by some users, and destination specific portals may be used by the others. The search software crawls the Web or other information sources to retrieve the relevant information and delivers it to the user as links to individual web pages. The user then has to visit these web pages to build a holistic mental picture of the entire trip. A Discrete Visualisation system generates a lot of information, but this information is often disjointed. Much time and effort is required by the users in accessing and viewing the required information.

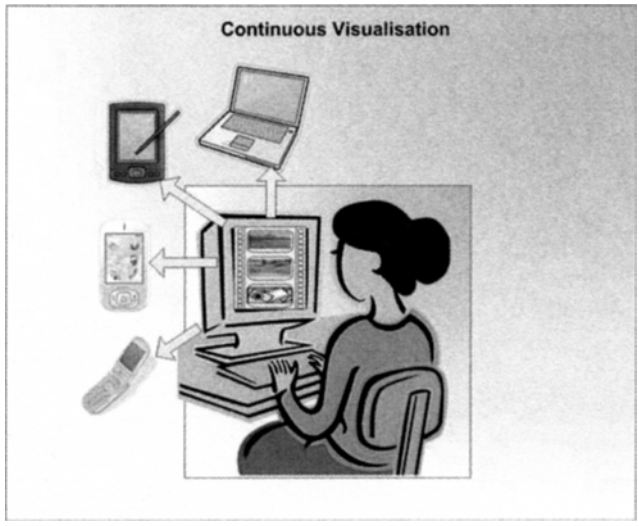

Fig. 3. Continuous Visualisation of Information

Figure 3 gives a conceptual view of Continuous Visualisation of tourism information. In this, discrete chunks of information gathered for one tour are combined into a single video clip. An intelligent system such as the IVTRS creates this visualisation by combining the most relevant media content, including text, photographs and videos (Sharda & Ponnada, 2007).

A Continuous Visualisation system dynamically retrieves and combines the information to be displayed. Furthermore, this information can be repurposed (i.e. modified vis-à-vis resolution, frame rate and the level of compression) to suit a variety of user devices, such as Notebook computer, PDA, or Mobile phone.

4 Evaluation Methodology

The purpose of this research project was to obtain users feedback on Discrete and

Continuous Visualisation of tourism information.

The evaluation methodology used in this project is based on standard usability testing concepts (Nielsen, 1993), with a re-engineered usability testing process to streamline usability experiments and reduced the task completion times (Georgievski & Sharda, 2006). Nielsen (1993) suggests that even five users are enough to conduct a first-cut usability study on any system. However, we used a cohort of eight users as we wanted to classify these into beginner, intermediate, as well as advanced users. The same cohort of users tested the two visualisation prototypes.

Usability testing involves measuring the quality of user experience in handling software applications. Usability testing should be conducted before and during application development to ensure high quality user experience. Many innovative software systems fail due to bad or mediocre user interaction methodology, leading to unsatisfactory user experience (Nielsen, 1993). According to the International Standard Organization (ISO), usability is the effectiveness, efficiency and satisfaction with which users can achieve a specific set of tasks in a particular environment. These factors can be judged by providing users the opportunity to use a working system, a prototype, or even a system mock-up. Usability testing with mock-ups or prototypes can provide valuable feedback before substantial resources are invested in developing the final system (Stangenberg, 2005). Our aim was to get user feedback on a prototype before investing further resources to develop operational systems for Continuous Visualisation.

5 Usability Testing, Results and Analysis

A well thought out testing procedure must be developed to get meaningful user feedback (Georgievski & Sharda, 2006). This involves developing test scenarios, which tell the participants what is expected of them. Participants are requested to answer pre-experiment questionnaires to provide information on their background. Post experiment questionnaires are used to get their feedback on the quality of their experience with the system under test.

An important ethical guideline governing usability research is that the participants must give their informed consent to participate in the tests (Ludi, 2005). All participants in this research were given detailed information on the nature and process of the tests, before they gave their written consent.

5.1 Participants background

These tests were conducted with eight participants, two female and six male. All participants were over 20 years of age, possessing basic IT skills. The participant's were given relevant training on using the prototypes used in the study.

A pre-experiment questionnaire was administered to determine the competency level of the participants in using computers and the Internet. Figure 4 gives a bar graph for the percentage of beginner, intermediate and advanced users. It can be seen that the number of beginners and advanced users are around 40% each, while only 20% users considered themselves as intermediate computer users.

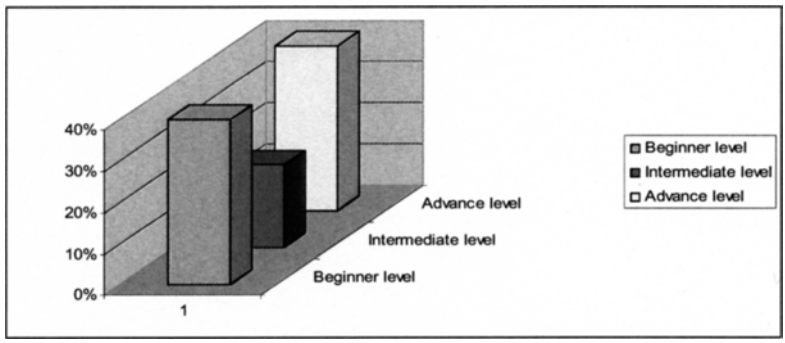

Fig. 4. Participant familiarity with using a computer

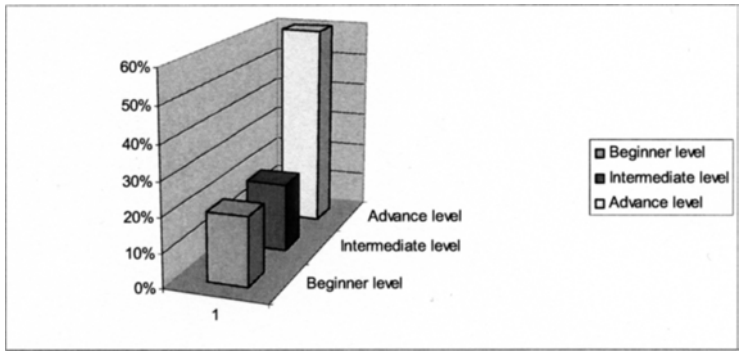

Fig. 5. Participant familiarity with using the Internet

Figure 5 presents the distribution of users with respect to their expertise in using the Internet. It is interesting to compare figures 4 and 5. It shows that many people who feel that they are advanced Internet users, do not consider themselves as advanced computer users. This is a common trend these days; many people who are not aware of technical aspects of computers (and therefore do not consider themselves advanced computer users) use the Internet with such regularity that they feel that they are advanced Internet users. This further enhances the importance of the Internet as a marketing tool for tourism services; and any marketing portal that can enhance the user experience will reap the benefit with increased patronage.

5.2 Usability Test of Discrete Visualisation

The Discrete Visualisation tests were conducted such that the users had to access and view five separate websites related to a tour on the Great Ocean Road, near Melbourne, Australia. The scenario for this test included steps required to access the required information to be able to answer specific questions about the tour. Full details of the testing procedure are presented in a Masters Thesis by Venkataiah (2007). The post-experiment questions answered by the users are given in table 1. Other data, such as task completion time and the error counts were also recorded to judge how efficient discrete data collection is. However, full analysis of this quantitative data is beyond the scope of this paper.

Table 1. Post-experiment Questions for Discrete Visualisation

Question:1	How easy was it to find the web links in the Discrete Visualisation system?
Question:2	How easy was it to browse the web links on the Internet?
Question:3	How easy was it to find the data required for the travel, when using the Discrete Visualisation system?
Question:4	How easy was it to use the various websites?
Question:5	How easy was it to retrieve information from these websites?

5.3 Usability Test of Continuous Visualisation

For the Continuous Visualisation tests, users were presented relevant information from the same five web sites, combined as a video clip. Users had to login to the system and navigate the various sections; just as a similar real application would require.

The post-experiment questions for this test are listed in table 2. These questions also allude to the nature of the tasks users accomplished in this test.

Table 2. Post-experiment Questions for Continuous Visualisation

Question:1	How easy was it to find the icon for the Continuous Visualisation system application?
Question:2	How easy was it to create an account on the system?
Question:3	How easy was it to enter and alter data over the user interface in the Continuous Visualisation system application?
Question:4	How easy was it to navigate from one page to other of the user interface?
Question:5	How easy was it to use this application?

5.4 Result and Analysis

User feedback obtained from the post-experiment questionnaires is presented in figures 6 and 7 for Discrete and Continuous Visualisation respectively. While the matching questions (i.e. for the same question numbers) for the two tests are not exactly the same, they do relate in terms of the type of activity performed by the user; therefore, the responses to these can be used to compare the users' experience for Discrete and Continuous Visualisation.

A comparison of the bar graphs for the five questions reveals that more users found Continuous Visualisation easier to navigate and to get the required information.

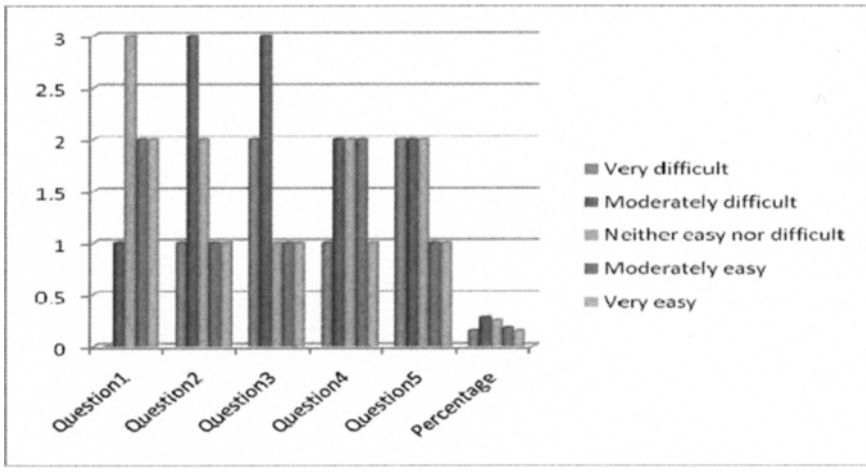

Fig. 6. Usability Results for Discrete Visualisation of Information

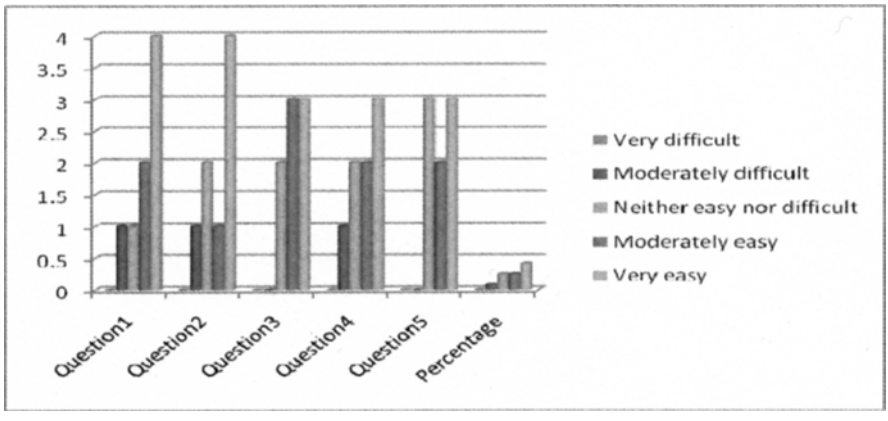

Fig. 7. Usability Results for Continuous Visualisation of Information

The combined results are given in the right-most set of bars (labelled percentage). In these bars, the scale reading of 1 implies 100%. The following results were obtained.

In the Discrete Visualisation system prototype:

- Users considered 32.5% of the activities very or moderately easy to perform.
- 27.5% of the activities were considered moderately difficult.
- 15% of the activities were considered very difficult.

In the Continuous Visualisation system prototype:

- Users considered 67% of the activities very easy or moderately easy.
- 7.5% of the activities were considered moderately difficult.
- None of the activities were found to be very difficult.

For both methods, 25%of the activities were considered neither difficult nor easy. Clearly, Continuous Visualisation was considered much easier for obtaining the required information.

The above results demonstrate (within the limits of our testing methodology) that Continuous Visualisation is considered much better by a cohort of beginner, intermediate and advanced users. These results support further development of IVTRS and Tourism Blog Visualiser systems. However, usability testing is a continuous process, as any ill-designed interface can turn a good idea into a bad implementation. Hence, further usability testing is necessary at various stages of development of the IVTRS and Tourism Blog Visualiser systems.

6 Conclusions and Future Work

In this paper we have compared the ease of using Discrete and Continuous Visualisation systems for accessing tourism information. Discrete Visualisation required users to visit five web sites related to the Great Ocean Road. Continuous Visualisation presented the same information combined as a video clip. The test users included beginner, intermediate as well as advanced computer and Internet users. While not many users considered themselves as expert computer users, many more viewed themselves as expert Internet users. Quantitative results demonstrated that most users find it easier to access information via a Continuous Visualisation system, as compared to accessing information via a Discrete Visualisation system.

This research used a prototype of the proposed system to carry out alpha (in-house) testing. In the next phase of the research, an Internet-based model of the system should be subjects to beta testing involving general public.

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Evaluating Recommender Systems in Tourism – A Case Study from Austria

Markus Zanker[a], Matthias Fuchs[b], Wolfram Höpken[b], Mario Tuta[b] and Nina Müller[b]

[a] Institute for Intelligent Systems and Business Informatics
University Klagenfurt, Austria
markus@ifit.uni-klu.ac.at

[b] e-tourism competence center Austria (ECCA)
Innsbruck, Austria
{firstname.lastname}@etourism-austria.at

Abstract

Recommender systems (RS) are employed to personalize user interaction with (e.g. tourism) web-sites, supporting both navigation through large service assortments and the configuration of individual service packages. Depending on the interaction strategy, RS are either utilized to elicit users' tastes and preferences or to stimulate desire for different offerings. In addition, as a potentially rich source of digital traces, RS also act as a repository for marketing intelligence. Web-usage mining is an accepted approach to analyse web-usage behaviour based on information traces left by the web-user (Mobasher, 2007). This paper proposes an empirically tested approach which combines typical web-log data with user feedback gathered by an interactive travel advisory system developed for an Austrian spa-resort. The proposed approach focuses on evaluating the RS with respect to efficiency, effectiveness and actionable marketing intelligence.

Keywords: Recommender system, interactive advisory system, web-usage mining

1 Introduction

Web-usage mining aims to exploit vast amounts of transaction data in order to gain valuable marketing intelligence (Cooley et al., 1999). Today, a variety of standard tools exist (e.g. *123loganalizer*) that allow webmasters to effectively analyze user-driven traffic on their platforms (http://www.123loganalyzer.com). These tools generate standardised reports comprising, for instance, the amount of unique visits, the geographic location of accessing clients or referring sites (Büchner & Mulvenna, 1998). No doubt, this information is highly relevant for determining bandwidth and the maximal load on the web-server; for deciding to offer, for instance, additional multi-lingual content; or for improving search-engine marketing. However, it does not provide advanced insights into web users' behavioural patterns. Both Büchner and Mulvenna (1998) and Cooley et al. (1999) described methodological approaches for combining different sources of Internet data (e.g. web-server logs and marketing data) to discover actionable marketing intelligence. Similarly, the aim of the paper is to exploit additional information like the explicit feedback obtained from the users of an

interactive travel advisor. Combining this data with data obtained from web-server logs facilitates the identification of user segments based on similar preferences or behavioural patterns.

The paper starts with a brief discussion on studies in the application field of both recommender systems in tourism and the corresponding web-usage data mining approaches. Motivated by the main success factors in the context of RS applications, namely efficiency, effectiveness and marketing intelligence, Section three proposes an evaluation approach which supports this scope. For instance, by analysing users' *click-stream sequences,* the interactive dialogues can gradually be improved, and thus be made more efficient (Senecal et al., 2005). Furthermore, the effectiveness of a RS application can be evaluated by *cross-tabling* non-metric user characteristics and computing corresponding contingency parameters (Giudici & Castelo, 2001). Finally, additional insight into the usage behaviour can be gained by visualizing the relationships between the various user-characteristics based on *correspondence analysis* (Hair et al., 2006). In Section four selected results are presented. Finally, the conclusion summarizes the findings and briefly outlines future research agendas.

2 Background

Due to the informational nature of travel and tourism services, the industry is the leading application field for electronic commerce (Werthner, 2002). Intelligent applications, like recommender systems, enable users to become their own travel agents. Ricci (2002) provides several examples where a matching engine derives recommendations according to the user input and, in addition, gives an excellent introduction into the field. *SkiMatcher* (Delgado & Davidson, 2002), for instance, is a well-known example that incorporates multiple recommendation paradigms, such as constraint-based, content-based and collaborative information filtering techniques. Following Burke's classification of recommendation techniques, constraint-based recommendation is a variant of knowledge-based RS exploiting explicit domain knowledge (Burke, 2002). Furthermore, content-based recommender systems reason on the similarity between product items in order to propose additional items to a user. In contrast, collaborative filtering techniques recommend items based on user similarities. Finally, case-based recommendation applications utilize techniques from all the three paradigms (Ricci & Werthner, 2002), first by asking the user to state his/her preferences and then by improving over time and learning from past interactions (i.e. their case base).

The interactive travel assistant that acted as a case for our study can be assigned to the constraint-based recommender group (Jannach et al. 2007). Its implementation is based on the knowledge-based ADVISOR SUITE framework presented in (Felfernig et al., 2006). More precisely, it uses a single interaction style, i.e. a forms-based dialogue to ask the user for tourism motives and preferences, like relaxation, health improvement or different sports activities. Figure 1 depicts this question/answer style

of interaction. The result from this interactive advisory process is a personalized list of recommended travel packages.

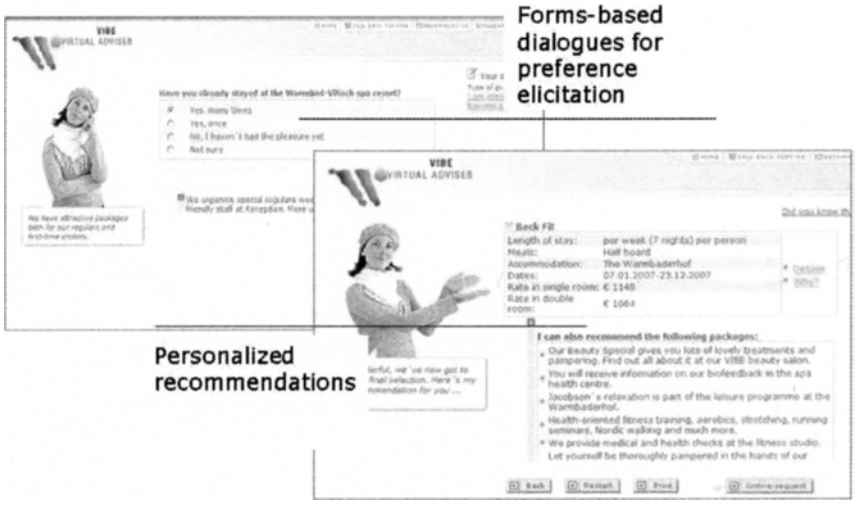

Fig. 1. Screenshots of the interactive advisory system

With respect to the evaluation of recommender systems Herlocker et al. (2004) provided an encompassing overview. Furthermore, Pan and Fesenmaier (2003) investigated users' search behaviour from the viewpoint of their mental models and their semantic understanding. Similarly, Zins et al. (2004) conducted usability tests based on questionnaires to compare user satisfaction after using different destination recommender systems. In contrast, the proposed approach uses automatically collected data to derive insights into the system's performance in terms of efficiency, effectiveness and marketing intelligence, respectively. The proposed evaluation approach refers particularly to Mobasher's (2007) state-of-the-art paper on web-usage mining techniques for personalization. It provides an overview on the necessary data collection and preprocessing tasks and describes the techniques for predictive user modelling.

3 Proposed Web-Usage Mining Approach

Supported by related work, data pre-processing is a highly necessary and important precondition when conducting web-usage mining (Cooley et al. 1997; Büchner & Mulvenna, 1998). Figure 2 sketches the proposed knowledge discovery process based on the WEBMINER architecture described by Cooley et al. (1999).

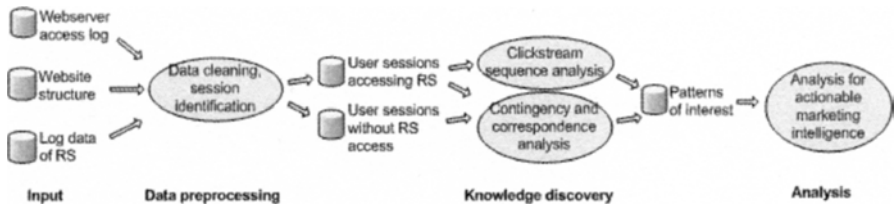

Fig. 2. Knowledge discovery process (source: adapted from Cooley et al., 1999)

The knowledge discovery process starts with the integration of several data sources. Subsequently, in a data cleaning step, user sessions from the raw access log entries are firstly identified and all sessions deriving from web robots are removed. Secondly, if the users invoked the interactive travel assistant, their explicit answers from the logging facility of the advisor component are extracted. Thus, two data sets resulted from this pre-processing step: user sessions that accessed the recommender system and those that did not.

As already mentioned, the proposed evaluation approach focuses on rating the RS with respect to the dimensions *efficiency*, *effectiveness* and *marketing intelligence*. Herlocker et al. (2004) extensively discuss evaluation criteria for RS. They note that most evaluations focus on accuracy. However, in commercial environments goals like conversion rate, ease-of-use or creation of strategic knowledge become more important. Put differently, a RS is expected to accomplish its purpose without producing friction or annoyances that provoke the user to quit the application. Moreover, an interactive travel advisor is expected to support users in navigating through a large space of electronically offered travel service packages. Therefore, next to customer satisfaction the application's ease of use or more general its usability represents an appropriate indicator to approximate efficiency. Thus, to cope with this aim, a *click-stream sequence analysis* (Senecal et al., 2005) is employed. With respect to the effectiveness of a RS the achievement of its core objectives is of primary interest. These are both click-through and conversion rates, respectively, as well as the capability to retain users on the site (Fesenmaier et al., 2003; Zins et al. 2004). Accordingly, in the advisory scenario analyzed below, a user visit is successfully completed by an online reservation request. Cross-tables and corresponding *contingency analyses* are thus proposed as appropriate means of determining significant relationships between non-metric variables, such as user-group characteristics and conversion rate (Pallis et al., 2005).

Finally, the third evaluation dimension (i.e. marketing intelligence) is probably the most abstract one. According to Büchner & Mulvenna (1998) it has been defined as the gain of additional marketing knowledge for a better understanding of the users' behaviour when using the interactive advisory system. Core objectives with respect to marketing intelligence are both the identification of coherent customer segments and outstanding preference patterns which may lead to new service developments (Woon et al. 2003; Mobasher, 2007). Thus, the evaluation approach proposed below finally employs *correspondence analysis* to visualize the interrelation between

categorical characteristics of users in order to identify previously unknown patterns of interest (Backhaus, 2003). Table 1 provides a summary of the evaluated dimensions, targeted indicators and selected methods.

Table 1 Evaluation Dimensions

Dimension	Efficiency	Effectiveness	Marketing intelligence
Measure/ Indicator	Customer Satisfaction (CS) Usability	Click-through- & Conversion-Rate, Customer Retention	Identified Customer Segments, Opportunities for Product Development
Mining Method	Click-stream Sequence Analysis	Contingency Analysis	Correspondence Analysis

The choice of data mining methods mainly depends on the scaling type of the involved variables (e.g. user characteristics). In this study these were mainly nominally scaled (Hair et al. 2006).

4 Application of the Evaluation Framework

The exemplarily findings presented are based on web-usage data logged during the second half of 2006 belonging to the web-portal of an Austrian thermal resort and the corresponding interactive travel advisory system. More than 40,516 distinct user sessions (i.e. online visits) were identified out of which approximately 2% could be unambiguously associated with an advisory session of the interactive travel advisory system. However, approximately the same percentage of sessions couldn't be related to web-log entries due to unresolved DNS-names of the accessing hosts or the use of proxy servers. Consequently, a total of 712 distinct user sessions of the interactive travel advisory system were used in the analysis.

4.1 Click-stream Sequence Analysis

In order to empirically detect the eventual friction that provoke users to quit a RS, a *click-stream sequence analysis* is proposed as a method for visualizing users' online interaction paths and showing the relative share of traffic at each node (Senecal et al., 2005). Figure 3 depicts the online conversations of users interested in wellness offerings. As can be seen from the sequence diagram, after question six users can either switch to the final page comprising the individual recommendations or can further communicate preferences to the system. Around 60% of all users reached the recommendation page. Nevertheless, it became evident that most users left the interactive advisory system already within the first three dialogue steps, which thus need to be reassessed particularly with respect to understandability and usability.

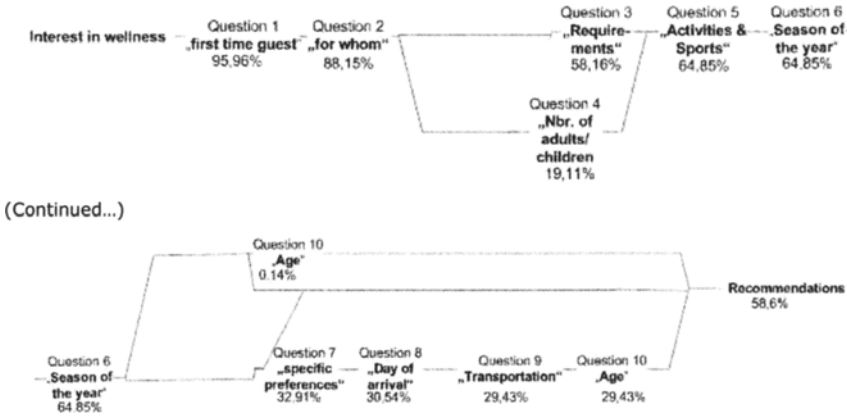

Fig. 3. Click-stream Sequence Analysis

4.2 Contingency Analysis

As effectiveness of a RS has been approximated by both the click-through and conversion rate, (Zins et al. 2004) a *contingency analysis* is proposed as it allows the detection of interrelationships between categorical variables (Giudici & Castelo, 2001; Pallis et al., 2005). In doing so, this method answers the question whether the usage frequency of the interactive travel advisory system varies depending on contextual session parameters, such as access time or cultural background (i.e. preferred language). Interestingly, a significantly higher relative frequency of accesses to the RS could be observed on weekends ($\chi^2(1) = 3.848$; $p < 0.05$; see Table 2).

Table 2 Use of interactive travel advisor and access times

	Use of virtual advisor		
	Yes	No	Total
Access at weekend	in %	in %	in %
Yes	2,07	97,93	100
No	1,77	98,23	100

From the viewpoint of cultural groupings it was interesting to observe that Italians are much more likely to use the innovative interactive advisory tool than both German or English speaking users ($\chi^2(3) = 208.11$; $p < 0.001$; Table 3).

Table 3 Use of interactive travel advisor and cultural belonging

	Use of virtual advisor		
	Yes	No	Total
Language preference	in %	in %	in %
German	1,42	98,58	100
Italian	3,14	96,86	100
English	0,46	99,54	100
Unknown	0,91	99,09	100

In a final step the hypothesis that '*users who interact with a recommender system are more likely to enquire about accommodation availability'* was empirically tested (Zins et al., 2004). From Table 4 one can easily observe that a significantly larger share of availability requests is triggered by online visits that employed the interactive advisory system compared to the group of potential customers who did not use the system. The above hypothesis that the usage of a RS positively correlates with the number of availability requests was empirically confirmed ($\chi^2(1) = 62.87$; $p < 0.001$; see Table 4).

Table 4 Probability of booking requests and use of interactive travel advisor

	Use of virtual advisor	
	Yes	No
Availability request	in %	in %
Yes	8,91	3,49
No	91,09	96,51
Total	100	100

4.3 Correspondence Analysis

According to Büchner & Mulvenna (1998) marketing intelligence has been defined as the gain of additional marketing knowledge for a better understanding of the users' behaviour when using the interactive advisory system. Thus, the goal is to identify coherent customer segments and outstanding usage patterns leading to new service developments (Mobasher, 2007). The proposed empirical method of *correspondence analysis* pursues this goal to visualize relationships between a set of non-metric attributes, thus reducing data complexity and helping to group corresponding characteristics of non-metric data (Backhaus et al., 2003).

As an example, correspondence analysis was computed for the two non-metric variables 'cultural belonging' (i.e. *language*) and 'usage group'. The latter construct was identified by asking users for whom the travel packages were intended. Users could choose one of the following standardized answers: *for myself, for myself & my partner, for my whole family* and *for others* (see Table 5).

Table 5 Correspondence Table

Language	For whom				
	For myself	For myself & my partner	For my whole family	For others	Active border
German	83	81	32	15	211
Italian	70	205	108	5	388
English	14	9	3	0	26
Active border	167	295	143	20	625

Table 6 shows the details of the two reduced dimensions. '*Inertia*' measures how much information of the raw data has been absorbed by the corresponding dimension (Hair et al., 2006). For instance, it can be seen that dimension 1 incorporates 91.3% of total variance, whereas dimension 2 only holds about 8.7% (Hair et al., 2006).

Table 6 Correspondence analysis

Dimension	Singular val	Inertia	Chi-Square	Sig.	Share of Inertia		Singular value for confidence	
					Condition	Cumulativ	Standard deviatio	Correlation 2
1	,306	,094			,913	,913	n ,039	,236
2	,094	,009			,087	1,000	,025	
Total		,103	64,071	,000[a]	1,000	1,000		

a. 6 Degrees of freedom

Figure 4 displays the perceptual map obtained from the correspondences between cultural belonging (i.e. language) and the usage group variable. Interestingly, the obtained findings suggest that Italian speaking users are more likely to be looking for family offers and offers for partners, while German speaking users intend to travel alone. These previously unknown item combinations are of particular interest for new (i.e. tourism) product developments that are addressed to specific tourist segments (Weiermair & Fuchs, 1999).

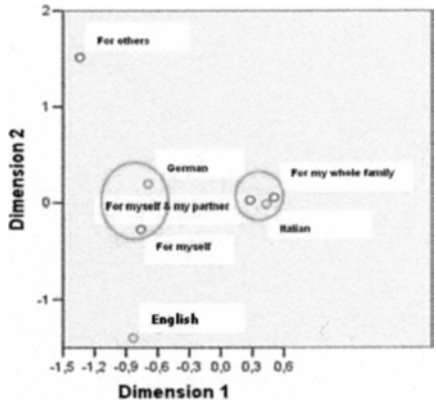

Figure 4 Perceptual Map based on Correspondence Analysis

5 Conclusions and Future Work

Based on the WEBMINER framework (Cooley et al., 1999), the paper proposed an approach for evaluating interactive recommender systems in the tourism domain. Starting from the main performance dimensions, methodological approaches for determining the value of recommender systems from an organisation view point (i.e. in terms of efficiency, effectiveness and marketing intelligence) were proposed and explored. For instance, based on a *click-stream analysis* (Senecal et al., 2005), the specific node that caused the majority of users to quit the virtual travel advisor could be identified. Furthermore, based on *contingency analysis* (Pallis et al., 2005) it was demonstrated that the usage share of the interactive travel advisor is significantly higher on weekends and is more than twice as likely to be used by Italian speaking users. Interestingly enough, the hypothesis that the usage of an interactive recommender system positively correlates with the number of availability requests was empirically confirmed. Finally, marketing intelligence was obtained by the use of *correspondence analysis* (Hair et al., 2006). For instance, of particular interest for both segment specific (i.e. tourism) product development and targeting is the notion that Italian speaking users are more likely looking for family offers and offers for a partner, while German speaking users intend to travel alone.

The discussed results should only be interpreted as selected examples to underline the usefulness of the proposed approach in evaluating interactive recommender systems in the tourism domain based on automatically collected log data. Additional insights can, however, easily be generated by using the described methods when considering the totality of variables and their corresponding web-log data (e.g. first time guest, number of children, transportation mode, users' age and sex, preferred sports activities, etc.). Moreover, future evaluation steps will include further analytical tools which are able to handle categorical data, such as a *Chi-Squared-Automatic-*

Interaction-Detector (CHAID) or *logistic regression based on binary variables* (Prinzie & Van den Poel, 2005).

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Use and Impact of Online Travel Reviews

Ulrike Gretzel
Kyung Hyan Yoo

Laboratory for Intelligent Systems in Tourism
Department of Recreation, Park, and Tourism Sciences
Texas A&M University, USA
{ugretzel; toinette}@tamu.edu

Abstract

Consumer-generated content (CGC) is growing in importance. Especially online travel reviews written by consumers are ever more available and used to inform travel-related decisions. A Web-based survey of users of the most prominent travel review site, TripAdvisor, was conducted to investigate how other travellers' reviews inform the trip planning process. Since current CGC statistics show generational and gender differences, the study also aimed at examining whether those carry over into the realm of travel review use. The results show that reviews are used mostly to inform accommodation decisions and are currently not used much for en route travel planning. Gender differences were found for perceived impacts of reviews, with females reaping greater benefits from using reviews, especially in terms of enjoyment and idea generation. Age differences occurred across a variety of perceptions and use behaviours. Implications for travel marketing and travel information systems design are provided.

Keywords: online travel reviews; consumer generated content; trip planning; age differences; gender differences.

1 Introduction

Through the Internet, individuals can make their thoughts and opinions easily available to a global community of Internet users (Dellarocas, 2003), and a growing number of users actively takes advantage of this opportunity. A total of 35 percent of US Internet users publish their thoughts or otherwise create content online (Pew Internet & American Life Project, 2006a). Even more Internet users use consumer-generated content (CGC). According to eMarketer (2007a), about 75.2 million online users use CGC today in the US, and this number is expected to grow to 101 million by 2011.

Searching for travel-related information is one of the most popular online activities (Pew Internet & American Life Project, 2006b) and travellers are expected to increasingly take advantage of such content. Indeed, a growing use of online travel referrals for the purpose of planning travel has been reported by several travel-related studies (Bonn, Furr & Susskind, 1999; MacKay, McVetty & Vogt, 2005). Further, such electronic word of mouth (eWOM) can even have a significant influence on travel-related decisions after they have been made. eMarketer (2007b) reports that among travellers who use peer reviews for their hotel booking, 25% of infrequent

leisure travellers and 33% of frequent travellers report having changed a hotel stay based on reviews by other consumers.

However, little is known about the specific relevance of eWOM in different stages of travel planning and for specific types of travel-related decisions. Consequently, a study was conducted to investigate how eWOM sources, specifically online reviews provided by other travellers, are used for the various facets of travel planning.

2 Background

2.1 Use of Word of Mouth in Travel Planning

Word of mouth (WOM) communication refers to interpersonal communication among consumers concerning their personal experiences with a firm or a product (Richins, 1983). Previous studies illustrate the significance of WOM for consumers' purchase decisions (Bone, 1995; Brown & Reingen, 1987; Engel, Blackwell & Kegerreis, 1969; Arndt, 1967), especially within a service context (Murray, 1991; Murray & Schlacter, 1990). Because service products are intangible and cannot be easily described, consumers tend to rely on word of mouth from an experienced source to lower perceived risk and uncertainty (Bansal & Voyer, 2000; Murray, 1991; Olshavsky & Granbois, 1979).

Word-of-mouth information search is greater in circumstances when a consumer is unfamiliar with a service provider (Chatterjee, 2001), which is often the case for travel-related decisions. WOM has long been recognized as one of the important external information sources for travel planning (Crotts, 1999; Murphy, Moscardo & Benckendorff, 2007; Hwang et al., 2006; Kotler, Bowen & Makens, 2006; Snepenger & Snepenger, 1993; Fodness & Murray, 1997). Hanlan and Kelly (2005) found that word of mouth and independent information sources are the key media through which respondents formed their image of an iconic Australian tourist destination. As the use of the Internet for travel planning becomes ever more prevalent, travel decision-making processes are expected to become increasingly influenced by eWOM. Online word-of-mouth differs significantly from its offline form in that it includes many-to-many communication between communicators who do not necessarily share any social ties and that it is much more voluminous (Chatterjee, 2001). Consumer opinion-platforms have established themselves as important venues for eWOM (Hennig-Thurau et al., 2004).

2.2 Consumer Reviews

Consumer-generated content encompasses a variety of media forms and types of Web sites (Gretzel, 2006). One form in which content is created online is as consumer reviews and ratings. Consumer reviews and ratings are the most accessible and prevalent form of eWOM (Chatterjee, 2001). Over 30 percent of Internet users have rated products online (Pew Internet & American Life Project, 2006a). Forrester

(2006a) reports that about 70 percent of adults currently use consumer product ratings and reviews. Consumer reviews serve two distinct roles: 1) they provide information about products and services; and, 2) they serve as recommendations (Park, Lee & Han, 2007). Consumer reviews are perceived as particularly influential because they are written from a consumer's perspective and, thus, provide an opportunity for indirect experience (Bickart & Schindler, 2001). They are also perceived as more credible than information provided by marketers (Smith, Menon & Sivakumar, 2005).

Online consumer reviews appear to play an increasing role in consumer decision-making processes. More than 80% of web shoppers said they use other consumers' reviews when making purchasing decisions (Forrester, 2006b). eMarketer (2007c) reports that nearly six out of ten consumers prefer Web sites with peer-written reviews, and that Web sites with reviews experience greater conversion rates. A study conducted by Bazaarvoice (2007) indicates that for about 75% of US shoppers it is extremely or very important to read customer reviews before making a purchase. The sample also shows a clear preference for peer reviews over expert reviews. Smith, et al. (2005) also found that recommendations provided by online peers are preferred over editorial recommendations.

Consumers tend to rely more on consumer reviews when purchasing high involvement products (Park, Kim & Han, 2007); since travel is a high involvement product, one can expect extensive use of reviews for travel-related decisions. Indeed, Compete, Inc (2006) found that nearly 50% of travel purchasers visited a message board, forum, or online community for their online travel purchasing and one in three of these buyers said that consumer reviews helped with their purchase decision. Importantly, almost half of those whose purchasing decision was influenced by consumer reviews said that consumers' opinions actually caused them to change their mind about what they purchased. Moreover, among those buyers, 25% said they also posted a review on a consumer review site after making their purchase. Clearly, online consumer-generated information is taking on an important role in online travelers' decision making.

2.3 Travel Planning and Decision Making

Planning a trip involves a "temporal, dynamic, successive, and multistage contingent decision process" (Jeng & Fesenmaier, 2002:15). Information needs and information search strategies can be assumed to vary for different stages in the travel decision-making process (Gretzel, Fesenmaier & O'Leary, 2006). Also, travel planning involves a multitude of facets for which decisions need to be made. Extent of planning and timing of the decision differs for these various facets (Fesenmaier & Jeng, 2000). While past research has extensively looked at factors influencing information source use (Gursoy & McCleary, 2004), little is known about the role of specific sources in particular planning stages and with respect to particular sub-decisions. Consequently, it was the goal of this study to investigate the importance of consumer reviews in different stages of planning and for different trip facets to be planned.

2.4 Age and Gender Differences

Gender differences have been found for Web usage in general (Sanchez-Franco, 2006) and online travel information search in particular (Kim, Lehto & Morrison, 2007). Research also suggests that women are more likely to engage in WOM behavior, and female Internet users have been found to be more likely influenced by recommendations received from friends than marketer-based information (eMarketer, 2007d). Further, differences exist for different age groups. Young consumers (millennials or Generation Y) are more likely to be influenced by WOM, with 85 percent of them indicating that they primarily learned about new products through WOM (eMarketer, 2007e). In general, WOM conversations are more likely to happen online for Generation Y consumers (eMarketer, 2007f). Differences in the use of information sources driven by age have also been reported in the tourism literature. For instance, Fodness & Murray (1997) as well as Fall & Knutson (2001) and Patterson (2007) report that WOM is particularly important for older travellers. Thus, it appears that use of consumer reviews for travel planning and the impact of such reviews on travel-related decisions might differ for travellers based on their gender and age.

3 Methodology

Currently, a number of travel-related CGC sites are available such as TripAdvisor.com, Virtualtourist.com, Wayn.com and Igougo.com. Among those CGC sites, TripAdvisor is the most prominent online travel review platform in terms of use and content available. As of September 1, 2007, it featured over 10 million travel reviews and over 750,000 photos posted by travelers (TripAdvisor.com, 2007). It attracts over 24 million visitors a month and has over 5 million registered users. Thus, a Web-based survey in collaboration with TripAdvisor.com was administered during a 4 week period between January 5 and January 31, 2007. The sample was drawn from the TripAdvisor traveller panel. This panel is maintained by TripAdvisor.com and includes TripAdvisor users mostly from the US but also Canada, the UK and Australia. Consumers who work in or live with someone who works in market research, advertising, marketing, media/news, or public relations are excluded from participation in the panel. Also, the sample used for the study included only consumers who had taken pleasure trips in the previous year and/or anticipated taking pleasure trips the following year. A drawing for one of two $100 Amazon.com gift certificates was used as an incentive. A total of 7000 randomly selected panellists received an email invitation to complete the Web-based survey and 1480 actually participated, resulting in a 21.1 percent response rate.

Since the goal of the study presented in this paper was to investigate when and how other travellers' reviews are used in the trip planning process and what the perceived benefits of those reviews are, the survey included 29 questions regarding trip planning, use and impact of online travel reviews and general Internet use behaviour questions as well as questions regarding demographic characteristics. All questions

regarding reviews referred to travel reviews written by consumers rather than travel experts. The results presented in the paper were obtained using descriptive analyses of the data, while age and gender differences were analyzed using Chi-Square statistics.

4 Results

4.1 Profile of Sample

More females (64%) than males (36%) completed the survey. Most respondents (79%) reported being married or living with a partner. A majority of respondents (78.5%) reported having children under 17 living in their household. The largest age group was comprised of those who are between 50 and 64 years old (42.8%). Only 2.2 percent are between 18 and 25 years old, 14.4 percent between 26 and 34 years, 34.1 percent between 35 and 49 years and 6.5 percent 65 years or older. Over 69 percent have a college or post graduate degree. The majority (52.2%) has an annual household income of $90,000 or greater. These results were compared to the characteristics of the overall panel membership and no differences were found.

About 26 percent report having taken 1-2 pleasure trips and 38 percent report having taken 3-4 pleasure trips in the 12 months prior to the survey, while 36 percent took 5 trips or more. Almost 45 percent of the survey respondents typically begin their trip planning four or more months in advance. Nearly 30 percent plan 2-4 months in advance, about 20 percent plan 3-8 weeks in advance. About 4 percent plan 1-3 weeks in advance, just over 1 percent plan 1-6 days in advance, and only 0.4 percent plan during their trips.

Since the sample consists of TripAdvisor users, the respondents are clearly more inclined to use the Internet than a general population of travellers. Over 84 percent report that they are very skilled at using the Internet. Almost all (96.4%) use the Internet when planning pleasure trips. They are also frequent users of the Internet for travel planning. Over 82 percent use the Internet always and 13.5 percent use it often to plan at least some aspects of a pleasure trip. Of those who use the Internet to plan pleasure trips, 90 percent look at materials posted by consumers when planning pleasure trips, 64.2 percent read travel-related blogs, 27.7 percent watch videos online and only 6.6 percent listen to travel-related audio files/podcasts in the travel planning process.

4.2 Perceptions and Use of Online Travel Reviews

Not surprisingly, given the characteristics of the sample, 97.7 percent of the respondents who use the Internet for travel planning say they have read other travellers' reviews in the process of planning a pleasure trip. Of those who read other travellers' reviews, 57.8 percent do so every time they plan a pleasure trip while 26.1

percent read them very often. Over 10 percent read reviews frequently, 5.3 percent regularly, and only 0.2 percent rarely.

Most online review readers look for other travellers' reviews on virtual community sites (92.3%), followed by travel guidebook sites (60.6%), online travel agency/auction sites (58.1%) and search engines or portals (51.5%). Not so many (44.6%) look for reviews on local destination Web sites and state tourism Web sites (29.7%). Only 27.9 percent look for reviews on company sites and 13.4 percent on meta-travel search engines.

Online travel review readers use reviews to inform different stages of their pleasure trip planning. Most (64.7%) use other travellers' reviews in the middle of the planning process, to narrow down choices. But many also use reviews to get inspired at the beginning of their pleasure trip planning process (63.7%). Other travellers' online reviews are also important in later stages to confirm decisions. Almost 41 percent of travel review readers use them in this stage. Interestingly, for almost a third (29.5%) of the travel review readers, reviews are also important in the post-consumption phase to compare notes with others and share experiences. Only 8.7 percent use reviews to inform decisions during a trip.

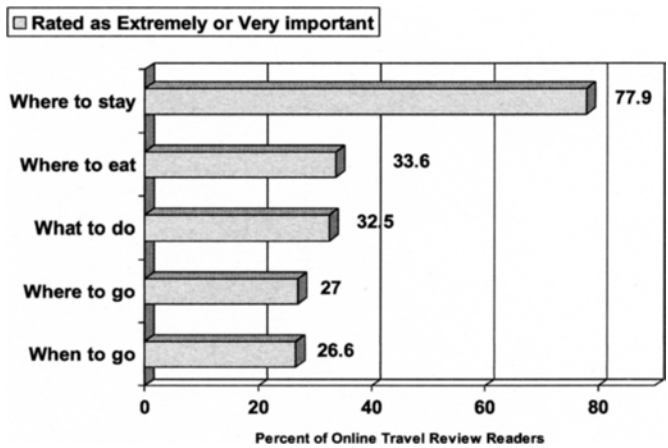

Figure 1. Importance of Travel Reviews for Travel-Related Decisions

Travel review readers perceive reviews posted by other consumers as having several advantages over information from travel service providers. Almost two thirds (65.3%) of the review readers think other travellers' reviews are more likely to contain up-to-date information, enjoyable information (61.2%) and reliable information (61.1%). Over half of the respondents perceive them also as more likely to contain detailed information (57.4%) and relevant information (53.6%).

Most TripAdvisor users (77.9%) who actively read other travellers' reviews in their pleasure trip planning process think that reviews are extremely or very important to decide where to stay. About a third think that reviews are important for restaurant decisions (33.6%) and activity decisions (32.5%). Not so many review readers consider reviews to be important for destination-related decisions (27.0%) or the timing of trips (26.6%) (see Figure 1).

4.3 Influence of Online Travel Reviews

Survey respondents were further asked to indicate in what ways the reviews posted by other travellers influenced their travel planning. The results are presented in Table 1. Almost all review readers think that reviews are a good way to learn about travel destinations and products (94.6%), help with the evaluation of alternatives (91.9%), help them avoid places/services they would not enjoy (91.8%) and provide them with ideas (90.3%).

A clear majority of the review readers also thinks that reviews increase confidence and help reduce risk by making it easier to imagine what a place will be like. Reviews are also perceived as helping with making the decision process more efficient in that they make decisions easier because they reduce the likelihood of later regretting a decision. Although less prominent than the other areas of influence, reading travel reviews also makes the planning process more enjoyable. However, not so many respondents think that reading reviews saves them time.

4.4 Gender Differences

Despite the gender differences reported in general CGC use, the analyses did not show any significant differences in terms of use except for the use of online travel agency sites to find reviews and for the perception of reviews in terms of providing detailed information. More females (60.8%) than males (53.5%) look for travel reviews on online travel agency sites (χ^2=7.15; $p<0.01$). Slightly more females (59.1%) than males (54.3%) think other travellers' reviews are more likely to contain detailed information (χ^2=6.53; $p<0.05$).

However, gender differences were found for the impact of travel reviews on different aspects of decision-making. Females (83.4%) are more likely than males (77.9%) to agree or strongly agree that other travellers' reviews make it easier to reach decisions (χ^2=18.10; $p<0.01$). They are also slightly more likely to think that reviews help them save time (69.6% compared to 65.2%; χ^2=14.65; $p<0.01$). Females (83.3%) are slightly more likely than males (80.7%) to agree or strongly agree that reviews reduce risk/uncertainty (χ^2=15.39; $p<0.01$). Females are also more likely to perceive hedonic value; 81.9 percent (compared to 67.5% males) think reviews make them feel more excited about travelling (χ^2=56.75; $p<0.01$) and 80 percent (compared to 70.3% for males) think they add fun to the travel planning process (χ^2=31.58; $p<0.01$).

Table 1. Influence of Other Travellers' Reviews

Other Travellers' Reviews...	% of Travel Review Readers Who Strongly Agree or Agree
Are a good way to learn about a travel destination, product or service	94.6
Help me evaluate alternatives	91.9
Help me avoid places/services I would not enjoy	91.8
Provide me with ideas	90.3
Increase my confidence in the decisions I make	86.6
Make it easier to imagine what a place will be like	85.3
Reduce the risk/uncertainty involved in making travel decisions	82.4
Make it easier to reach decisions	81.3
Help me plan my trips more efficiently	80.2
Reduce the likelihood that I will later regret a decision	77.6
Make travel planning more enjoyable	77.4
Make me feel excited about travelling	76.8
Add fun to the travel planning process	76.5
Help me save time in the travel planning process	68.0
Help me imagine my trips more vividly	67.4

Differences occur also for impacts regarding imagination and inspiration. Females (71.7%) are clearly more likely than males (57.6%) to think that reviews help them imagine trips more vividly (χ^2=34.85; p<0.01). More females (86.5%) than males (83.2%) indicate that reviews make it easier to imagine what a place will be like (χ^2=30.21; p<0.01). Small differences were also found for idea generation and learning; 91.1 percent of females and 88.8 percent of males see reviews as providing travel ideas (χ^2=15.17; p<0.01) and 95.1 percent of females compared to 93.7 percent of males think reviews are a good way to learn about a place (χ^2=30.18; p<0.01).

4.5 Age Differences

Several interesting differences regarding use and perceptions of reviews were found for different age groups. For instance, those 65 years or older are less likely to have read other travellers' reviews (χ^2=28.21; p<0.01). Older respondents are also less likely to use reviews every time they plan a pleasure trip (32.2% compared to 63.3% for those between 18 and 34 years of age; χ^2=45.06; p<0.01). Younger travel review readers are more likely to use reviews in the middle of the trip planning process to narrow down alternatives (80% of 18-25 year olds compared to 55.2% of those 65 or over; χ^2=15.51; p<0.01). Very young travellers (18-25 years) are also clearly more likely to use reviews during their trips (23.3% compared to 8% of those 65 or over; χ^2=11.16; p<0.05).

Older travel review readers are more likely to look for reviews on company sites (39.1% compared to 23.3% of those between 18 and 25; χ^2=15.92; p<0.01). The 65 years and older group is also the most likely to use search engines to look for travel reviews (58.6% compared to 47.2% of those between 35 and 49; χ^2=10.13; p<0.05). In addition, older travel review readers are more likely to look for reviews on state tourism sites (41.4% compared to 13.3% of those between 18 and 25; χ^2=18.61; p<0.01). The same pattern can be seen for local destination Web sites (57.5% of those 65 and older vs. 40% of those between 18 and 25 years old; χ^2=12.79; p<0.01). In contrast, younger readers are clearly more likely to look for reviews on virtual community sites (96.7% of those between 18 and 25 in contrast to 86.2% of those 65 or older; χ^2=11.33; p<0.05).

Younger travellers find reviews more important for deciding where to stay (90% compared to 60.9% for those 65 or older; χ^2=44.13; p<0.01). Older review readers are more likely to find reviews unimportant for deciding when to go (47.1% compared to 33.3% for those between 18 and 25; χ^2=29.73; p<0.01). Also, those 65 years of age or older are less likely to believe that reviews provide more up-to-date (χ^2=19.25; p<0.01), detailed (χ^2=21.03; p<0.01) and reliable (χ^2=29.09; p<0.01) information.

Reviews are more likely to increase confidence for younger review readers (86.7% compared to 72.4% of those 65 and older; χ^2=58.66; p<0.01). The same pattern was found for risk reduction; while 86.6% of those between 18 and 25 agreed or strongly agreed that reviews reduced uncertainty, this was the case for only 74.7% of those 65 years of age or older (χ^2=46.01; p<0.01). Younger review readers also experience more excitement from reviews (86.7% compared to 76.8% for those 65 or older; χ^2=38.87; p<0.01).

5 Conclusion

The survey results provide interesting insights regarding online travel review readers. They are highly educated, have high incomes, travel rather frequently, use the Internet extensively and plan in advance. Thus, travel review readers, and specifically TripAdvisor users, appear to be a very important target market for travel marketers. The study results also confirm that travel review readers perceive reviews posted by other consumers as superior to marketer information, especially as far as being up-to-date, reliability and enjoyability are concerned. Importantly, those who read other travellers' reviews do so frequently and mostly on virtual community and travel guidebook sites. This indicates that partnerships with virtual community and travel content providers are important for destination marketers.

The findings clearly show differences in the use of online reviews for different trip planning stages and trip facets. Travel reviews are not only used in the decisive stages of trip planning to narrow down choices but also for idea generation. However, they are clearly underused for en route decision-making. Thus, making other travellers' reviews more accessible through mobile applications seems to be an important goal. Also, most review readers currently perceive reviews as important for accommodation

decisions. This is not surprising as most reviews are encouraged for hotels and other accommodation establishments. One can expect that the perceived usefulness for other decisions would increase if more reviews were available for those aspects. It is fairly easy to encourage accommodation reviews as most travellers have to provide an email address when booking a room online. Hotels as well as online travel agencies typically send an email to travellers after their stay, asking them to provide a review. Different models to provide incentives for destination-, restaurant-, activities- and timing-related reviews are needed.

The results further suggest that travel reviews play an important role in the trip planning process for those who actively read them. They provide ideas, make decisions easier, add fun to the planning process and increase confidence by reducing risk and making it easier to imagine what places will be like. Especially female travel planners seem to benefit greatly from the use of travel reviews. While gender differences were almost exclusively found for impacts on the trip planning process, generational differences occurred across a variety of perceptions and use behaviours. These results confirm the importance of considering demographic variables when modelling information search behaviour.

These conclusions are not only important for travel marketers and researchers but also for system designers. Given the importance and many positive benefits of travel reviews for travel planners, systems have to be designed in a way to not only make travel reviews ubiquitously available but also to make it easy for travellers to provide reviews. Also, rather than sitting on specialized sites, reviews should be seamlessly integrated with other content such as maps and videos to make travel planning more efficient.

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User-Generated Content and Travel: A Case Study on Tripadvisor.Com

Peter O'Connor

Institute de Management Hotelier International,
Essec Business School, France
oconnor@essec.fr

Abstract

Consumer generated content is rapidly gaining traction as part of the purchase decision making process. After examining the implications for travel businesses, this paper focuses on TripAdvisor.com, the largest online network of travel consumers to establish its current practices and challenges. Using a sample of London hotels, it was shown that the system displays detailed, rich and relevant data for use by consumers in their travel planning. Analyses also suggest that the belief that the system is compromised by false reviews posted to enhance a hotels reputation or tarnish that of competitors is unfounded. Little evidence was found of characteristics that typify false reviews.

Keywords: Travel, social networks, user-generated content, electronic word-of-mouth.

1. Introduction

Just as the diffusion of the World Wide Web as a mainstream consumer media in the mid-1990s had important implications for commerce, another revolution currently in progress will potentially have similar effects. The Web is evolving from a business-to-consumer marketing media to one where peer-to-peer generation and sharing of data are the norm. Collaboration has come to the fore in a manner unimaginable in the past. As a result, it has become more difficult to carefully craft a marketing message and position it in front of the consumer. This change has important implications for business, not least the travel sector, which had hither fore embraced the web as a marketing and selling mechanism and now need to adapt to its changing characteristics. This paper examines the implications of user generated content for travel businesses, focusing in particular on hotel reviews on TripAdvisor.com, the largest online network of travel consumers. Current practices and challenges are established, areas which need further research identified and advice for industry practitioners as to how to best cope with this phenomenon offered.

2. Background

There is no denying the radical transformation that the World Wide Web has brought about. It has enabled new, more efficient, ways of communicating; of distributing and accessing information; and of doing business; helping to act as a dissolver of boundaries and a catalyst to globalisation (Puri, 2007). One of its key benefits has been the incredible access to information it provides to consumers (Bellman et al, 2006). During the consumer decision making process, potential customers can now access this vast pool of data to help evaluate alternatives. Their information search process is facilitated by search engines – websites which act as the front end of

complex categorisation systems that trawl the web categorising every page they encounter. The ease with which consumers can use such sites to search has turned the web into a user-driven, non-linear repository of information. As a result, instead of the marketer dictating how information is presented and consumed, the user is now in control. Website visitors no longer necessarily enter through a site's home page and browse as they would a brochure (Schipul, 2006). Instead they use search to hunt for, and transport them directly to, specific pieces of information. As will be discussed below, a series of developments collectively known as "Web 2.0" further revolutionise this process by radically altering the origin of information. Consumers are no longer dependent on web site owners to publish the information they seek, as they can increasingly rely on unfiltered, dynamic and topical information provided by their own peers. This change has prompted a change in the power relationship between vendors and customers, and was one of the reasons why Time magazine nominated "You" as person of the year in 2006.

Increased quantities of information can be both a blessing and a curse. Often the sheer quantity of information available can complicate the decision making process, as consumers do not have the time or ability to examine all data or compare all options (Bellman 2006). The abundance of alternatives can be overwhelming, leading to confusion, sub-optimum decisions or dissatisfaction with choices made (Smith, Menon & Sivakumar, 2007). Increased scepticism among consumers is also driving many to question the quality and credibility of information found on the web, much of which is generated by marketers, who naturally stress the benefits of their products. In the off-line world, word-of-mouth plays a pivotal role in overcoming these challenges and helping consumers understand what to believe (Looker, Rockland & Taylor- Ketchum, 2007). As Smith, Menon and Sivakumar (2007) point out, in an information intensive situation, consumers actively seek others' opinions as a means of managing perceived risks. This type of information, often referred to as 'world-of-mouth', is perceived as being more vivid, easier to use and more trustworthy than marketer-provided information (Smith, 1993). And while in the past, world-of-mouth implied people talking individually or in small groups by the water cooler, the Internet has turbo-charged world-of-mouth into a mass communications media, be it a with predefined group of friends or with thousands of online-but-connected strangers on an online community (ComScore, 2007). Thus while a dissatisfied customer used to tell ten people about their experience, now thanks to web-based consumer opinion platforms, they can potentially influence thousands of their peers (Hennig-Thurau et al, 2004). By making it easier for consumers to disseminate their viewpoints, and facilitating access to such opinions, the Internet is having a profound effect on how consumers shop.

2.1 Social networks

The term "Web 2.0" emerged in late early 2004, originating in the work of Tim O'Reilly of O'Reilly Media. However, despite much media hype, a formal definition has still to be agreed-upon. Wikipedia defines it as a "perceived second generation of

web-based services – such as social networking sites, wikis, communication tools and folksonomies – that emphasise online collaboration and sharing among users". Irrespective of definition, Web 2.0 sites share common traits – being participatory, collaborative, inclusive, creator / user centric, unsettled and very information intensive (Dearstyne, 2007). In particular, Web 2.0 affects how individuals create, exchange and use information. An example from publishing illustrates this concept, with the traditional publishing model typified by Encyclopaedia Britannica being contrasted with the flexibility, speed and topicality of Wikipedia – an online encyclopaedia whose entries are created by; continuously edited by; and used by millions of individuals. The logic behind this approach this is that over time, successive modifications will result in entries that are more comprehensive, more relevant and more current that those found in paper equivalents – a process that has been termed the "wisdom of the crowd". Folksonomies (more commonly known as "tagging"), whereby users classify web content using their own words, follows a similar philosophy. Sites that leverage these user generated tags (such as Digg, Slashdot or Del.icio.us) allow consumers to find content as it is perceived by their peers rather than how it has been classified by site owners. Other socio-technological developments usually included in the Web 2.0 portfolio include social networking (or community) sites, RSS feeds, user generated content such as blogs, photo or video sharing, podcasts, virtual worlds such as Second Life and syndication. The underlying common denominator is a kind of online democracy, with content provided by consumers for consumers (Milan, 2007).

According to Carroll & Rosson (2003) social networks have their origins in support interactions among neighbours in a community. These typically facilitated information exchange, discussion and joint activity related to local events or issues and concerns within the community. However their context has been transformed by the development of electronic communications and the Web. No longer are such networks limited by physical location, as now communities of individuals with similar interests can be formed virtually, interacting primarily in the online environment (Hennig-Thurau et al, 2004). Valkenburg et al (2006) identify three different types of online social networks – dating sites, where participants' primary objective is to find a partner; friend sites, whose objective is to help members establish and maintain a network of friends; and common interest sites, whose aim is to bring people with similar interests together and facilitate information sharing / communication between participants.

One of the key effects of social networks is the support they provide during the consumer decision making process. According to Puri (2007), there are online forums for just about any consumer product you can think of, from coffee to consumer electronics, where consumers discuss their experiences, provide their opinions and share news and advice. Such sites harness the two-way communication ability of the Internet to not only allow consumers to read other consumers' unedited and unfiltered opinions, but also collect and aggregate data from large numbers of similar people at a low cost (Hennig-Thurau et al, 2004). As Dellarocas (2003) points

out, this means that for the first time in history, "individuals can make their personal thoughts, reactions and opinions easily accessible to the global community". The Pew Internet & American Life Project now estimates that nearly half of all US Internet users have published their thoughts or otherwise created content online (Gretzel, Hyan-Yoo, & Purifoy, 2007). Consumers' motivation for doing so varies considerably. Despite what might be expected, venting frustration about negative experiences seems to be a relatively minor reason for posting a review. Desire for social interaction, concern for other consumers and potential to enhance their own self-worth were the top motivators identified in a 2004 study (Hennig-Thurau et al, 2004).

Amis (2007) estimates that social network sites now have as much influence on consumers as television and more than newspapers. Furthermore, content on social network sites is extremely search engine friendly, with the result that user's opinions usually rank highly on consumer searches for information on products or services. Thus such sites have become a prominent part of the marketplace, influencing both online and offline purchases. Dellarocas (2003) points to anecdotal evidence that consumers are increasingly relying on online peer opinions as inputs in a wide range of decisions including which movies to watch, which stocks to invest in and of course which products to buy. Smith, Menon and Sivakumar (2007) claim that consumers prefer such peer recommendations over other forms of input. Because social networks are usually formed between consumers with similar interests and are peer-to-peer, the opinions expressed are perceived to be both relevant and unbiased and are thus more likely to be believed by today's sceptical consumer than advertisements or professional input (Smith, Menon & Sivakumar, 2007). Commercial sites are also trying to make use of the user generated content phenomenon to help convert surfers into buyers. For example, retailing sites such as Amazon.com and ebay.com encourage consumers to write reviews about products purchased on their sites and use these reviews as promotional tools.

Social network sites are not without their problems. While, as discussed above, consumers often turn to such sites to reduce their information overload problem, the proliferation of sites and sheer quantity of user reviews, comments and feedback available may in fact complicate the decision making process (Bellman 2006). In such cases, credibility and trust become even more important, and the absence of contextual clues to aid interpretation can be problematic (Dellarocas, 2003). We normally use a variety of contextual clues (such as for example, a person's facial expression) to help evaluate opinions. Such clues are naturally absent in the online environment, making interpretation more difficult. Sites often display demographic or other data about reviewers (for example, the length of membership, their location, etc.) to help build credibility and trust. Others allow readers to provide feedback on the quality of reviews, incorporating each input into a rating of the reviewer. Puri (2007) also highlights the problem of authenticity. The anonymity with which individuals can post content on social networking sites has led some commentators to question the legitimacy of such ratings. While registration is required on many

systems, an identity can be changed by simply registering an alternative email address, making it in effect easy to manipulate the system. Unless appropriate safeguards are in place, participants can post dishonest reviews to enhance their own reputation or tarnish that of their competitors (Dellarocas, 2003). Left unchecked, such actions compromise the quality and utility of the entire system.

2.2 User-generated content and travel

The Internet undoubtedly plays an important role in the travel planning process. According to the Pew Internet and American Life project (2005), searching for travel related information is now one of the most popular online activities. Within travel, the Web 2.0 topic receiving most attention is clearly user reviews. Here individual consumers are solicited to provide both quantitative and qualitative feedback on destinations, hotels or other travel experiences that they have visited, which are then amalgamated to generate overall satisfaction scores. Thus instead of the expensive, glossy, perfectly posed photos included in brochures or adverts, a customer's image of a hotel may actually be determined by comments or candid photos posted by prior guests on social network sites. User generated reviews and scores are now routinely built into online travel agencies sites (see for example Expedia.co.uk or Priceline.co.uk), impacting display order and undoubtedly influencing the potential customer's choice. However research by Gretzel, Hyan-Yoo, & Purifoy (2007) indicates that reviews posted on such sites are less credible than those posted on dedicated review sites, as the former are (correctly or incorrectly) perceived as being less objective because of the commercial interests of the site. The most prominent stand-alone user-generated review site within travel is undoubtedly TripAdvisor.com, which is discussed in more detail below.

The growth of user generated content is clearly affecting travel consumer decisions. Gretzel, Hyan-Yoo, & Purifoy (2007) quote statistics from Complete, Inc that suggest that almost half of travel purchasers used consumer generated content in their travel planning, and nearly one third said that they found the input useful. Harwood (2007) quotes research from Nielsen / Netratings on information sources claiming that user-generated content websites were cited as the most reliable information source by over a fifth of respondents, nearly double its nearest rival – travel agency sites. Most readers perceive travel reviews are being more likely to provide up-to-date, enjoyable and reliable information in comparison to what is provided by travel service providers (Gretzel, Hyan-Yoo, & Purifoy, 2007). Frequent travellers in particular see peer reviews as superior and are more likely to be highly influenced (Gretzel, Hyan-Yoo, & Purifoy, 2007). The latter also claim that more than half of users consult online reviews every time they plan a pleasure trip. Most use them at the beginning of trip planning to get ideas or to narrow choices, with a smaller number consulting them later in the planning process to confirm their selection (Gretzel, Hyan-Yoo, & Purifoy, 2007). Reviews are particularly important for the accommodation product, with relevance for other travel products much smaller (Gretzel, Hyan-Yoo, & Purifoy, 2007).

2.3 TripAdvisor

TripAdvisor, part of Expedia Inc., operates a variety of consumer facing user generated content websites including bookingbuddy.com, independenttraveler.com, seatguru.com, smartertravel.com and of course TripAdvisor.com (TripAdvisor.com, 2007). According to comScore Media Metrix (2007), taken collectively this set of sites attracts nearly 30 million monthly visitors (by way of comparison, travel publisher Frommer's sells about 2.5 million guidebooks each year), making it one of the most popular sources of travel information on the web. TripAdvisor claims to have over five million registered members and to feature over 10 million user generated reviews and opinions on over a quarter of a million hotels and attractions worldwide (TripAdvisor.com, 2007). According to Travel Weekly (2007), about 8% of all leisure travellers who used the Web for travel research visit TripAdvisor. In 2007, the site was named one of the "Top 25 Travel Milestones" by USA Today. It was the only website included in the list and was cited as being instrumental in changing the way in which consumers research travel.

Part social network, part virtual community and part blog, like all Web 2.0 sites TripAdvisor is difficult to categorise. However it's clear that its primary function is the collection and dissemination of user generated content – reviews, ratings, photos and videos – on a highly specific domain, namely travel. Its most prominent value adding features are its user generated reviews and ratings. Travel consumers can go onto the site and consult quantitative and qualitative feedback on any hotel, restaurant or other travel attraction, all posted by other travellers. When adding their own reviews, users are asked to rate each experience on a five point scale (from excellent to terrible), and to consider issues such as check-in, location and quality and comfort of the room. Reviewers are also asked if they would recommend the property to their best friend, whether they were travelling alone, as a couple or with family, and whether they feel that the experience in question is suitable for different types of trips (e.g. a romantic getaway, a family trip with children, etc.). Lastly reviewers are offered the opportunity to upload candid photos and video to support their review.

All data entered by users is examined by TripAdvisor to insure that it conforms to content guidelines. Once approved, reviews are added consecutively to each property's page and displayed indefinitely. The quantitative data provided by users is consolidated to generate a summary score and rank the properties within a destination in terms of overall popularity. Details of the algorithm used to calculate this ranking are not public knowledge, but take into consideration the quantity, quality and age of the reviews submitted to the site. TripAdvisor also claim the calculations take external data into consideration by incorporating "guidebook entries, newspaper articles and other web content to determine traveller satisfaction" (TripAdvisor, 2007). This index (known as the TripAdvisor Traveller Rating) is then used to determine the order in which properties within a destination are displayed to subsequent visitors, with the most popular shown at the top of the list. Hotels have the opportunity to post a management response to each review, but requests from hotels to remove or edit reviews are not entertained.

The problem with authenticity noted earlier is one of the key challenges face by TripAdvisor. Several press reports (and a large amount of hotel industry buzz) call into question the legitimacy of the review system (see, for example, Keates, 2007 or Milan 2007). Unlike travel reviews posted on online travel agency sites, TripAdvisor does little to verify that the reviewer has stayed in the property being reviewed, although the company claims that each review is assessed by personnel trained in fraud detection (Reiter, 2007). As a result, there is a widely held belief that many reviews are not genuine – posted in some cases by jealous competitors to decrease a hotel's rating, or in other by the hotel itself in an effort to improve scores. (One of TripAdvisor's competitors, SideStep.com, estimates that approximately 2 percent of its own reviews are bogus (Reiter, 2007)). TripAdvisor attempts to minimise the problem by posting notices prominently throughout the site warning that fake reviews will not be tolerated, and that hotels attempting to manipulate the system will be penalised in their rankings and have a notice posted indicating that they post fake reviews. The "power of the crowd" that typifies Web 2.0 sites is also relevant here. As the number of reviews grows, the impact of fake reviews falls as they are overwhelmed by genuine consumer generated content.

3. Research Methodology

Given the growth in Web 2.0 site in general and social media in particular, the objective of the study was to explore how hotels are presented on TripAdvisor as an aid to helping managers better understand how they can manage their image and positioning on the site. Other objectives included investigating if relationships existed between hotel characteristics such as star rating and positioning on the system; to establish if hotels were using their right to reply; and to search for evidence of dirty tricks among reviews. Hotels were chosen as the category to be studied as research had shown that travellers consider user reviews to be more relevant for hotels than for other travel products (Gretzel, Hyan-Yoo, & Purifoy, 2007).

One hundred hotels were randomly selected from the 1042 listed on TripAdvisor.com for the London market. Each listing was analysed and selected characteristics (including its star rating, its TripAdvisor Traveller Rating, its rank within the London market, its average rate and the number of reviews listed for that property) were recorded. The five most recent reviews for each hotel were also analysed, in particular to establish demographic characteristics of the reviewers. Parametric and non-parametric tests were then used to investigate key questions. A summary of the findings is presented below.

4. Research Findings

As can be seen from Table 1, the sampling process resulted in a variety of hotel types being included in the study, with 3-star and uncategorized hotels the most highly represented, which corresponds well with characteristics of the London market (Mintel, 2007). The mean ranking of hotels sampled was 383, with rankings in general showing a relationship with star rating. Similarly overall rating of properties

was found to move in line with star rating. An exception to both comments is the scores for 5-star properties. Both average rank and average rating for 5-star properties were substantially below those of 4-star or even 3-star properties. However analysis failed to show that these differences were statistically significant, indicating that the findings could have occurred by chance or due to some external factor. Nevertheless such an anomaly deserves further investigation and should be examined in more detail in subsequent studies.

An average of 75 reviews was displayed for each property. Such a high number is important as research indicates that consumers evaluate reviews in the context of other reviews and other contributions by the same reviewer (Gretzel, Hyan-Yoo, & Purifoy, 2007). Once again the number of reviews increased in line with star rating, with 5-star properties again being an exception to the rule. It is also worth noting that despite prominent notices throughout the site that hotels posting fake reviews would be "named and shamed", no such notices were encountered on any of the property listings studied.

Table 1, Hotel Characteristics

Star Rating	Number	Average Rank within London	Average TripAdvisor Rating	Average number of reviews	Average Room Rate (US$)
Unclassified	46	468	3.10	67.6	256
1 star	4	857	1.75	38.5	154
2 star	4	470	3.25	32.5	188
3 star	32	290	3.56	83.1	316
4 star	10	91	4.10	129	409
5 star	4	314	3.50	33	555
Overall	100	383	3.32	74.76	282

For each property in the sample, the five most current reviews were analysed in more detail. Taken as a whole, these had similar mean and median rating scores to the summary scores presented on each property's page. An analysis of means and standard deviations reveal no significant difference between the summary and sample scores, suggesting that examining the most recent five reviews was sufficient to form an impression of reviews as a whole. In general, the narrative of reviews was shorter than expected. The mean number of words per review was just 157 words, with a standard deviation of 62. This is surprising as previous research on TripAdvisor had indicated that the majority of users noted detailed descriptions as being important when evaluating a travel review (Gretzel, Hyan-Yoo, & Purifoy, 2007). "Candid" photos, taken by consumers, were included on practically all reviews (92%), increasing the richness of the information available to readers. The ability to upload video clips is a relatively new TripAdvisor feature, and no consumer generated video was encountered during the study. Lastly, despite the facility of a right-to-reply being offered by TripAdvisor, few management responses to consumer reviews were encountered during the study. Of the 500 reviews analysed, responses from hoteliers were only found in two cases (0.4% of the time). Characteristics of the person

posting the review were also examined. Analysis revealed that a typical reviewer posted an average of 4.5 reviews, and had been a member for an average of 10 months at the time of posting.

5. False reviews

As discussed above, one of the challenges faced by social network sites is false postings. Many people (including TripAdvisor itself) suspect that at least some reviews are bogus – posted either by other hoteliers to drag down the scores of their competitors, or by hoteliers themselves to do the inverse or push existing negative reviews 'below the fold' so they will not be seen at a glance by casual surfers. A simple examination of the review data seemed to support this theory. Dellarocas (2003) points out that one of the most important factors in considering the credibility of a reviewer is the overall number of reviews posted (irrespective of whether they are positive or negative).

In this study, many of the most extreme scores were from reviewers with only a single review – either extremely positive (5 out of 5) or extremely negative (1 out of 5). To investigate if such findings were statistically significant, reviews from reviewers with only a single review were selected, and their mean rating score compared with the rest of the sample. As can be seen from Table 2, their score was significantly lower than for the sample as a whole or for reviews where the reviewer had posted multiple reviews. Similarly, the standard deviation was significantly higher for single review scores, indicating more extreme responses. However this does not imply that single reviews are false, merely that such reviews are more extreme. This in itself is understandable, and reflects a well known phenomenon with guest comment cards, whereby extremely negative or extremely positive customers are more likely to provide feedback.

Keates (2007) identifies several factors that might indicate a fake review – including scores that differ greatly from the average, mentioning nearby properties as superior and having written about only one hotel and visited the site only once – on the day that review was posted. The latter point could be particularly important in identifying fake postings, as TripAdvisor estimate that over 97% of reviewers return to the site to plan their next trip (Reiter, 2007). Thus to identify reviews more likely to be false, reviews where the reviewer registered on the same day as their single review was posted and never subsequently returned to TripAdvisor (dubbed, for the purposes of this study as 'suspect' reviews) were selected and compared with other reviews. As can be seen from Table 3, suspect reviews were more likely to be at extreme ends of the scale than either other single reviews or multiple reviews. The number of suspect reviews that gave a rating of one is particularly high at over one-third. While these findings do not conclusively prove the existence of false reviews, such a high proportion of extreme reviews, with the reviewer in question having joined and posted their review on the same day and never subsequently returned, is highly suggestive.

Table 2, Analysis of single reviews

Measure	Sample	Single Reviews	Multiple Reviews
Mean	3.14	2.93 **	3.33 **
Standard Deviation	1.48	1.63	1.31

** $p < 0.05$

Lastly an analysis was performed to see if there was evidence of fake reviews being posted by hotels to minimise the effect of negative reviews. The sample was analysed to identify single reviews giving the property an excellent rating, which were immediately proceeded by a review giving the property a very poor score (1 or 2). In total, 20 (4%) cases were identified that fit these criteria. These were visually inspected and a subjective judgement made as to whether they might be false. Only a small number (five or 1%) were phrased in exclusively positive terms, suggesting that they might be false and entered by someone connected with the property in an attempt to manipulate the system.

Table 3, Analysis of suspect reviews

TripAdvisor Rank	Suspect Reviews	Other Single Reviews	Multiple Reviews	Overall sample
1	36%	21%	12%	21%
2	14%	14%	16%	15%
3	11%	7%	20%	16%
4	15%	24%	29%	24%
5	24%	34%	22%	24%

6. Conclusion

It's clear that although they are relatively new concepts, social media and user generated content are rapidly gaining traction among travel consumers. All hotels sampled on Tripadvisor.com had been the subject of multiple reviews, where consumers voiced their opinions about experiences in that property. Given the number of visitors to the site, it's clear that this content is being consulted; the guest experience is becoming essentially transparent; and reviews are having an effect on consumer decisions. And given the increasing numbers of web-savvy consumers, increased focus on social media and the continued growth of online travel sales, its importance can only grow in the future. Given such potential influence, it would seem logical that hotels would spend time managing how they are presented on such sites. Yet this study calls into question how seriously hotels are responding to this issue. As was discussed above, while a hotel cannot get negative reviews changed or removed, sites such as TripAdvisor do provide a "right to reply" facility where properties can respond to criticism. Yet this study shows that this facility is rarely if even used. This is particularly worrying. While word of mouth cannot be controlled, it can be managed and must not be ignored (Looker, Rockland & Taylor, 2007). On today's Web, the model has changed from where brand image was set by suppliers to

one where it is forged in continuous dialogue with consumers, often at the virtual point of purchase (Milan, 2007). Hotels thus need to be more proactive, engaging in dialogue with customers to protect their brand image (Ellis-Green, 2007). If they do not react, once again they will be left behind, just as they were at the beginning of the Internet boom when online travel agencies were able to capture massive market share while hotel companies sat on the sidelines trying to figure out the rules of the game.

The biggest threat to sites such as TripAdvisor is a loss of credibility. As was discussed earlier, there is considerable feeling in the hotel sector that many reviews posted on such sites are bogus. While far from conclusive, this study suggests that such fears are unfounded. While some reviews are suspect, the vast majority do not conform to the criteria suggested by Keates (2007) for the identification of false reviews, namely extreme scores and a solitary visit by the reviewer to join and post the review. Thus, in spite of the absence of the threatened abuser notices on property pages, it appears that TripAdvisor is doing a good job of policing its system.

To succeed in the future, hotels need to actively embrace the concept of social media and try to leverage these developments to generate incremental business and build customer loyalty. Meeting customer expectation has become more important than ever, as the Internet has changed the ease with which they can share their experiences, with others. Hotel companies need to become more proactive at both monitoring and managing how they are being represented on social network sites. As the latter continue to grow in importance, their influence on travellers can only increase.

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RevisiTour: Enriching the Tourism Experience With User-Generated Content

Youn-ah Kang, John Stasko, Kurt Luther, Avinash Ravi, and Yan Xu

School of Interactive Computing & GVU Center
Georgia Institute of Technology, Atlanta, GA, USA
ykang3@mail.gatech.edu

Abstract

We have explored design opportunities to enrich the tourism experience of people at the Georgia Aquarium by providing a context of photos and by motivating people to be active creators of content to share their experiences with others. We designed a system named RevisiTour to enable visitors to reorganize photos taken from tour sites and share the photos with others. A visitor's path and timestamp are recorded on a badge with a sensor throughout a trip. After the trip, the visitor can access a website where s/he uploads photos, synchronizes them with the path, and shares the photos with others. We report on how the system was designed, developed, and refined. After developing a prototype, we evaluated a mock-up of the system with actual visitors in the Georgia Aquarium. The analysis and design implications show the possibility of user-generated content systems for tour sites.

Keywords: Tour Technology, Ubiquitous Computing, User-Centred Design, User Experience, User Generated Content, Web Services.

1 Introduction

Often, a visit to a popular place such as a museum, aquarium, or tour site is a special one-time visit to that place. Unless people live near a site, are particularly interested in that venue, or the site constantly changes its content/collections, they may rarely revisit the venue. Also, visits to tourist attractions tend to be limited to on-site experiences since many people do not gather much information about a site before a visit. Even after a visit, they may soon forget what they saw and how they felt while touring even though they have taken pictures to cherish the memories. In other words, they lose context of their experience.

We found that tourists at the Georgia Aquarium desire more interaction than is currently provided. Tourists not only want to see and feel each exhibit, but they also want to learn more about its history and make an impact on its future. We found that tourists seek to share their personal experiences even with other tourists they do not really know. Tourists come with cameras in hand, snapping pictures of everything they see, and uploading them to blog posts and media sharing websites such as YouTube and Flickr. Although this evidence shows that people are willing to share their tour experiences with others, there is no integrated system that can support these uploading, accessing, and sharing activities embedded in the process of touring. To

address these problems, we must confront two major issues: (1) how to capture visitors' experience without interrupting their current practices of touring and (2) how to make records of the visit (e.g., pictures) meaningful before/after a visit.

Our project, known as RevisiTour, aims to design, build and test an experience-sharing system for tourists who are visiting places of interest. We chose the Georgia Aquarium in Atlanta, Georgia as the environment where our system will be deployed and tested. We first discuss issues from previous research followed by a description of our design process. We then provide an overview of the prototype that was tested at the Georgia Aquarium and conclude with an analysis and discussion of our evaluation.

2 Theory/issues

2.1 Tour Guide System

Location-tracking systems and mobile computing have been successfully applied to the tourism domain in the context of the handheld tour guides. Cyberguide, a mobile context-aware tour guide, uses a person's current locations, as well as a history of past locations, to provide more appropriate services that they come to expect from a real tour guide (Abowd et al., 1997). The GUIDE system utilizes contextual information such as location and user profile, in order to provide the tailored information and navigation needs of visitors to the city of Lancaster (Cheverst et al., 2000). Researchers also have studied the use of handheld devices in a museum. The Guidebook project, in which nomadic web content was created to explore user experiences with handheld devices in a museum, used a travel guide providing directions, historical context, information, and background stories (Hsi, 2003).

As shown in previous work, a mobile tour guide is often limited to provide richer, just-in-time information or provide a path to the right object. Our attempt here is to involve visitors with creating content and serving information, thereby suggesting a new perspective on tourism-related technology for aspects of the tourism experience.

2.2 Photo-Sharing Support

Researchers have recently explored photo-sharing practices on the web to support more meaningful digital record sharing. The Personal Digital Historian (PDH) project is an effort to facilitate conversation and storytelling for multiple, co-present users to explore digital collections (Shen et al., 2004). In the first application, they suggested a new interface that enables users to annotate, organize and query the digital collections around four questions essential to storytelling: who?, when?, where?, and what?

Frohlich et el. (2002) studied 11 families and identified photo-sharing practices using ethnographic field observations. Some of their findings included that: people are motivated to do some basic organization immediately; people complained about

forgetting details of people and events; and several people want more specialized photo archiving (e.g., putting together special milestone projects to mark a significant life event). In a study that examined photography practices, socialization styles, and perspectives on privacy, Miller and Edwards (2007) found that people used a chronological organizational strategy as their primary method. Bamford et al. (2007) implemented LogoBlog, a space-time photo travel blogging service that consists of the mobile application and associated website. The service provides a unique way for individual users to record their travels and also provides the family and friends an interactive way of sharing travel experiences in real-time.

3 Methods / procedures

Our design process included the following phases: user research and secondary research to identify needs and requirements; and sketching and ideation to develop multiple design alternatives and explore the design space.

3.1 User research

We conducted user research including several interviews and online reviews in order to better understand our target users. We focused on various types of user groups and how those groups differ in terms of interests and group dynamics.

We found that different user groups have different purposes and we need to fulfil each group's requirements. Basically, we identified two main goals of people visiting an aquarium: for educational purposes including information seeking and simply for having fun and enjoying the experience. Individuals who attend the aquarium with these different goals in mind show different behaviours while staying in the aquarium. Education-seeking visitors try to obtain as much information as possible by reading descriptions, querying the staff, and taking pictures of the animals. The fun-oriented visitors simply enjoy the atmosphere of the aquarium and place more emphasis on being in this beautiful place with other strangers. Of course, many visitors come to the aquarium with both goals in mind, but we felt it important to carefully consider these two different goals in the design of the system.

The differing technological abilities and familiarities of visitors was another design implication. Visitors to the aquarium may range from a 5-year-old child to a 70-year-old grandparent, from a person without any computer experience to a technologically savvy student. Our design must be appropriate for this wide range of individuals. Also, the system is not an application being used routinely in people's everyday lives. Visitors are likely to use it several times a year at most and that is even only for frequent aquarium visitors. This highlights on an important design implication: the interface should be intuitive and easy to use without training.

3.2 Secondary research

In this phase, we explored existing systems that people use when they are visiting a tourist venue or when they share their tour experience before or after a visit. While there was no existing system that could systematically support experience sharing for tourists, through interviews and online resources we examined different systems that had similar functionalities and characteristics. We found evidence that tourist venues are beginning to realize people's desires for both knowledge and entertainment, and current efforts are scattered into different systems that were designed for different groups of users. The existing sources of information and experience sharing we reviewed include: (1) Official website of Georgia Aquarium, (2) Tour guides, (3) Information Placards in front of each exhibit, (4) Displays for each of the sections, (4) Flickr, a popular online photo sharing website where one can fine more than 27,000 photos for "Georgia Aquarium", (5) YouTube, an online video sharing website where 545 videos are found by a search on "Georgia Aquarium".

From the systems listed above, we found that there have been many efforts from the aquarium to provide more content to visitors, and visitors are starting to use different platforms provided by third parties to share their experience. The examples of YouTube and Flickr demonstrate tourists' desire to share their experience with others. Interestingly, the Georgia Aquarium website has attempted to integrate different experience-sharing resources, for example, the site links to related web pages on Flickr and YouTube. We seek to go beyond this to provide an integrated system that can support accessing, reading, uploading and commenting on the tour experience.

3.3 Sketching and ideation

In the ideation phase, we generated several sketches and scenario concepts. This process helped us identify key system features and narrow the design space. In particular, we wanted to answer key design questions regarding possible options. Our design alternatives varied in the design space listed below.

- Hands-off and unobtrusive interaction versus access to information: the system should be designed to be unobtrusive when users are focusing on the tour and moving around on their feet. However, as found in interviews, tourists want more information on-site; they are more interested in getting information about exhibits when they actually see them. While hand-held devices can provide better access to "information on-the-go", they tend to be obtrusive, especially under mobile circumstances. It is crucial to find a balance between accessibility of information and physical demands.
- Private expression versus public presence: while we try to encourage tourists to share their experiences, we need to keep in mind that everyone has different levels of privacy concerns. Some people enjoy sharing their pictures with the public but some do not. The design needs to address these different levels of privacy requirements, allowing tourists to have the freedom to decide which content they want to share and how they want to share it.

- On-site versus off-site subtasks: some of the functions of the system we envision could be done either on-site or off-site (e.g., sharing photos). We need to compare the cost, difficulties, and benefits of on-site and off-site tasks and decide upon an effective and user-satisfying solution.

4 Results

4.1 RevisiTour: the design

Our design focuses on off-site experience sharing. Tourists' experiences (pictures or videos) are organized by both location in the Aquarium and time. This information is detected and recorded silently by a wearable tag that measures the proximity between the tourist and the exhibit and the related timestamp. Visitors tour the Aquarium as they normally do. Upon exiting, the badge automatically uploads their organized experience as a package to the website, which tourists can later visit to view their path through the Aquarium, sort their photos and videos by location and time, share their experience with others, view others' shared content, and comment and rate content. We call this experience-sharing system RevisiTour.

Our RevisiTour system prototype consists of multiple components. Zigbee technology is used for the location-tracking component. The online website Flickr is used as the repository for user's pictures. Finally, a custom web-interface and database is used to merge photos, timestamps, and location data in order to present them to the user in an intuitive and interesting way.

The RevisiTour system does not disrupt the on-site touring experience: tourists make use of their traditional way of recording the experience, either by digital cameras or camera phones. The Zigbee tag for recording proximity information and timestamps works automatically without disturbing the tourists.

4.2 Usage scenario

In order to better understand the prototype developed, we provide a typical visitor scenario and describe the system. The scenario refers to a tour of a family.

Eileen is a 41-year-old mother, who has a 5-year-old son, Dan, and a 9-year-old daughter, Alice. One weekend, Eileen decided to take her daughter and son to the Georgia Aquarium. When they arrived at the Aquarium, there was a long line waiting at the entrance. While they were waiting, they noticed a big display on the wall of the entrance, showing the pictures that previous visitors had taken and shared. After they entered the aquarium, a staff member gave Eileen a small tag that she could pin onto her t-shirt. During the tour, she was busy watching her children and taking pictures. She forgot about the tag that she was wearing.

After three hours, Eileen and her children finished the tour. While passing through the exit, Eileen's tag automatically uploaded her family's location data to the Internet. At night, Eileen wanted to go over the pictures that she had taken. She connected her digital camera to her laptop and uploaded all the pictures to her personal Flickr account. She then navigated the Georgia Aquarium website and logged in using her ticket ID and Flickr ID. She was presented with all her pictures sorted by location and time, which helped her renew her memory. She went over the pictures following the route she took in the Aquarium, as if she revisited the aquarium.

4.3 Prototype development

Here, we describe three elements of our prototype: Zigbee technology, Flickr, and a web-based visualization tool with a database. While we did not build the hardware design, we fully implemented the system interface and built the website including database and web-based visualization tools.

4.3.1 Zigbee technology

Zigbee technology is used to unobtrusively track the visitor paths through the Aquarium. Zigbee is a short-range wireless communication standard similar to Bluetooth that is ideal for low-power, limited-memory computing devices (Adams & Heile, 2006). For our application, Zigbee nodes can be fixed to each exhibit and also given to each visitor in the form of a tiny, wearable badge. The visitor Zigbee node can measure the radio signal power between itself and all nearest nodes and then simply record the ID and timestamp of the exhibit node that provided the highest signal power. A major benefit of Zigbee technology is its scalability, robustness, and cost-effectiveness. With these advantages, Zigbee technology provides an unobtrusive location tracking system and visitors can tour the Aquarium normally

4.3.2 Integration with Flickr

In our system, media sharing in an online community would be an important component. To serve the purpose of a photo organizing and contextualizing tool, we decided to integrate our system to Flickr using the Flickr API rather than building an online community *per se* for the following reasons.

Even before the phase where we conducted user and secondary research, we had come to the realization that many tourists were already sharing their experiences via media sharing websites such as Flickr and YouTube. As a result, Aquarium staff had placed links on the Georgia Aquarium website to areas of Flickr and YouTube where media created by tourists were being shared. Beyond this, however, the Aquarium was looking for ways to explicitly take advantage of these emergent tourist activities and leverage them towards something more closely tied to the Aquarium itself.

Also, we thought that the Flickr interface does a good job of presenting media sharing capabilities to users in a straightforward, easy-to-use way. It was daunting to simulate such an extensive online community, so we decided to build our system in such a way

that it could integrate with Flickr's functionality, simultaneously leveraging Flickr's huge database of photos and functionality and providing services to Flickr users that make their photos of the Georgia Aquarium more meaningful and interesting.

4.3.3 Web-based visualization

Anyone who visits the RevisiTour website (http://revisitour.kurtluther.com/) will have a number of options from which to choose. Without providing his or her ticket ID, the tourist can browse the photos that other tourists have synchronized. This option, which we refer to as the **spatial or map visualization tool**, is selected by default when the RevisiTour website is accessed. If a tourist mouses over a sector of the map, as shown in Figure 1, that sector becomes translucent, uniquely coloured and its boundaries are made explicitly visible. The sector's name and the number of synchronized photos for that sector also appear. If the tourist clicks a sector, the photos in that sector appear as thumbnails in a translucent, overlaid, modal window. The tourist also has the option of viewing the most interesting photos and most recent photos of the Georgia Aquarium that are tagged on Flickr.

Fig. 1. Two visualizations: spatial (left) and temporal (right) view

At any time, the tourist may type his or her ticket ID into a textbox in the interface to view his or her *own* location data and synchronize his or her *own* photos. Once the ticket ID is typed and submitted, the tourist is brought to the **temporal or timeline visualization tool**, shown in Figure 1, where his or her location data is presented. The temporal visualization tool presents the tourist's path through the Aquarium as a sequence or timeline, moving from one sector to the next. For each sector that the tourist visited, the name of the sector is presented. In addition, the time spent by the tourist in each sector is presented, allowing the tourist to easily ascertain where he or she spent the least and most time. Besides time and location data, the temporal visualization tool also associates photos with each location visited by the tourist. In this view, the photos shown are those taken by other tourists during the same time period that the tourist was in that sector. Thus, the tourist can see what other tourists photographed and found interesting in the same place at the same time that he or she

was there. By clicking small arrows, the tourist can cycle through thumbnails of these photos. Beneath each thumbnail is a bar graph visualization of the relative number of photos available for each sector, revealing at-a-glance the sectors that prompted tourists to take the least and most photos.

Besides viewing the photos that other tourists took, the tourist may also want to see precisely where, within the Georgia Aquarium, his or her own photos were taken. To take advantage of these additional features, the tourist must synchronize his or her Flickr photos with the location data stored by RevisiTour. When the tourist's Flickr account username is provided after s/he logs into RevisiTour with his or her ticket ID, RevisiTour will then use the tourist's location data to synchronize his or her Flickr photos and import them into the temporal visualization tool, replacing the photos of other tourists that were presented previously. Likewise, the bar graph visualization representing the relative number of photos taken by the tourist will also update to reflect the tourist's own synchronized photos.

5 Evaluation

We deployed the prototype in the Georgia Aquarium to assess our design with real visitors and find room for improvement. As the RevisiTour system is comprised of an on-site (aquarium-based) component and an off-site (web-based) component, we divided the evaluation process into two phases. The first phase evaluated the tourist's experience with the location tracking system at the Georgia Aquarium, while the second phase evaluated the tourist's experience with the web-based visualization tools on the RevisiTour website.

5.1 On-site Evaluation

Since it would require tremendous resources to implement the real location-tracking system, we constructed a system for evaluation purposes that, from the tourist's point of view, is completely indiscernible from how the real system would operate. We simulated the automatic location tracking provided by the Zigbee infrastructure by simply observing where tourists go throughout their visit and recording this path without informing the participants. This approach yielded a data set identical to that which would be generated by the Zigbee infrastructure. After they finished the tour, participants filled out a brief questionnaire. We asked each about how they felt having his or her location tracked and recorded. Specifically, we were interested in to what extent they were sensitive to obtrusiveness and privacy issues. Some questions asked whether the location-tracking badge was obtrusive and whether they felt uncomfortable about being tracked.

5.2 Off-site (Observation, Survey, Interview) Evaluation

The RevisiTour website and visualization tools were fully implemented. In the real world, tourists would use this part of the system in the privacy of their own home or

workplace. However, we evaluated the system at the Aquarium simply because we wanted to observe the tourist using our system and to collect data firsthand.

After the subjects finished touring, they were taken to a room where they could access a laptop and wireless network. They were provided with an instruction sheet that included how to use the system and a description of the tasks to perform. After they finished the session, we asked them to complete a questionnaire. Though we did not measure objective performance such as task time or accuracy, we asked Likert-scale questions to obtain quantitative data. We also conducted a follow-up interview to solicit more detailed responses on our system. The interview was semi-structured; we generated questions based on what we had observed.

5.3 Users Involved and Tasks

We recruited subjects in advance and had them to visit the aquarium and use our system. We had 13 participants (5 female). All the users were familiar with computer and Internet usage. Most of the users had photo-sharing experience, but only one user had experience in Flickr.

In the off-site evaluation, users were asked to take photos while touring the Aquarium as they normally would. Though we did not list a set of benchmark tasks for the on-site evaluation, there were several main tasks that users were asked to perform when they interacted with the RevisiTour site. The tasks included (1) creating a Flickr account, (2) uploading photos to the Flickr website, (3) visiting the RevisiTour website, (4) logging in using a Ticket ID, (5) synchronizing photos using Flickr ID, and (6) exploring the website as they would like to do.

5.4 Evaluation Results

We analysed the data gathered through surveys and interviews and then divided our findings by themes or topics. Two are *feature*-based themes—location tracking and photo sharing—and two are *usage*-based themes: usability and desirability.

5.4.1 Location tracking

We knew that location-tracking component of our system would lead to a host of privacy issues. Our question was whether tourists would see the value brought about by the location tracking as offsetting the perceived costs of allowing themselves to be tracked and having this data stored as they roamed around the Aquarium. To help illuminate this issue, we asked participants how comfortable they were with relinquishing their location data at varying granularities: having their location tracked at all, having the data used by the Aquarium, connecting the participant to her data through the ticket ID, and storing and accessing this data online. The data showed that participants, across the board, were very comfortable with having their locations tracked in the Aquarium and their location data made available on the RevisiTour website. Though some expressed concern about the data being made available to

outsiders through intention or security flaws, overall, participants had a favourable reaction to the location tracking system and how it handled privacy concerns as one user commented: *"As long as the tracking information stays within the aquarium with the purpose exclusively for the aquarium, there is no objection against it"*

5.4.2 Photo sharing

We sought to get a feeling for how our participants felt about photo sharing, in terms of both sharing their own photos and looking at photos shared by others. We also wanted to see how difficult it would be for tourists unfamiliar with Flickr to get up and running with it. The ratings of each question showed that participants were active in sharing their photos with others and viewing shared photos by others. Participants were also generally willing to learn to use Flickr. Though participants did not express particularly high levels of enthusiasm for viewing photos shared by others, we suspect that if more photos were available—for the evaluation, RevisiTour only showed a small number of photos—the viewing experience might be more rewarding.

5.4.3 Usability

To solicit holistic feedback on the entire experience, we asked participants questions about how easy or difficult the system was to use. Overall, the results of our usability-focused data were very favourable. Participants reported that the RevisiTour website interface was easy to learn; as learnability was a crucial usability attribute we were seeking to address, these results were very encouraging. Participants also indicated that navigating the RevisiTour website, once they knew how to use it, was quite easy. Some participants requested additional features for the website: *"It's very good to add the fish database, such as fish's name and short characteristic explanation and a listing of what was contained in each exhibit to help with tagging."*

5.4.4 Desirability

Since RevisiTour is designed to supplement tourism experiences, it was important for us to evaluate whether RevisiTour seemed to make tours more fun than they already were. Did they enjoy using it? Would they use it again if they had the chance? We asked participants several questions across a variety of dimensions, ranging from entertainment to usefulness to aesthetics. Though the ratings were not as high as we expected, all questions met with relatively positive results from participants. They felt that the system was mildly desirable but a few were quite excited about RevisiTour as some participants commented: "*...I have never seen such a synchronization method of sorting pictures by location, very fresh experience.*" "*...I feel this system has great potential to be a value-adding tool to the experience. The most difficult part of owning a disk [unintelligible] is remembering the specifics of where/what/when I took pictures. Your system shows me which general area I was in...*"

6 Conclusions

This paper presented a design case study of an experience-sharing system for tourists. Preliminary studies have identified a need for better support for media sharing with

such spaces and other tourists. User study and secondary research narrowed down possible design spaces. After initial sketching and design, we created the RevisiTour system, a location-based experience sharing system for visitors of the Georgia Aquarium. It provides an integrated system with which tourists can upload, access, and share their personal experiences embedded in the process of touring. We built a prototype and conducted an evaluation with actual visitors under a real environment. While the analysis showed the possibility of RevisiTour as a new way of experience-sharing system, it still leaves a room for improvement in supporting for exhibit information and better integration with Flickr.

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Web 2.0: A study of online travel community

Jin Young Chung [a] and
Dimitrios Buhalis [b]

[a] Department of Recreation, Park, and Tourism Sciences
Texas A&M University, USA
jy0914@tamu.edu

[b] School of Services Management
Bournemouth University, U.K.
dbuhalis@bournemouth.ac.uk

Abstract

Online communities have been increasingly recognised as important information sources for consumers and as an effective marketing channel for marketers. It is critical therefore to understand what actually makes members participate in online communities. Accordingly, the fundamental benefits of online community members and how those benefits influence the level of participation and attitudes in the online community were examined in this study. Using the data collected by an online survey, three main benefits were identified, namely: information acquisition, socio-psychological, and hedonic. It was found that online community members perceive functional benefits, including information acquisition and experience sharing, as the most influential element on level of participation and attitude. This study also provides managerial implications regarding how to utilise and operate an online travel community whilst providing significant inspirations for future study.

Keywords: Web 2.0, online community; information source; information needs

1. Introduction

The rapid diffusion of new Information Communication Technologies (ICTs) transforms tourism from a labour-intensive to an information-intensive industry (Poon, 1993; Sheldon, 1997; Buhalis, 2003). As a result, the role of the ICTs and the Internet in tourism has been instrumental in both commercially and non-commercially activities. Individuals visit the Internet to search for information and communicate or simply spend time and shop (Rodgers & Sheldon, 2002). Increasingly it is evident that people "meet" online to express views, share information and often keep online diaries or blogs. The emergence of online communities, where people meet and discuss on forums and bulleting forms or exchange information on social networking sites (such as Facebook or Linkedin) demonstrate the dramatic increase of peer to peer communication online. Although many of these developments have been propelled by non-commercial purposes, it is gradually evident that consumers are using these tools to review commercial products and services, and to support or criticise organisations for the quality of their offerings. Consumers also learn to trust their peers more than the marketing of organisations. As a result blogs, review and networking sites are becoming incredibly important for organisations.

In particular, Werry (1999) argues that online virtual communities have become a central model of interactive marketing since 1997. Armstrong & Hagel (1997) also claim that an online community plays an increasingly important role as a credible information source in the dynamic global marketplace. In effect, it simulates word-of-mouth but on a global scale where millions of peers may have a view on the quality and suitability of a product or service.

In tourism, tourists use the Internet to obtain travel information, share their experiences, make a relationship with people from various destinations or purchase travel-related products. The Internet already supports the pre-travel phase where all the research and bookings can take place online; the during-travel phase through interactive forums such as on the Tripadvisor or through publishing blogs while on the road; and the post-travel phase where people can share experiences, review hotels and destinations, and post photographs and videos from their trips. As much as portals such as Yahoo, American On-Line, and MSN provide communities and blog features related to travel, many travel-oriented websites are largely designed on the basis of online community attributes. Tripadvisor for example specialises in hotel reviews and acts as a travel forum where people can post questions, whilst WAYN specialises in bringing people together whilst on their travels. Hence tourism organisations and destinations need to adopt proactive strategies and not only monitor what is reported about them online but also to create a positive image across all the communication channels that refer to their brand.

To understand the travel community phenomenon in the online context and to meet the needs of online users, it is important to examine what actually motivates online users to become involve in these communities with positive attitudes. Participation and attitude are two vital dimensions of consumer behaviour trait (Vogt & Fesenmaier, 1998). Understanding community users' motivation also enables organisers or operators to build and operate online communities efficiently, and furthermore, facilitates consumer centric marketing (CCM) or relationship marketing (Niininen, March, & Buhalis, 2006). Thus, this research aims to identify the benefits members gain in an online travel community, and to analyse how much the perceived benefits are associated with the level of participation in the online community and members' attitude towards the online community.

2. Theoretical foundations

2.1 Information Search Behaviour and information needs

When planning to travel, individuals tend to undertake extensive information search. This is because travel products are intangible and cannot be evaluated in advance. Furthermore, travel and taking a holiday is one of the biggest expenditures in the annual budget, (Holloway & Robinson, 1995; Mill & Morrison, 2002; Sirakaya & Woodside, 2005). Travellers are also often eager to meet 'like-minded souls who have similar attitudes, interests, or lifestyles (Wang, Yu, & Fesenmaier, 2002). This behaviour is believed to occur in order to reduce risk and uncertainty (Gitelson & Crompton, 1983; Mansfeld, 1992; Mayo & Jarvis, 1981; Mill & Morrison, 2002;

Stigler, 1961). Hence prospective travellers often attempt to maximise knowledge through searching as much as information as possible (Holloway & Robinson, 1995). The pattern of information search is often influenced by demographic profiles, levels of experiences and a range of other variables (Andereck & Caldwell, 1993). Potential tourists, not surprisingly, are exposed to many different kinds of information. However, the type and the relative importance of information sources have changed over time. In particular the proliferation of information now available on the Internet from a plethora of different providers makes it difficult to appreciate the reliability of this information and to trust that it is accurate and appropriate. As a result, the demand for credible information sources has increased dramatically.

Tourism information sources have been identified as a main factor influencing destination choice. However until the proliferation of the Internet most information sources usually came from commercial or social (or non-commercial) environments. The standards of commercial and social environments depend on the existence of compensation when information is provided (Mill & Morrison, 2002). If any compensation is offered for information, then information is believed to have commercial traits. Some researchers also argue that there are *neutral* information sources provided by third-parties such as travel agents and travel guides (Money & Crotts, 2003). The latter suggest that the Internet is also classified into neutral sources depending on the purpose and characteristics of the content. Many researchers manifest that reliable word of mouth from family or friends play a significant role in decision making process (Holloway & Robinson, 1995; Niininen et al., 2006; Schiffman & Kanuk, 2000) as non-commercial information is regarded as more objective and credible (Mill & Morrison, 2002). Schiffman and Kanuk (2000) also argue that informal sources such as friends, neighbours, and family provide a customer with more credibility than commercial advertising because it is expected that a word-of-mouth provider gains no profit from spreading good publicity.

While individuals obviously search for information for decision-making, it is also evident that individuals who collect travel information do not necessarily have an actual intention to travel (Messmer & Johnson, 1993; Urry, 1990; Woodside, 1990). In addition to the functional needs, people attempt to use information for sharing with others, viewing pictures, or simply enjoying. Vogt and Fesenmaier (1998) argue that information needs are expanded beyond functional needs, towards additional four dimensions, namely: hedonic, innovation, aesthetic, and sign needs.

- Hedonic needs involve the pursuit of enjoyment.
- Aesthetic needs signify the search for visual stimulation for the imagination.
- Innovation needs indicate pursuit of new products and information.
- Sign needs refer to needs for expressing one's social status, personality, and identity throughout interactions with others.

Based on the conceptual model regarding the relationship between consumer behaviour and the multiple information needs, hedonic, innovative, aesthetic, and visual needs are also found to play a significant role in information search process (Nishimura, Waryszak, & King, 2006; Vogt & Fesenmaier, 1998).

2.2 Impact of the Internet on information search

The emergence of ICTs ranging from online virtual communities to commercial advertising on mobile phones creates new types of information sources. Consequently it has a major impact on tourist's information search behaviour (Schiffman & Kanuk, 2000). In particular, the Internet has changed the way of purchasing travel-related products and services due to its interactive and two-way communication functionality (Buhalis, 2003). For instance, consumers not only receive content from the Internet, but also increasingly generate their own content through digital cameras, web cams, picture phones, online communities, and web blogs (Gretzel, Fesenmaier, & O'Leary, 2006). Online community members may post their own experiences, share their opinion, give advice, or look for answers to their questions (Armstrong & Hagel, 1996; Olsen & Connolly, 2000). Subsequently, an online community is regarded as the most influential information source, and information-savvy tourists increasingly consider the online community as a substitute for word of mouth (Niininen et al., 2006). Of the new marketing communication channels, online communities have their own members or loyal users who regularly visit and contribute. If the membership generates good quality content and is strongly maintained, it is often perceived as similar to recommendation provided by friends, family or even like-minded souls (Bray, Schetzina, & Steinbrink, 2006; Fernback & Thompson, 1995; Wang et al., 2002). This is particularly obvious in several examples such as the Tripadvisor, WAYN or the IgoUgo forums.

2.3 Online virtual community

An online community can be seen as a virtual agora and marketplace in which information is shared and consumers generate their content (Wang et al., 2002). Many researchers have defined online communities and attempted to grasp their features (Armstrong & Hagel, 1996; Fernback & Thompson, 1995; Powers, 1997; Preece, 2000; Rheingold, 1991; Rosenblatt, 1997; Shelton & McNeeley, 1997; Smith & Kollock, 1999). Preece (2000) claims that an online community has basic operational elements including people, purpose, policy, and computing systems. She also argues that online communities can be analysed by several diverse disciplines/perspectives, such as multidisciplinary, sociology, technology, virtual world, and e-commerce. In particular, sociologists have attempted for years to define the concept and characteristics of a community (Wellman, 1982). Besides some physical factors such as size, location and boundaries, the degree and type of relationships among participants were found to be critical indicators for communities (Haythornthwaite & Wellman, 1998; Wellman, 1997). The strength of these relationships can also be measured from the perspective of social network analysis. However, the research on online virtual communities is still in its infancy in comparison with research on physical and geographically defined communities (Preece, 2000).

Understanding the motivations and needs of members is a critical factor for understanding if an online community can be successful (Kim, Lee, & Hiemstra, 2004; Kozinets, 1999). Hence, many researchers have been trying to identify the perceived benefits of members in virtual communities. Additionally, the relationship between community traits and members' fundamental needs have been emphasised (Wang et al., 2002). Table 1 shows the benefits and needs of online communities' members.

Table 1. Benefits and needs of online community

Researchers	Benefits or needs
Armstrong and Hagel (1997)	Transaction, Interest, Fantasy, Relationship
Angehrn (1997)	Information, Communication, Distribution, Transaction *(ICDT model)*
Wang *et al.* (2002)	Functional, Social, Psychological
Bagozzi and Dholakia (2002)	Functional, Hedonic
Rodgers and Sheldon (2002)	Research, Communication, Surfing, Shopping *(Web Motivation Inventory)*
Wang and Fesenmaier (2004b)	Functional, Social, Psychological, Hedonic
Kim *et al.*(2004)	Membership, Influence & Relatedness, Integration and fulfilment of need, Shared emotional connection *Adapted from (McMillan, 1996)*

Armstrong and Hagel (1997) demonstrate that an online community provides four different values to members, namely: transaction, interest, fantasy, and relationship. In line with previous research findings, Wang and Fesenmaier (2004b) argue that social and hedonic benefits have a greater impact on members' participation in online community activities than functional benefits do. Social benefits refer to communication with other members, building relationships, exchanging ideas and opinions and getting involved (Angehrn, 1997; Preece, 2000; Wang & Fesenmaier, 2004a). Psychological benefits demonstrate that if individuals trust a certain community, their belonging and affiliation will arise. Some researchers argue that psychological benefits are initially required when people join the community (Bressler & Grantham, 2000). However, psychological benefits may be gained as a result of continual communication and activities – extended social benefits.

Online travel communities have increasingly be seen as one of the vital information sources to potential tourists. Some communities such as VirtualTourist.com, Trekshare.com, Lonelyplanet.com, IgoUgo.com, and Tripadvisor.com already play a major role in providing up-to-date destination information from members around world (Beith, 2004). VirtualTourist.com, one of the most popular and largest online

travel communities, has over 800,000 registered members from more than 220 countries. About 1.4 million travel tips on over 25,000 destinations and 2.6 million photos are posted on members' personal pages (www.virtualtourist.com [July 1, 2006]). About 5 million users visit the community and see 30 million pages every month, leading to high level of participation and sharing plenty of information with members whether they are real travellers or locals (Niininen et al., 2006). IgoUgo.com is another well-known online travel community with 350,000 members (www.igougo.com [July 1, 2006]). It has about 300,000 travel reviews and 200,000 photos on destinations, hotels and travel products since it has started in June 2000 (Beith, 2004).

3. Methodology

3.1 Research Framework

To achieve the objectives of this study, the conceptual model was proposed on the basis of previous research methodologies and findings. Wang and Fesenmaier (2004b) found that social and hedonic benefits are mainly related to level of participation in online travel communities. Hence, social benefits, including communication with other members and hedonic benefits, such as fun, enjoyment, and entertainment are taken as independent variables in this study. In addition to social and hedonic benefits, the relationship between functional benefits and involvement was also examined, since members in travel-related communities undoubtedly have very strong motivation to acquire travel information (Armstrong & Hagel, 1997). Accordingly, functional, social, psychological, and hedonic benefits of community users are selected as independent variables, whilst the level of members' participation and attitude towards an online community are dependent variables in the model.

3.2 Sampling and research instrument

The sample of this study is the online community users in South Korea. Recent research demonstrates that Korea is one of the top 5 countries by number of Internet users and also has high Internet penetration rate (http://www.itu.int/ITU-D [June 12, 2006]). In addition, Koreans indicate the cultural characteristics such as "collectivist" (Hofstede, 1991). Thus, it is expected that a research on online travel communities in Korea will result in significant findings. The survey instrument was divided into four parts: benefits from online community activities, level of participation in online travel communities, attitude toward online travel communities, and demographic information. The questionnaire was fundamentally based on Wang and Fesenmaier' (2004b) research instrument, and the parts of attitude and information source were added to the questionnaire.

3.3 Data Collection and Analysis

The data was collected through a web-based survey which was posted on a Korean survey website during 30 days from 26th June to 26th July (www.wsurvey.net). Online survey panel and normal Internet users visit this website to participate in surveys. By answering an online survey, they earn a credit for online shopping. Consequently, 419 Internet users participated in the online survey, and 217 of them were also found to be online travel community users.

4. Results

4.1 Profile of Respondents

A total of 58.5% of the community users were female (n=127) and 41.5% of them were male (n=90). The age groups were divided into 5 categories, and the vast majority of the Internet users were in their 20s (51.3%) and 30s (41.1%). Almost 80% of the respondents are either full-time employees (53.7%) or students (30.1%).

4.2 Perceived benefits of online community

Throughout factor analysis, the benefits perceived by members of an online travel community were identified (*See* Table 2).

Table 2. Perceived benefits of online community (n=217)

Variables	Factor loadings	Eigen value	Cumulative % of variance	Cronbach's Alpha
Information Acquisition		5.096	42.470	.842
Obtaining up to date information	**.858**			
Efficient to search information	**.853**			
Convenient to find information	**.802**			
Sharing experiences	**.700**			
Having trust in the community	**.537**			
Socio-psychological		2.037	59.449	.843
Seeking identity	**.817**			
Keeping relationship with members	**.792**			
Seeking a sense of belonging	**.790**			
Getting involved with members	**.756**			
Hedonic		1.110	68.696	.816
Having fun with contents	**.901**			
Entertainment	**.798**			
To be amused by members	**.643**			

KMO: 0.835
Bartlett test: $x^2 = 1334.047$, significant at $p = 0.000$

As a result of the Principal Component Analysis of factor analysis with VARIMAX rotation, three main factors were subsequently found according to the categorised variables, with factor loadings of 0.50 or higher. Factor 1 was named as "Information Acquisition" since its five variables are related to information gathering. Factor 2 was named as "Socio-psychological" with four variables related to social benefits (*seeking identity and getting involved with members*) and psychological benefits (*keeping relationship with members and seeking a sense of belonging*) (Kim et al., 2004; Wang & Fesenmaier, 2004a; Wang et al., 2002). Factor 3 was named Hedonic benefits, as it is composed of three variables, all pertaining to hedonic benefits. It is also supported by previous findings that surfing and fantasy needs are major factors motivating Internet users to participate in online communities (Armstrong & Hagel, 1997; Bagozzi & Dholakia, 2002; Rodgers & Sheldon, 2002).

However, the results of the factor analysis in this study were different from the previous findings by Wang and Fesenmaier (2004b), who argued that online travel community benefits were divided into functional, social, psychological, and hedonic benefits. These results demonstrate that social and psychological benefits are separate and no significant relationship between psychological benefit and participation in a virtual community is found. Although the research instrument in this study was based on Wang and Fesenmaier's (2004b) questionnaire, social and psychological variables were integrated into one variable. It could be argued that the Korean respondents in this research perceived the two variables as a single benefit, whereas American participants, the population of Wang & Fesenmaier's (2004b) study, feel they would not seek psychological benefit in virtual community. Accordingly, the cultural difference between two respondent groups may be considered as one of reasons leading to the significantly different results and should be identified as a topic for further study (Grace-Farfaglia et al, 2006).

4.3 The relationship between benefits and participation/attitude

The relationship between respective benefits (independent variable) and level of participation (dependent variable) was investigated using multiple regression analysis. Table 3 displays the results of the multiple regression analysis.

Table 3. Multiple regression between benefits and participation (n=217)

Variables	Coefficient	Standard Error of Coefficient	Beta	t	Sig.
(Constant)	3.076	.068		45.425	.000
Information acquisition benefits	.322	.068	.290	4.737	.000
Socio-psychological benefits	.234	.068	.211	3.440	.001
Hedonic benefits	.296	.068	.267	4.362	.000
R^2	.200				
Adjusted R^2	.189				
F	17.768 (p=.000)				

The results of the first multiple regression analysis reveal that all three benefits have a significant impact on the level of participation in an online travel community. The fact that the benefits have an influence on the level of participation is consistent with the results of Wang and Fesenmaier (2004b). However, their research showed that functional needs have a negative relationship with participation. In contrast this study found that functional needs are positively associated with level of participation. This positive relationship explains that an online travel community usually has explicit and robust purposes of providing information with users.

The difference between the two research findings seems to be caused by distinction in operational definition. Wang and Fesenmaier (2004b) defined the level of participation as the amount of time spent using the online travel community per week. In their study, it was measured by asking the question "How long, on average, do you go online to participate in this online travel community per week?" In this research, on the other hand, the level of participation was measured as follows: "When deciding travel destinations or planning trips, how often do you go online to participate in online travel community?" The frequency of visiting online communities was used as an instrument to measure degree of participation in this study. The results therefore indicate that individuals with the purpose of gathering information visit online communities more often, but usually not for so long. Wang and Fesenmaier (2004b) also argue that members who only want to look for information efficiently are not willing to spend a great deal of time for online travel communities.

Secondly, the relationship between respective benefits and attitudes was analysed using multiple regression analysis. It was revealed that there were significant relationships between benefits and attitudes toward an online travel community. The concept of attitude was measured in three dimensions such as trust, positive/negative, and loyalty. Loyalty is one of the critical success factors to increase Internet user's visitation to the online travel community (Kim et al., 2004; Reichheld & Schefter, 2000). Figure 1 demonstrates that on the basis of data analysis, a model was developed as an alternative to the initially proposed conceptual model in the current research.

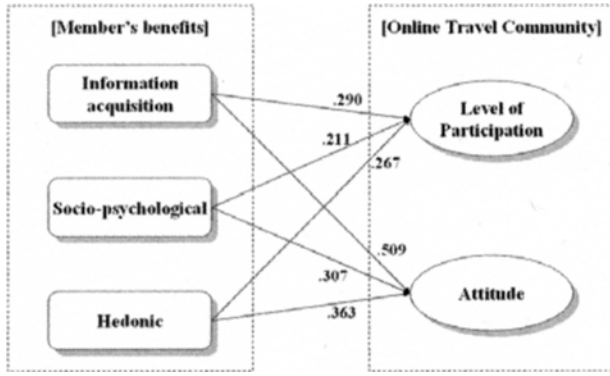

Figure 1. The alternative model ($p<0.01$)

The social benefits and psychological benefits are integrated in this model. Information acquisition benefits were found to be the most influential factor in level of participation and attitude respectively. Hedonic and socio-psychological benefits were also regarded as the main factors leading to higher level of participation, and higher and more positive attitude.

5. Conclusion

As ICTs have increasingly been influencing consumer behaviour in tourism (Buhalis, 1998; Poon, 1993; Sheldon, 1997), the role of the online communities is becoming more critical. They are gradually becoming more influential both as a reliable information source for travellers and as an emerging marketing channel for marketers (Armstrong & Hagel, 1996; Kozinets, 1999; Wang et al., 2002). This study has found that three benefits were mainly perceived by online community users in Korea: information acquisition, socio-psychological, and hedonic. It was also found that the three benefits respectively have an influence on the level of participation in the online community activities and attitude towards the online community. Specifically, information acquisition benefits, such as efficient and convenient information search, have a greater influence on the degree of participation and attitude toward the online travel community than other benefits. This was consistent with Vogt and Fesenmaier's (1998) argument that functional needs are perceived as the most important factor influencing information search.

For instance, as information acquisition needs are satisfied, members are retained in the online community and demonstrate a more positive attitude towards it. Plenty of information and up-to-date content will make an online travel community attractive to Internet users (including potential tourists), and motivate community users to make a repeat visit. In addition, the high level of participation and positive attitude leads members to generate more valuable contents (Armstrong & Hagel, 1997). From a marketing perspective, a basic understanding of the traits of the online community is required to develop an informative and substantial online community, and to provide users with real values. It subsequently results in enhancing the value of the online community as an information source and in becoming an attractive virtual market place. Accordingly, consumers are able to obtain valuable information from the online community and marketers can address the needs of those communities by targeting them with appropriate messages. Hence, online communities undoubtedly will play a much more important role as a credible information source for supporting decision making in the future.

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Influence of an Online Travel Community on Travel Decisions

Irem Arsal[a], Sheila Backman[a], and
Elizabeth Baldwin[a]

[a] Department of Parks, Recreation, and Tourism Management
Clemson University, USA
iarsal@clemson.edu

Abstract

Influence of online community member's postings on travel decisions were analyzed using thematic networks. Tremapper was used to discover which country postings to be analyzed and resulted in analysis of 8 countries. This study identified 8 organizing themes from an analysis of 81 communication threads that consisted of 713 members and 1691 postings. Out of the 81 threads included in the study, 23 showed a clear evidence of influence. The members' decisions were categorized by the information sources experience at destination such as residents and experienced travellers The analysis of the chosen countries and topics indicate that residents were more influential in food and beverage recommendations, safety concerns at the destination, and travel itinerary refinements (including things to do and places to see) whereas experienced travellers were more influential in accommodation recommendations, transportation, monetary issues like exchanging money and how much money to carry during the travel, destination information including tourist hassle at a specific destination, and itinerary advice.

Keywords: online community, influence, travel decision, word-of-mouth, thematic networks.

1 Introduction

Tourists' information search behaviour has been of interest to tourism researchers for many years. Travel planning is a complex process that consists of different decisions (Jeng & Fesenmaier, 2002). A myriad of sources of information that can influence tourists' vacation decisions exists. According to Fodness and Murray (1998) tourists obtain information from both personal sources such as friends and relatives through personal *word-of-mouth* as well as *marketer-dominated paid forms of communication* such as information retrieved from hotels, airlines, resorts and destination marketing organizations. In addition, after a definite trip decision travellers use informal information sources such as friends and relatives since they are considered more trustworthy than the formal sources (Bieger & Laesser, 2004).

However, the way tourists search for travel information has changed because of the dominant role of the Internet in today's society. Using the internet for travel information search offers the traveller several advantages. However travellers' online information search can lead to information overload due to the vast amount of

information available on the internet. Furthermore, the information sought can also be irrelevant information (Good et al, 1999; Pan & Fesenmaier, 2005).

Retrieving information from online discussion boards specific to their travel interest is likely to be a solution to this problem. Postings in online communities are considered as a form of word-of-mouth (WOM) communication and thought to be more credible that supplier produced information. WOM has been found to be one of the most influential information sources for travel (Morrison, 2002). Travellers engage in information exchange in online travel communities because they provide the opportunity to share knowledge gained from a previous trip. Research has shown that those with past experience with a specific travel destination who engage in digital word of mouth communication are most likely to be the most preferred source of information, as well as the most influential, in the pre trip stage of travel decision making (Crotts 1999). Not only do potential travellers and travellers with previous experience post in online communities, but so does another group who may also have an influential impact on potential travellers' travel decisions. In the digital community, residents of the tourist destination also participate in the information exchange.

However, little is known about which segment in the online community, travellers with previous experience or residents of the tourist destination is the most influential source for potential travellers. The purpose of this study, therefore, was to explore whether residents or experienced travellers were more influential in pre-trip travel decisions of inexperienced travellers to a destination. Specifically types travel decisions were examined to determine if residents or experienced travellers influence varied by travel decision type. Microsoft's Treemapper was used to identify which country forums to examine. Resulting data from the identified countries was analyzed using thematic networks. Additionally topics were analyzed in accordance with communicator type.

2 Literature Review

2.1 Word-of-mouth

Word-of-mouth (WOM) is defined as "informal communications between private parties concerning evaluations of goods and services"(Anderson, 1998). Through WOM, individuals exchange their experiences with products or services, which can be positive, neutral or negative. The influence of WOM is different in each step of consumer decision making process. Previous research has shown the impact of WOM on consumer choice (Arndt, 1967; Katz & Lazarfeld, 1955; Richins, 1983) and perceptions of post-purchase product (Bone, 1995). A single recommendation is enough to influence an individual to try a specified service provider (Gremler, 1994).

The internet offers travellers a relatively efficient way in which to engage in digital word of mouth. Online WOM has different names and forms such as virtual opinion

platforms, consumer portals and online feedback mechanisms. However Dellarocas (2003) pointed out that online WOM is different from traditional WOM in three ways: (1) Online WOM's scale is larger due to the Internet's low-cost and communication capabilities; (2) Online WOM gives the ability to organizations to monitor and control their operation; (3) the absence of contextual cues and not knowing who the information provider is makes it harder to interpret the subjective information in online interaction. For organizations online feedback mechanisms affect brand building and customer acquisition, product development and quality control, supply chain quality assurance activities (Dellarocas, 2003).

The influence of online WOM and whether it affects consumer behaviours is still a relatively new subject for researchers. Online consumer reviews of video games positively affect purchasing behaviour (Bounie, Bourreau, Gensollen, & Waelbroeck, 2005). According to Guernsey (2000), consumers use online reviews to guide their buying decisions across a wide variety of product classes.

The influence of online WOM has also been studied by assessing its value in forecasting motion picture revenues and the results show that average online movie ratings are better predictors of future movie revenues than movie's marketing budget, professional critic reviews and other variables that have been used before (Dellarocas, Awad, & Zhang, 2004).

Online WOM is assumed to be true and authentic, though trust and credibility are common issues in online environments. Despite this, consumers perceive electronic WOM (eWOM) to be a reliable source of information (Gruen, Osmonbekov & Czaplewski, 2006).

2.2 Word-of-mouth and Online travel communities

Dellaert (1999) proposes that online communities became a key medium in tourism marketing over Internet. Wang et al. (2002) studied virtual tourist communities from a marketing perspective. They indicated that virtual communities can help brand building for tourism organizations as well as relationship building with consumers. Moreover, virtual communities can aid travel companies in new product development by communicating with consumers about their needs and wants. They are the cheapest form of customer interaction for information dissemination. Depending on the success and volume of traffic of the virtual travel community, revenues such as sponsorships, banner advertising, prospect fees and sales commissions can be gained.

Wang and Fesenmaier (2004) examined the antecedents of online travel community activity and found that online travel community members mostly seek social and hedonic benefits. Members join the community for exchanging travel information and tips and sharing their travelling experiences with others. The reasons for active contribution to the community include efficacy and possibility of reciprocity. Wang and Fesenmaier (2002) concluded that online communities were able to fulfil social

and psychological needs of its members. They also found that member needs and participation were influenced by membership status and demographic characteristics of the members (Wang & Fesenmaier, 2004).

Sense of virtual community's affect on loyalty and travel product purchase was measured in a virtual travel community (Kim, Lee, & Hiemstra, 2004). Four factors - membership, influence and relatedness, integration and fulfilment of need, and shared emotional connection - were used to measure sense of virtual community. Other than shared emotional connection, the other three factors were found to have significant impact on purchasing behaviour of the member.

Wu and Chang (2005) examined whether trust and interactivity influence flow experience and online travel community members' purchase intentions. The results indicate that interactivity is an important factor of flow state whereas trust is not.

Although online travel community research has examined motivations, sense of community, interactivity, little or any research has been published that examined the interactions between potential tourists, residents and travellers with previous experience. Previous research on residents and tourists interactions did not examine online communities (Andereck, Valentine, Knopf, & Vogt, 2005; Jackson & Inbakaran, 2006). Furthermore, residents were not seen as information sources for tourists. In this study, residents and experienced travellers are both considered travel information sources as they can answer the member's questions. Since the residents are onsite and have the insider knowledge about a destination, they are extremely important information sources for potential first time visitors. Thus they could be considered influential sources of information for travel decisions. Travellers who have knowledge about the destination are also important sources of information for potential tourists. In contrast to residents, the travellers are likely to be more influential to potential tourists' decision from a travellers' perspective. However, together both residents and experienced travellers may be important for travellers. It is likely that their aspect of influence will vary by travel decision type.

3 Methodology

3.1 Study Area

The present study was conducted on Lonely Planet's thorn tree forum located at http://thorntree.lonelyplanet.com/. Thorn Tree is an online travel community that includes various topics such as destinations, what to pack, travelling companions, and travellers with disabilities. This community is a part of lonely planet's website, which is mostly known by its guidebooks. In order to post messages to the forum, users need to become members by registering on the website. Registration requires an email address and username. Members' password is then sent to their email addresses, thus it has low entry barriers. On the other hand, anybody can read information in the

forum. As of March 2007 Thorn Tree forum has approximately 400,000 members worldwide.

3.2 Data collection and analysis

In order to identify which country forums from which to collect data, Microsoft's Treemapper was used. The treemaps represent the data visually by treating each country as a box whose area is proportional to the number of average responses to postings.

The Thorn Tree forum has 15 world regions that include 204 countries. The treemaps of each world region was drawn by using the number of topics, number of replies and the number of average replies to each topic under each country. The top three countries that had the most discussion going on including the most number of different topics were identified. This resulted in 52 country forums. Then the top 10 most discussed topics were identified in each county forum and classified according to discussion topics. Some postings were categorized more than once since they had information that would fit into more than one category. If same number of replies were indicated for the 10^{th} posting and the 11^{th} and so on, they were also included in the topics analysis. Africa and Western Europe were chosen as a result of their discussion topics to maximize variation in data. Data from chosen countries and topics was collected for a three month period that represents eight months of postings. The country forums that were analyzed in this study are shown in Table 1.

Table 1. Analyzed country forums

Region	Country	Average direct response	Total number of topics
Africa	*Guinea*	16.4	9
	South Africa	5.7	686
	Ghana	5.48	143
	Morocco(*)	5.05	902
Western Europe	*Netherlands*	6.245	269
	Belgium	5.22	110
	Germany	5.14	520
	Spain(*)	5.09	1225
* Indicate the most number of topics in one country category.			

Data was analyzed using thematic networks that are web-like illustrations of the main themes in the qualitative data (Attride-Sterling, 2001). In thematic networks the data is categorized in three steps; (i) Basic themes are lowest-order themes that are evident in the text; (ii) Organizing themes are the categorization and grouping of basic themes that summarize more abstract principles; (iii) Global themes are the conclusion of the

text that indicate the meaning of the whole text (Attride-Sterling, 2001). The data was examined for repeated codes and themes were identified in accordance. This process was followed by arranging themes in groups and the identified groups were used as basic themes. Organizing themes were defined by categorizing the basic themes, which all together correspond to the global theme (the core of the concept of the data).

4 Results and Discussion

4.1 Study Area

In the Thorn Tree online community, communication takes place in threads in which the postings about a specific topic are grouped together. In most cases the person who starts the thread, original poster (OP), has never been to the destination and the members that respond the OP's question are either residents or travellers that have been to that destination. The more detailed the original posting is the better and more satisfactory answers the original poster gets.

4.2 Organizing themes

This study identified 8 organizing themes from the analysis of 81 communication threads. Each organizing theme is associated with basic themes represented in Figure 1. Thematic networks are referred to as topic areas in building the thematic networks.

1) **Accommodations:** Finding a place to stay at destination is an important part of their travel decision. This topic has two basic themes including places to stay and their prices. Members recommend the places at which they have stayed.

2) **Food and beverage recommendations:** Dining and drinking is an important part of travel experience and in the Thorn Tree forum this topic is one of the most discussed ones in country forums. It has basic themes including local dishes and drinks, restaurants, and bar/brewery discussions. The community members' recommendations are very specific including the full name of the place, which districts it is located and how to reach to that place by local transportation or walking.

3) **Transportation:** This topic includes three basic themes that are transportation at the destination, transportation to the destination and the cost of transportation. Transportation to the destination is about the discussions of airlines. At the destination level, discussions are about driving at the destination or how to go from one place to another.

4) **Safety/Health:** This topic is discussed in African country forums mostly and includes postings about safety at destination, political situation at the destination, police corruption and health issues (i.e. malaria).

5) **Destination information:** The basic themes in this topic are general destination information and includes weather, tourist hassle, what to wear at destination, warning and tips about the destination, and language related questions.

6) **Money:** Monetary issues are a concern for those travelling to foreign countries. Exchanging money, how to carry money (i.e. take cash, travellers check) at the destination and the availability of ATMs are basic themes for this topic. This kind of information may be hard to find both online and offline in some cases such as travelling to a developing country.

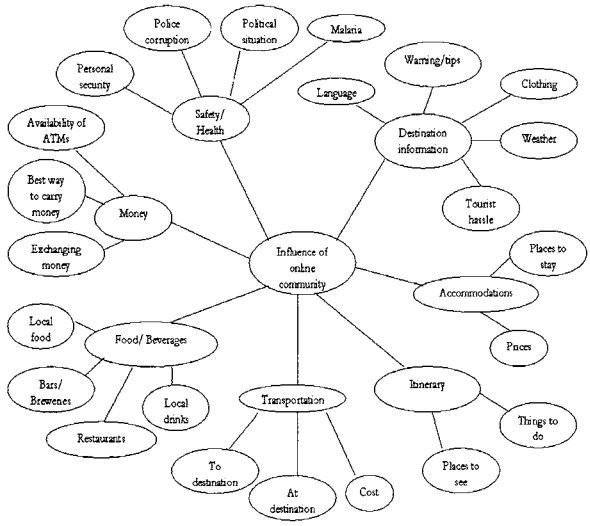

Fig.1. Thematic Networks

7) **Itinerary/things to do:** Writing a travel itinerary seems like a good way of asking for advice from those that have been there. This topic includes two basic themes: places to see and things to do.

8) **Living at destination:** This topic was also discussed in the forum as members could get their specific questions answered by the residents. The basic themes are visa issues, learning the local language, finding a job, which city to live in, what part of the city to move to, and living costs. However, this topic was not included in the study as the intention of this study was travel related decisions.

4.3 Member profiles

The members are classified as residents, experienced travellers, potential travellers and unknown members that post messages in this online community. Residents are

members who indicate that they are living at the destination in their postings. Experienced travellers are members who have been to the destination and write about their experiences in their postings. Unknown members do not mention anything related to their knowledge about the destination specifically. These kinds of postings are seen in general discussion topics like safety of staying in a mixed dorm. Potential travellers are members that point out that they have a desire to visit the destination. Original Poster (OP) is the member that starts the thread. Table 2 represents posting distribution by topics and members experience level at destination.

Table 2. Postings distribution by topics and members

	Resident	Experienced Traveller	Unknown	Potential Traveller
Accommodations	1	11	15	2
Food and Beverages	11	69	10	0
Transportation	3	14	9	1
Safety	10	49	31	6
Money	0	26	8	0
Destination Information	29	142	96	6
Itinerary	21	119	18	6
Total	75	430	187	21

In 81 threads there were 713 members that contributed to the total of 1691 postings. The distribution of members by country and topic is included in Table 2.

Table 3. Posting distribution by country

	Resident	Experienced Traveller	Unknown	Potential Traveller	Total
Belgium	72	92	19	0	183
Netherlands	42	123	54	4	223
Spain	99	150	105	6	360
Germany	20	85	58	6	169
Morocco	17	137	31	5	190
Ghana	7	83	27	7	124
South Africa	30	163	66	3	262
Guinea	1	100	22	18	141

4.4 Modes of influence

Influence is defined as "the act or power of producing an effect without apparent exertion of force or direct exercise of command" (Merriam-Webster). In this study the influence of postings on members were identified by reading the threads and finding

out if original poster (OP) stated that he/she will include the recommendations in the postings in his/her travel plans in each identified discussion topic.

Out of 81 threads included in the study 23 of them showed a clear evidence of influence. In those that did not, the original poster did not return to post their ideas about the members' recommendations or even if they did they did not indicate their final decision in their postings. During the analysis of these 23 threads the number of members that answer the OPs question in addition to their classified member type was identified and counted until the OP indicated that he/she will include the recommendation in the postings in his/her travel plans. Results were categorized based on a traveller being influenced by either residents or experienced travellers in their travel decisions and are represented in Table 4.

Table 4. The percentage of influential members in conclusive threads

	Resident	Experienced Traveller
Accommodations	4%	5.80%
Food and Beverages	20%	19%
Transportation	0%	0.70%
Safety	16%	4.38%
Money	0%	4.38%
Destination Information	16%	23.35%
Itinerary	44%	26.27%

The analysis revealed that residents were more influential in food and beverage recommendations, discussions about safety issues at the destination and travel itinerary refinements including things to do and places to see at the destination. The residents were also influential in accommodation recommendations and destination information as well. These results are in congruence with previous research about travel planning. Stewart and Vogt (1999) found that on-site activities are the ones that are most often changed in plans and the amount of information searched for also differs according to travel products. Most importantly repeat visitors can make better plans than first-time visitors (Stewart & Vogt, 1999), thus asking travel related questions in an online travel community creates its own advantages by getting information directly from residents and experienced travellers at the destination. Direct and first hand information from travellers can be more useful in travel planning than information gathered from marketing based sources. Moreover, experienced travellers are expected to use the Internet more in planning their trips (Stewart & Vogt, 1999). An example of residents being more influential than the experienced traveller is in the following excerpt from a thread:

> *OP:* Where in Amsterdam or any nearby environs would one go to have an old-time dutch meal? I'm seeking the sort of place that the cheese makers would go to after a day at the market, preferably a smoky mom and pop place where everyone would wonder who the new guy is as soon as I walk in the door. All replies gratefully acknowledged.

> *Resident Member:* "Moeders" is one of the restaurants I know that makes Dutch food the way our moms make it."
>
> *OP:* "Well Moeders it is then! Thank you both for the tip and the link, I will certainly give it a try"

On the other hand, experienced travellers were more influential in accommodation recommendations, transportation, monetary issues, destination information including tourist hassle at a specific destination, and itinerary advice. When there were no residents in the thread the experienced travellers influenced decisions about destination information and things to do at the destination. These findings are reasonable since residents do not need accommodations at their hometown and experienced travelers have the actual knowledge about them. Tourist hassle is an issue specific to tourists thus the residents would not know much about it either. Safety issues were taken seriously by both residents and experienced travellers. Since all the residents indicate that the destination is safe to travel is a normal reaction, thus travellers find experienced travellers postings more influential since they will be tourists as well. Moreover, the residents in the forum take pride in their country and try to help others who want to come and visit as much as they can. An example of experienced travellers influence on what kind of clothing to bring to the destination as a result of weather related information is:

> *OP:* Is it going to be too cold....(the cold bit, I am from Los Angeles, CA...I have no concept of anything below 35 degrees...so be specific...) If I can bundle up and be fine then that is what I'll do...if no amount of bundling is going to work, I'll probably still try but at least I will have been warned ;)"
>
> *Experienced traveller:* It was cold, but not as cold as New York. I wore a medium winter jacket and jeans most of the time (I'm from Boston though).
>
> *OP:* Thanks for replying so quickly. This is exactly what I needed to know...I've been to Boston and New York in December, I was FREEZING ;) but it didn't keep me in (of course both trips the locals told me it was 'warm' for the season). I'll make sure I bring my gloves

5 Conclusions

Getting information from online communities reduce the information search time as well as gives the option of customizing questions in accordance to traveller's needs. It is easier to find basic destination information online but getting what one is specifically looking for can be as easy from travel communities. Residents and experienced travellers have different perspectives on destination as a result of their motivations. Thus their influences are on different travel related topics. This study found that residents influence on-site travel decisions such as food and beverage recommendations, safety concerns at the destinations and travel itinerary

modifications. Experienced travellers influence general travel related issues such as accommodations, transportation, monetary issues like exchanging money and how much money to carry during the travel, destination information including the weather, tourist hassle and what to wear in order not to offend locals and itinerary refinements. The authors assumed that all the members and their postings were authentic and indicated their true intentions, but this does not mean that actual behaviours of members would be in congruence with their postings.

This study explored the Thorn Tree travel community and the results may be different on other travel communities. Thus, it is recommended to replicate the study on other online travel communities. While analyzing the postings the researchers assumed that original posters do not know whether other posting members are residents of the destination or travellers who have experienced at the destination unless it was indicated in their postings. However original posters can be followers of the online community by accessing it a few times a week even for reading the forums. In that case they would be familiar with other members and their level of experience at the destination and this could influence their travel decisions as well.

This study looked at the influence of online travel communities from the members' perspective by analyzing the postings. However these forums are open to anyone, thus readers of these forums can be influenced in their travel decisions. Besides these decisions may vary according to their familiarity with the other members and the destination.

By reading an online community, postings individuals get both sides of the travel experiences - both good and bad. One member explains the usefulness of these forums as: "Thanks for your post. Forums like this are one of the few places you can read about first hand experiences. I try to read as many forums/stories as possible to help me form my opinions and make my decisions. One post bad or good won't change my mind much but 100 might." Despite the limitations noted, this type of analysis is essential for understanding the influence of online travel communities on travel decisions. Online travel community research is also essential since the feedback is coming from experienced travellers that can be used for maintaining service quality and learning the strengths and weaknesses of a destination from travellers' perspective. All these help marketers to allocate their marketing efforts in needed areas.

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MySpace, My Friends, My Customers

Patricio Carrera,
Chia-Yu Chiu,
Pailin Pratipwattanawong,
Somjai Chienwattanasuk,
Sharifah Fatimah Syed Ahmad,
Jamie Murphy

School of Business,
University of Western Australia, Australia
syedas01@student.uwa.edu.au

Abstract

This case study examines a Web 2.0 exemplar – MySpace – as a marketing tool for an Australian company targeting youth, Go Workabout (GW). The leading global online social network MySpace has over 114 million members – mostly students and youth – who create personal profiles as well as join others' networks as their friends. One success measure for this burgeoning marketing tool is friends in one's profile. Three weeks after implementing a strategy to increase its friends, GW's MySpace profile had 101 friends and 405 users viewed GW's profile. Even though acquiring friends is a hard task, nearly 12% of users that viewed GW's profile clicked on a banner directed to GW's website. The paper illustrates difficulties and benefits of using MySpace as a marketing tool.

Keywords: Web 2.0; social networks; internet marketing.

1 Introduction

Unlike the early Internet days with websites broadcasting one-way information, a recent Internet trend, Web 2.0, puts consumers at the helm as users create, edit and view information (O'Reilly, 2005). User generated content (UGC), an aspect of Web 2.0, facilitates information retrieval, editing and sharing among users. In Europe, 60% of online users have embraced UGC activities such as "reading or writing blogs, listening to podcasts and setting up RSS feeds, reading and writing online customer reviews, or taking part in social networking sites" (Anonymous, 2007a).

Blogs are online journals or personal websites, while podcasts are audio recordings for downloading to a personal audio player such as Apple's iPod. Really Simple Syndication (RSS) lets users subscribe to feeds for automatic updates on topics that interest them (Hanson & Kalyanam, 2007, p. 80). Users' comments and reviews, which resembles word-of-mouth opinions, are on websites such as Flickr (flickr.com, pictures), TripAdvisor (tripadvisor.com, travel experiences), Wikipedia (wikipedia.org, encyclopedia), and YouTube (youtube.com, videos). Lastly, online social networks are Web spaces for group communication using one's profile – a page with individual biodata (Lenhart & Madden, 2007) – in online communities such as Bebo, Facebook, Friendster, Hi5 and MySpace.

In August 2007, MySpace was the most popular online social network at sixth place of all websites, followed by Facebook (10), Hi5 (11), Friendster (18) and Bebo (89)

(Alexa, 2007a). These online social networks target youth and more than half (55%) of American youths ages 12-17 use online social networking sites (Lenhart & Madden, 2007). Undergraduate students are even more involved with 94% participating in Facebook (Ellison, Steinfield, & Lampe, 2007). Profiles on MySpace also include politicians, musicians, artists, comedians, short-film makers and businesses (Anonymous, 2007d).

Businesses can participate in online social networks such as MySpace and become friends with other users (MySpace, 2007). For example, travel companies such as Lonely Planet (lonelyplanet.com) and STA Travel (statravel.com) have MySpace profiles. In August 2007, Lonely Planet had more than 3,500 friends for two of its MySpace sites, while STA had eight MySpace accounts (mostly branch locations) with about 900 friends. A search on Facebook showed STA Travel had over 12,000 friends and Lonely Planet had over 1,200 friends.

Despite the growing popularity of social networks and their business potential, few published studies have examined these new online communities. Therefore, this paper helps fill that gap by presenting a case study of MySpace as a marketing tool. Rather than examine a global leader such as Lonely Planet, this paper examines implementing a MySpace profile for a small Australian company, Go Workabout (goworkabout.com), which facilitates working holidays in Australia.

2 Literature Review

2.1 Internet Technology in Tourism

The Internet has changed distribution, pricing and customer interactions in travel and tourism (O'Connor & Murphy, 2004). Tourists are using non-media information sources, such as the Internet, to plan travel trips as opposed to mass media information sources like advertising (Seabra, Abrantes, & Lages, 2007). For example in 2005, 85% of European travellers used the Internet to plan their vacation (Tjostheim, Tussyadiah, & Hoem, 2007). Similarly, in the first quarter of 2007, online bookings for major hotels accounted for 41% of their central reservations, up 22% from the same period in 2006 (Anonymous, 2007b).

Research shows individual and organisational factors drive the Internet's growing importance in travel and tourism. At the organisational level, the success of convention and visitor bureaus in the US related positively to their website features, website promotion and customer relationship management (Wang & Fesenmaier, 2006). For lodging websites, the ability to provide complete information and ease of use for visitors related to success (Jeong, Oh, & Gregoire, 2003).

With regard to individuals, they differ in online information seeking and booking behaviours. For example, college students were more inclined to seek travel information than book travel, while travellers and tourists were more likely to book than seek information (Susskind, Bonn, & Dev, 2003). Furthermore, as individuals gain Internet experience, their information gathering progresses from brief product searches to reviewing what others say about a product (Wang, Yu, & Fesenmaier,

2002). As people master the Internet, the importance of Web 2.0 and its inherent user generated content increases.

2.2 Web 2.0

Rather than an online platform to make money via sales, many Web 2.0 business models provide services that invite users' input, improve with more participants and make money from advertising (O'Reilly, 2005). Web 2.0 should thrive, as advertisers spent $450 million in 2006 on UGC sites and this could to increase to $4.3 billion in 2011 (Shields, 2007). Related to the evolution of gathering information online (Wang, Yu, & Fesenmaier, 2002), reviews on UGC sites influenced 72% of United Kingdom's young professionals' travel plans, with TripAdvisor the most popular travel UGC site (Anonymous, 2007c). Globally, TripAdvisor ranked number 449 of the most visited sites (Alexa, 2007a) and according to TripAdvisor's website, over 17 million travellers from nearly 200 countries planned trips using TripAdvisor in a week in August 2007.

Travel blogs, another Web 2.0 aspect, are becoming popular as people share their experiences. A review of blogs related to destinations in the southeast USA found the majority of bloggers were from USA and that three of four blogs were positive (Pan, MacLaurin, & Crotts, 2007). Other studies have covered blogging practice and found that blogging increased during some crises, such as during the London attacks in July 2005 and New Orleans hurricane in August 2005, but not for Pakistan earthquake in October 2005 (Thelwall & Stuart, 2007). As for motivations to blog, an early study of the psychological and social influences of Japanese blogging found that positive feedbacks from readers motivated authors to continue writing blogs (Miura & Yamashita, 2007).

Most Web 2.0 literature has focused on uses in medicine (Barsky, 2006; Barsky & Purdon, 2006; Guistini, 2006; Skiba, 2006) and education (Fumero, 2006; Perkel, 2006). The former described applications of podcasting, RSS feeds, blogging and social community networks in medicine such as the best blogs in medicine and medical video sharing on YouTube. With regard to education, an online interactive campus enriched learning by sharing information amongst ten institutitions in nine countries, using social networking with the educators as mediators and mentors (Fumero, 2006). An unintended educational consequence is the proliferation of unauthorised video clips, audio and games on MySpace profiles. Although common on MySpace, this copying is plagiarism in education (Perkel, 2006). For businesses, Web 2.0 does not suit all types of organisations as its user generated information may not fit in formal organisations where endorsed information is a must, however fast changing innovative businesses with speedy information requirements could benefit (Tredinnick, 2006).

Online communities preceded Web 2.0. For example Microsoft and IBM hosted brand-focused virtual networks (Wang, Yu, & Fesenmaier, 2002), while customer created communites around Saab and Macintosh (Muniz & O'Guinn, 2001). Online communities create friendships and nearly two thirds of friendships that began online, such as in newsgroups or discussion groups, continued offline (Parks & Floyd, 1996).

However with Web 2.0 communities such as Friendster and MySpace, online friendship may not equate to offline friendship (Boyd, 2006). Facebook members use it to communicate with offline friends rather than to gain new online friends (Ellison, Steinfield, & Lampe, 2007).

Regardless of the online community type, participation can lead to fulfilment. Ideally, online communities fulfil four member needs: *functional* such as information or transactions, *social* to communicate and build friendships, *psychological* as part of one's identity, and *hedonic* fun or entertainment (Wang & Fesenmaier, 2004a). A travel community fulfilled users' functional, social and hedonic needs, with social need being the most fulfilled in this environment (Wang & Fesenmaier, 2004b). Similarly, Lonely Planet (lonelyplanet.com) managed to address, if not fulfil, all four users' needs in its travel community (Stockdale & Borovicka, 2006).

Companies use online communities to build brands and relationships, as well as to reduce costs and attain revenue (Wang, Yu, & Fesenmaier, 2002). Furthermore, these companies benefit from increased brand loyalty, which can increase product purchasing (Kim, Lee, & Hiemstra, 2004). The quality of information of online communities also affects users' loyalty to the communities (Lin & Lee, 2006). Finally, the quality of information – relevant, understandable, sufficient and objective – and quantity of reviews in these communities lead to purchasing intentions (Park, Lee, & Han, 2007).

Although having a profile on a social network is unlike hosting a community, organisations like Burger King used online social network to communicate with target audiences. For instance, friends visit the MySpace King profile page to download and view free episodes of some TV shows (King, 2006). Go Workabout hopes that joining nearly 22,000 MySpace businesses and entrepreneurs (MySpace, 2007b) will lead to increased awareness, business and eventually brand loyalty.

3 Building a MySpace Community

Go Workabout (GW) is a small Australian organisation that helps eligible students and young holiday travellers – from Canada, Finland, Germany, Japan, Sweden, Switzerland and the United Kingdom – work in Australia. GW organises Australian working holiday visas, jobs, and bank accounts for their clients. Considering the success of Lonely Planet and STA Travel getting friends, setting up a profile on a social network interested GW. As MySpace's members, mostly below 30 (Hansell, 2006), fit GW's target market and given MySpace's position as the leading online social network, GW established a MySpace profile. Success metrics for its social network were the number of friends, visits to GW's MySpace, GW's website, and ultimately, new customers.

A study of STA Travel and Lonely Planet's MySpace profiles identified three common characteristics. Firstly, the commercial approach was less on their MySpace profile than on their website. Neither MySpace profile advertised their goods or services heavily; the advertising was subtle. Secondly, both MySpace profiles used attractive images, music and video clips. Thirdly, both profiles encouraged user

interaction such as answering questions and posting travel comments. For example, the STA Travel profile contained questions on the users' best travel experiences and favourite cities. Blogging sections on both sites reflected interaction with users sharing tips, seeking advice and engaging in the posted topics or questions. Figure 1 shows the MySpace profile for Lonely Planet in Europe, the Middle East and Africa.

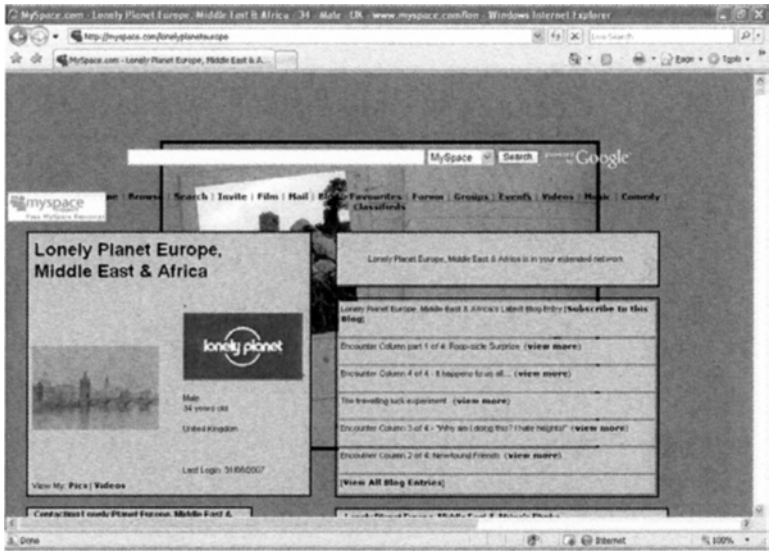

Fig. 1. MySpace profile for Lonely Planet Europe, Middle East and Africa [Sept. 5, 2007]

Go Workabout's MySpace profile (MySpace.com/goWorkabout) included a brief description of its services and pictures of popular Australian places and locations. The users could get more information on GW by clicking on links to the GW website. Figure 2 shows Go Workabout's MySpace profile.

After creating the MySpace profile, the strategy to acquire friends and increase GW's network commenced in May 2007. The strategy consisted of three activities:

(1) Request friends: Visiting MySpace profiles seeking members similar to GW's target group and asking them to join GW's network.

(2) Join key groups: MySpace offers the opportunity to create or join affinity groups. Since GW's target group is interested in Australian travel and travelling in general, GW's MySpace joined travel groups that could generate traffic to its site.

(3) Participate in forums: MySpace has travel related forums. GW answered questions regarding travel in Australia and directed enquirers to GW's MySpace.

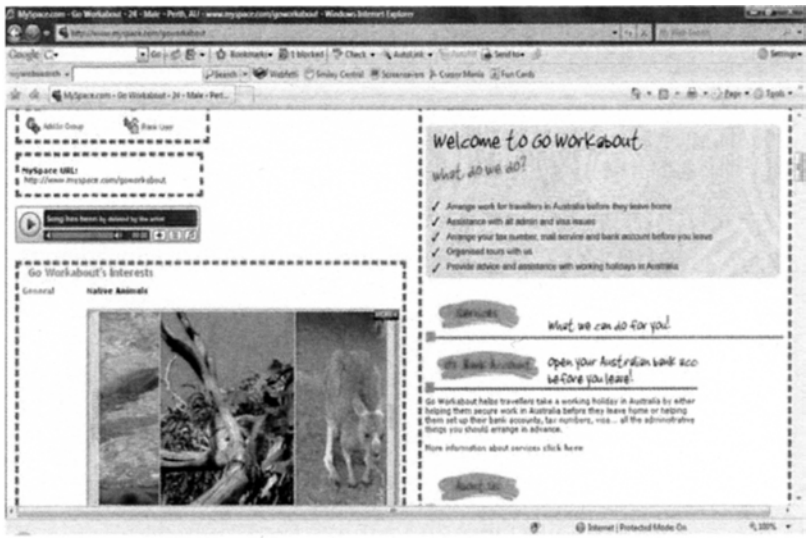

Fig. 2. MySpace profile for Go Workabout [Oct. 17, 2007]

4 Results

After three week's efforts of about 170 friend requests, joining seven travel related groups and posting a comment in a MySpace travel forum, GW had 101 *decent* friends. Friend requests worked best and brought in almost 95% of the new friends. In addition to friends joining, there was a network effect whereby friends of friends joined GW's profile.

About a dozen *parasitic* friends joined with no solicitation from GW or GW friends. These friends tried to feed off their GW friendship for two unfriendly pursuits. One group of parasites had a MySpace profile set up to sell pornographic images. The other group of parasites posted misleading comments with no relationship whatsoever to GW or travel in Australia. Their comments suggested easy ways to make money and led users to sites promoting schemes whereby a mere $49.95 payment led to untold riches.

Over 400 MySpace users viewed GW's profile and 47 people followed a link from GW's MySpace profile to GW's website. Divided by the number of users that viewed the MySpace site (405), the result was an encouraging 12% click-through rate and 100 times better than an average click-through rate of 0.11% for advertising banners on web pages (Hanson & Kalyanam, 2007, p. 281). Of the total traffic to the GW's website for the two weeks in May, traffic from GW's MySpace profile ranked sixth of 74 referral sites.

An analysis of GW's friends showed most were below 30 (81%) with more than half (57%) females. Most friends (78%) were from four countries, in descending order: USA, Australia, Canada and the United Kingdom. Aside from individuals (82%),

musicians (11%) and other organisations (7%) became GW friends. There were ten comments on Go Workabout's MySpace profile – four promoted their own profiles, another four complimented Go Workabout's company feature or profile, and two sent friendly comments. The majority of the comments were in May 2007, one in mid-June, while two were in September and October.

5 Discussion and Conclusion

This exploratory study highlights possible benefits and drawbacks of businesses creating a MySpace profile. One main benefit is that once a company's profile has a big community, such as STA Travel's 12,000 friends in Facebook, it can drive traffic to its main website and generate business for the company. Even with the short period, GW had 101 friends and a high click through rate (12%) from its MySpace profile to GW's website. This result suggests MySpace could reach a business' target market and create awareness about the company and its services. The short two-week duration of the study, however, is a limitation and a longer study could determine a more reliable result.

The potential to market products via online social networks is enticing. Internet research company ComScore reported MySpace had over 114 million members in August 2007, a 72% increase from 2006 (Anonymous, 2007e). For companies that target youth, MySpace is a great medium with the majority of its members being teenagers and college students (Hansell, 2006).

Another benefit of a MySpace profile is gaining customer information and insights through blogs. Members use blogs to share part of their lives with opinions about others' profiles, interests and ambitions. Giving special attention to the blogs on MySpace site could help businesses understand what is important and appeals to users. GW could incorporate the insights to improve services, as well as communicate about its services – online and offline.

A weakness of MySpace's blog feature is the need to monitor; anyone can post negative comments about the company. Friends could view comments that may harm the company's reputation and GW could lose friends and future business. Similarly in company hosted virtual online communities, when online interactions create negative feelings towards the company, community participation goes down (Nambisan & Baron, 2007).

Secondly, monitoring must encompass the kind of friends in GW's network. In addition to the GW experience with unfriends, an ongoing issue is false identities and profiles in these social networks (Donath & Boyd, 2004). Some might use MySpace for "glorification of drinking, drug use and sex" with provocative images and links to many unsuitable activities for youth (Hansell, 2006). Therefore, GW must screen friends' profiles twice a week so that GW will not have associations with unseemly activities.

Another drawback is the requisite man-hours to create and maintain a profile. GW should visit MySpace daily to maintain an appealing profile – by viewing others'

profiles and editing its profile (Lenhart & Madden). Members should enjoy interacting with GW and value GW as a friend. Table 1 summarises suggested activities and time to maintain GW's MySpace profile. In a month, the suggested maintenance time is twelve hours.

Table 1. Suggested Maintenance Activities

Activities	Maintenance plan	Minutes for each activity	Monthly minutes
Revising comments	Daily	10	300
Updating friends	Twice a week	10	80
Updating bulletin	Weekly	20	80
Updating forum	Weekly	20	80
Updating new jobs offers	Weekly	30	120
Updating pictures and videos	Monthly	25	25
Updating events	Monthly	35	35
TOTAL time required			720

Aside from maintaining the website, GW needs more friends. GW should send a promotional email to customers and leads in the GW's data base asking them to visit and join GW's MySpace. Thanks to network effects, the larger the community the more credible the community seems and the more people join (Hanson & Kalyanam, 2007).

One weakness of social networks is that most users regard them as a way to contact friends (Ellison, Steinfield, & Lampe, 2007) and may not consider social networks as a means to gather product information or communicate with companies. These users might be less willing to be friends with a company as another person. In addition, some people restrict who can view their profiles or request them as friends. This scenario limits the friends that a company can request, particularly during the first stage when the company is increasing its social network.

More importantly, GW needs to evaluate the effectiveness of its MySpace profile versus other promotional techniques. The company should keep evaluating its performance in profiles viewed, number of friends and website traffic. GW's management could then decide whether to maintain or expand its MySpace network to get more friends, and eventually, customers.

6 Future Research

This case study applies to MySpace, not other social networks such as Facebook or Hi5. Although MySpace is the global leader in online communities, website rankings in Canada and United Kingdom, rank Facebook higher than MySpace (Alexa, 2007b). Some businesses might want to change to another social network, or maintain profiles in a few top networks and future research should examine business applications on other social networks. Similarly, most online social network research is in the United

States but the United States' lead in Internet users has fallen from 48% to 22% in the last decade (Hanson & Kalyanam, 2007, p. 72). Future research could examine Web 2.0 applications outside of the US.

Furthermore, as the understanding about this new online community is low, companies face uncertainties using social networks. This is especially in relation to whether users would want to be friends with them, how the users regard their business friends, and whether these users will buy from their business friends. Although the traffic from MySpace is high for GW, another study might not yield the same result.

Several studies of online communities centre on brands or special topics such as travel (Muniz & O'Guinn, 2001; Nambisan & Baron, 2007; Stockdale & Borovicka, 2006). Yet few studies examine who interacts or how they interact with brands and companies in an online social network. For example, it would be useful to analyse a company with a big community such as STA Travel and its business-generating capabilities. Does the friendship businesses have with people relate to sales? Would people be loyal to business friends and buy more travel products from their friends, like the loyalty that made customers buy more frequently from the company that hosts a virtual online community (Kim, Lee, & Hiemstra, 2004). For instance, would online friends of STA Travel use its services to book for their travels or would they use another online travel site? Would these friends visit STA Travel's branch or the nearest offline travel agent?

Another worthy future research idea is the difference in responses to being friends with a small business such as Go Workabout versus being friends with established companies such as Lonely Planet and STA Travel. Are people more inclined to be friends with brand names they recognise, or would they be friends with any business that requests their friendship? Future studies could investigate users' loyalty to the social networks and how may networks they join, to give insights towards users' attitudes and behaviours towards online communities.

To succeed, an online community could take steps to fulfil users' functional, social, psychological and hedonic needs (Wang & Fesenmaier, 2004a). Therefore, a closer study of Go Workabout, Lonely Planet and STA Travel's friends could determine which needs to fulfil, and which needs to address to convert friends to customers.

The Adopted Page Rank (APR), a technique that quantifies the value of online reviews and reviewers (Dwyer, 2007), could help investigate which businesses are successful at gaining friends and customers. For example, APR could reveal which postings give reviewers expert status and are more popular. Furthermore, due to the rise of UGCs, the number of online 'experts' has increased. A measure of what makes experts popular and trustworthy would help businesses learn from these 'experts' and succeed in these UGC environments.

Other Web 2.0 applications that pose interesting possibilities for academic and businesses are travel reviews, photos and video clips from websites such as TripAdvisor, Flickr and YouTube. For instance, tracing travel arrangements made on TripAdvisor according to reviews on the site could reveal reviewer persuasiveness.

This measure could indicate how each review influences users' travel decisions. As for the motivation for posting reviews, research suggests the usual status seeking behaviour offline is in place online (Lampel & Bhalla, 2007). However, further research could unearth other motivations for writing reviews that might prove useful in travel and tourism.

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Web Services as a technology to support a global tourism offer

Rodolfo Baggio[a,b],
Magda Antonioli Corigliano[a]
Massimo Monetti[c]

[a] Master in Economics and Tourism,
Bocconi University, Italy
[b] School of Tourism
The University of Queensland, Australia
{rodolfo.baggio, magda.antonioli}@unibocconi.it

[c] DAUIN - Control and Computer Engineering
Third School of Engineering - Information Technologies,
Politecnico di Torino, Italy
massimo.monetti@polito.it

Abstract

The wide diffusion of disintermediating Internet technologies poses a threat to the role of tourism intermediaries. Service Oriented Architecture and Web Services look to be one of the few practical ways to develop operational systems able to provide customers effective tools to satisfy their needs and to ease the travel intermediary chores in a highly dynamic market environment. This paper presents an implementation under development and analyses the advantages of the solution adopted. Possible future developments and extensions are outlined.

Keywords: Web services, Service Oriented Architecture, Tourism intermediaries, Destination management system.

1 Introduction

Information and communication technologies (ICTs) and the online booking of travel and tourism products have had an enormous diffusion in the last years. All suppliers, in a highly competitive environment, have attempted to provide users with applications aimed at satisfying their needs and wishes. However, the problems induced by legacy infrastructure limitations has produced a very fragmented and diverse set of possibilities. This fragmentation results in inefficiencies for both the user and the organisation proposing its services. The user is burdened with the problems in coordinating diverse resources, the organisations, mainly if they act as intermediaries, are affected by the difficulties in assembling several different service offerings (Bogdanovych et al., 2006; Sharda et al., 2006).

Even the quest for possible standardisations suffers from this situation. For example, the EU funded Harmonise project (www.harmo-ten.org), in pursuing the objective of creating a network to support data interoperability within the tourism industry, had identified and analysed several dozens data models and standards (Missikoff et al., 2003). Different modelling approaches, languages, and levels were being employed and a very high degree of semantic overlap and conflict characterise some of the major standards and project outputs even if there is a fair amount of consistency between them.

During its initial deployment phase, the Internet has "put online" a very wide audience. The result has been the creation of a completely new market, with promising development perspectives. In order to be able to exploit these opportunities, companies and organisations of any kind have pursued the objective to automate their productive chains, with extensive technological and organisational efforts. They have been busy mediating between the necessity to exchange information with the external world and the necessity to preserve their own autonomy.

Today, the new web based Service Oriented Architecture (SOA) seems to have the potentialities to provide effective and efficient solutions to these problems. Information exchanged can well be thought as a type of service. An organisation can provide information to the external world and, at the same time, be a user. In this two-way exchange paradigm is enclosed the innovation of a new service oriented architecture.

The SOA paradigm represents a revolution for the information technology community and Web Services are a fundamental operational instrument. With them it is possible to consider the World Wide Web (WWW) a real distributed information system in which several services are made available. The WWW evolves from a purely hierarchical architecture, where the server transfers pages or applications, to a more "democratic" architecture in which specific servers, spread on the network, provide requesting computers with specific services as a result of local processing of applications or part of them (Erl, 2006).

A necessary condition to provide and use services via the Internet is interoperability among information systems, which translates into the availability of a common descriptive language for the services. The Web Services (WS) represent the technological solution for this interoperability in the framework of the reference architecture called Service Oriented Architecture (SOA) (CACM, 2003; IEEE, 2003).

The aim of this paper is to briefly discuss these new architecture and to describe an implementation highlighting the advantages of such a solution..

2 The SOA architecture

This architecture is depicted in Fig. 1. The whole picture can be schematically described by listing its three main components:

- *Service Broker*: manages the *registry* of available services; it allows to search for a specific service according to some specified characteristics;
- *Service Provider*: allows access to a service; the description is stored and transmitted to the broker's registry;
- *Service Requestor*: the system requesting a service; it interacts with the broker by issuing a *find* command on the network in which it questions on available services. Once identified the most suitable one it connects the Service provider (with a *bind* command) and starts using the service with a *use* command.

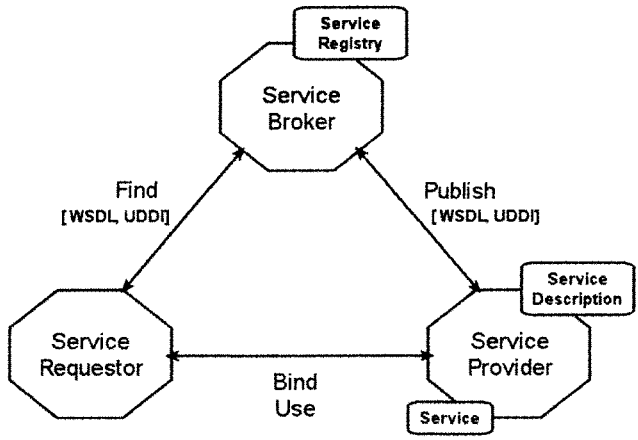

Fig. 1. A schematic view of the Service Oriented Architecture (SOA)

The SOA architecture defines and codes the roles of all the interested subjects and provides a service description language universally known as WSDL (Web Services Description Language) which allows the gathering of available services. These are defined following the Universal Description, Discovery and Integration (UDDI) specifications (Christensen et al., 2001; UDDI, 2007). The Internet provides the transport protocols, which have become a de facto standard for the communication among computerised systems. These protocols, first of all HTTP (HyperText Transfer Protocol), allow all the connections described above, solving all problems which may occur in routing, transfer and filtering. Within these well defined roles, the usage of services available on the network can evolve towards a very intricate scheme based on the recursive mechanisms naturally embedded in the WDSL language. From a practical point of view, this translates into the possibility to create a complex service built on simple elementary elements. In other words, it is possible to assemble a

Travel & Tourism service as an aggregate of base services such as: transport, stay, excursions and amenities.

The service complexity leads to the necessity of completing the architectural design through the usage of some kind of instrument which has the role of regulating the overall flow (i.e.: a "transport" service must be available before being able to book a "stay" service). This requirement is fulfilled by BPEL4WS (Business Process Execution Language for Web Services). It is a language which allows the composition of diverse services and can be used as a specification language for each single component. In this way it is possible to coordinate automatically the activities performed by various actors in order to achieve a common objective such as the approval of a request characterised by processes with a high number of instances with definite and repeatable execution rules (IBM, 2007; Leymann et al., 2006).

3 A case study

Sales and intermediary organisations need to rationalise a selling tool (B2B or B2C) capable of real time operations. In other words, they need to offer, without interruptions, only what is really available, as soon as this availability shows up. Online proprietary booking systems, today available on the Web, are not completely satisfactory from this point of view, as they are often not very efficient or have problems in providing real time answers (Sharda et al., 2006). This lack of efficiency does not concern the single systems, but rather their ensemble. The many different tools available have great diversities in their operational characteristics, even if they have similar objectives. This diversity forces a variety of operative procedures which may confuse the user. The lack in real time, instead, is an intrinsic feature of the booking instrument as it is usually designed. The system has a slave role, while the master functions are committed to the operator which calls for an availability only when a specific request is present or relies on pre-defined availabilities which may suffer from updating problems. A possible solution to overcome these limitations can be found in the improvement of the interactivity among the booking systems managed by tour operators or providers of tourist services. In this respect, the web services technology is a way to achieve this objective.

The case presented here concerns the system developed by ROBINTUR, an important Italian tourism distribution network comprising 120 travel agencies and belonging to the COOP Group. In this case, the interoperability translates into the possibility, at an application level, and in a transparent way for the user, to query, for example, availability or pricing of some product and to exploit the many possible automatic features a software system can have. Mechanisms for an automatic update of the offer are added to these main functionalities, thus giving an effective real time view, overcoming many of the traditional limitations.

The ROBINTUR development strategy is based on the implementation of a diversified network of travel agencies in which different forms of affiliation coexist:

franchising, direct ownership, participation etc. In this, the network needs can be summarised as follows:

- Automatic provision of the group's database with respect to availability and pricing;
- Uniform interface for the booking systems in order to increase the operational capabilities of the front-office operators;
- The possibility to try out tools for the comparison of different offers for an optimal composition of the final package.

The analysis of these requirements led to the choice of a SOA-WS based system. The advantages of such a framework over other possible implementations such as CORBA or DCOM have been extensively discussed in the literature (Bih, 2006; CACM, 2003; Erl, 2006; IEEE, 2003). They mainly consist in the recognised higher degree of interoperability due to the protocols and languages (XML, SOAP, WSDL and HTTP) which provide the basis on which Web Services are created. This choice has been deemed particularly suitable to support the strategic business model adopted.

The ROBINTUR group, in collaboration with In4matic, an Italian software house, has started a development project whose central element is the implementation of a series of SOAP-XML connectors to WS made available by some service providers and tour operators. As an example we analyse here the connector to the "Web Affiliation" system provided by COSTA Spa, a major player in the cruises market.

The implementation of a connector consists in organising a software layer which integrates the services offered by a Tour operator (the service provider). In our case, the service provider makes available a method called GetCatalog through which it is possible to have an XML version of the catalogue's contents to be locally cached and to be used as a feeding mechanism for the ROBINTUR database.

The Network Database is a RDBMS (Relational Data Base Management System) with an ORM (Object Relational Mapping) layer whose objective is to map the physical structure of the DB with the specific organisation of the data belonging to the single service providers. The feeding instrument is also equipped with a filtering mechanism in order to be able to perform special selections of the whole supply.

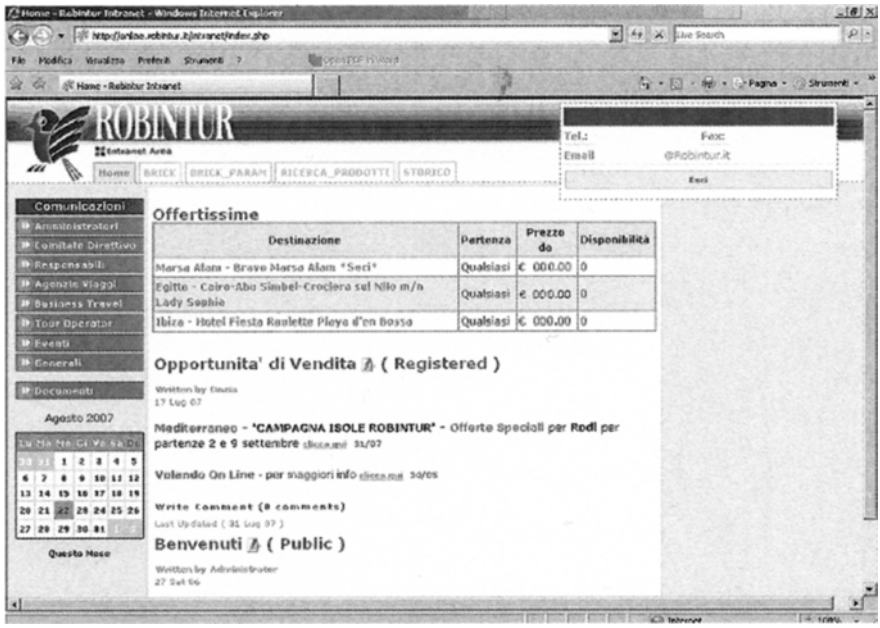

Fig. 2. Example screen for the ROBINTUR intranet application

ROBINTUR's Intranet application provides the user (travel agency's employee) with a series of screens to allow the choice of available offers. These screens are independent from the specific service providers and built on a Template Management logic. The latter allows to characterise inputs and outputs based on the type of service (a cruise will have cabins and ports, an hotel will have rooms and locations), without direct relations with the provider (Fig. 2).

One more layer creates a relationship between the intranet application and the syntax of the provider's methods (Fig. 3 contains an example of the methods used).

ListAvailableCruises

```
public Costa.WebAffiliation.BusinessComponents.Entities.Cruise[]
ListAvailableCruises(System.DateTime from, System.DateTime to, string
destinationCode, string shipCode, string portCode)
```

Retrieve all cruises: those cruises could be available or not, sellable or not. Possible parameter configuration are: (from), (from, to), (from, destination), (from, ship), (from, port), (from, to, destination),(from, to, ship), (from, to, port) (from, destination, ship), (from, to, destination, ship),(from, destination, port), (from, to, destination, port), (from, destination, ship, port), (from, to, destination, ship, port), (from, ship, port), (from, to, ship, port). Standard behaviours: - to omit a parameter set it as nil; - if the to date is nil, it is calculated as from + 30 days - the from date is always mandatory

Parameters:

`from` - search cruises scheduled from this date
`to` - search cruises scheduled to this date
`destinationCode` - search cruises associated with this destination
`shipCode` - search cruises scheduled on this ship
`portCode` - search cruises that sail from this port
Returns:
List of cruises

GetCruise

```
public Costa.WebAffiliation.BusinessComponents.Entities.Cruise
GetCruise(string CruiseCode)
```

Returns a fully-described cruise

Parameters:

`CruiseCode` - the cruise code to be returned
Returns:
a fully described cruise (including itinerary and segments of an itinerary)

Fig. 3. An example of the methods used

The interoperability with the service providers permits the design of different systems for research and selection through which the agent, ROBINTUR in our case, can customise his broker function. The WS technology provides a new way to play this role. The first selection phase is performed through the management of the Network Database, and the implementation of specific XML connectors gives the possibility of a real time verification of pricing and availability of the different offers. This is a new opportunity for the intermediary, which has at disposal a new and effective tool to evaluate the best offers. On the other hand, it is also a good chance for the service provider who may be able to apply flexible provision policies (availability, booking, pricing etc.), in line with market's demand. Figure 4 shows a schematic representation of the whole system architecture.

As implemented, the WS technology can be seen as an innovative way to conceive a distribution channel as for rules and commercial mechanisms.

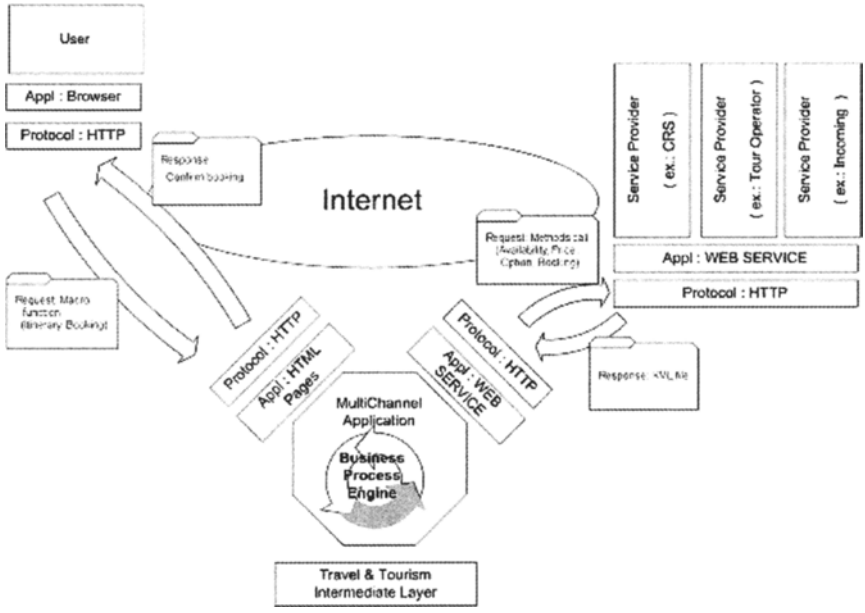

Fig. 4. The general architecture of the ROBINTUR system

4 Strategic evolutions

The development project objectives are to reduce by about 30% the burden and the time of operational activities. Preliminary results confirm the possibility to achieve this outcome. The savings are mainly due to superior integration with the tour operators' booking systems and to much higher reliability of the pricing, giving the possibility to react in real time to any variation in basic package components. More than that, however, the system is able to provide the group's agencies with effective tools to reinforce their role as intermediaries – a role which has been brought into question by the wide diffusion of 'disintermediating' Internet technologies (Law et al., 2004; Licata et al., 2001).

The project presented here is a first step of a strategic plan which will allow ROBINTUR to fully exploit the possibilities of ICTs in their operations. They are deemed essential for the networked organisation chosen as business model. In this scenario, the most important development concerns the consolidation of the

knowledge assets of the company through the design of a system capable to package dynamically the products offered.

As many scholars and practitioners highlight, the future tourism intermediary will be deeply affected by dynamic packaging technologies which will provide the possibility to overcome the idea of tourist offers as simply the sum of elementary components such as a transfer and an accommodation (Buhalis & O'Connor, 2005; Daniele & Frew, 2006). A key factor for achieving the strategic opportunities of dynamic packaging is, without doubts, an extensive integration of the diverse tourism information systems. In other words, to successfully develop dynamic packaging applications, it is necessary to integrate the nonstandard way of defining e-tourism products and services. The emerging Web services technologies seem a natural candidate for dealing with this lack of standards (Cardoso & Lange, 2007).

A dynamic package is a complex aggregate of service segments whose composition is completely free and demanded by the user, without necessarily starting from predefined combinations. In this setting, even relatively simple segments, as identified today, could be further decomposed and recombined in different ways. The SOA architecture and the availability of SOA compliant information systems is a founding element of such an evolutionary scenario. Dynamic Packaging, in fact, has as a structural necessity the capability to access tourism services with all their attributes (description, availability, pricing, booking) via simple and dynamic connections such as SOAP sessions or data access through standard formats (XML).

These necessities can be satisfied, in the view of ROBINTUR, only by massively using WS technologies in the framework of a service provider information system. Furthermore, reengineering policies or middleware software layers will be indispensable. An important role is played in this scenario by BPEL languages and by the capabilities to manage the service construction process from a dynamic packaging viewpoint.

The evolution of Information Systems towards a SOA architecture is considered to be a new opportunity for the tourism intermediaries, mainly the one aiming at serving niche or specialty travels with a very fragmented offering, as in the case of ROBINTUR. The evolutionary scenario sees an advancement towards a logic of dynamic packaging where the travel and tourism offer will be built based on highly specialised service segments and where the implementation of a recommendation system can greatly help the user in making well informed choices (Rabanser & Ricci, 2005).

These considerations can also be easily extended to any organisation responsible for the management and the marketing of a set of diverse tourism operators such as a destination management organisation. Collecting this offer on a territory and casting it with technological instruments able to answer in real time the fundamental requests of availability and pricing can open markets unthinkable today. To do that, however,

some essential conditions must be met, namely, the availability of interfaces which are easily embeddable in host systems (see examples such as Amazon or Google) and the identification of new stakeholders for these WS oriented open systems. In this group it is possible to include the new web-based engines (agency networks, vertical search engines, specialised portals).

5 Concluding remarks

Although quite promising, the SOA architecture, and its most "visibile" product, the Web services, have found only limited application in today's tourism information systems. The description of ROBINTUR's project has shown a feasible way to implement a SOA based system to help demonstrate its effectiveness.

The possible evolutions of this type of systems, mainly with respect to the dynamic packaging needs of tourism intermediary operators have been briefly discussed. This architecture seems to be an ideal setup also for a modern destination management organisation wishing to provide its actual and potential visitors with efficient information tools about the resources of the territory.

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A Product Line Architecture for Evolving Intelligent Component Services in Tourism Information Systems

Daramola J. O[a], Adigun M. O[b], Olugbara O. O. [b]

[a] Department of Computer and Information Sciences
Covenant University, Nigeria
dwande@gmail.com

[b] Centre for Mobile e-Services for Development
University of Zululand, South Africa
madigun@pan.uzulu.ac.za, oluolugbara@gmail.com

Abstract

The challenge facing developers of Tourism Information Systems (TIS) is the need to evolve more intelligent and dependable tourism support services. However, these kinds of information systems have largely identical functionalities and delivers almost similar services. The systems differ mostly in the customized information contents they deliver and the scope of the tourism interest that is being promoted. The peculiarity of the e-Tourism domain makes it ideal for product line development. In this paper, a reference Tourism Product Line Architecture (TPLA) as a platform for evolving intelligent component services is proposed. The TPLA is a layered architecture of core reusable components that can be leveraged for the development of a TIS product family. The architecture is extensible and its components are formally specified as possessing intrinsic intelligent attributes and the semantic awareness that are desirable for the next generation of Tourism Information Systems.

Keywords: Product line, e-Tourism, Formal Specification, Intelligent Component

1 Introduction

Tourism Information Systems (TIS) are software applications that are deployable on the web and on small hand-held devices and dedicated to the provision of tourism business support services. TIS share many attributes in common and generally perform similar functions such as providing useful information to prospective tourists and helping in travel planning and management. They mainly differ in the nature of local information content they deliver and the scope of tourism interest that is being promoted. They can be variously engaged in the promotion of tourism at the national, continental, regional, state, local and enterprise levels. This degree of observable similarity in TIS makes them good candidates for a product line development initiative, which seem yet to be a prevalent practice in the e-Tourism domain. However, the fact that Tiscover AG (http://www.Tiscover.com [June 6, 2007]) renders tourism support services for eight different countries around the world is a clear indication of the viability of Software Product Line Engineering (SPLE) in the tourism domain. SPLE is a software development paradigm that enables the strategic and systematic reuse of core assets in the development of a family of software

products that share some features in common. It leverages the existence of certain core reusable components in order to realise a significant order of magnitude improvement in the cost and time of development.

A Software Product Line (SPL) is a set of software intensive systems that share a common, managed set of features satisfying the specific needs of a particular market segment or mission and that are developed from a set of core asset in a prescribed way (Bass and Kazman, 2003). A Product Line (PL) possesses variability features that define the specificity of each product in the PL. A product within the PL is formed by combining relevant components from the common asset base and customizing them as required through carefully planed variation mechanism such as parameterization, inheritance or extensibility according to the configuration of the common reference architecture that is central to every product in the PL.

A critical challenge being faced by software developers of TIS is the dynamic nature of user requirements in the e-Tourism domain (Staab et al, 2002). More users are becoming more dependent on the services of TIS for the planning and organization of travel tours in preference to the use of human travel agents (Staab et al, 2002). This has consequently imposed a high demand for more advanced intelligent behaviour in TIS supporting features like context-awareness, personalization and semantic web capabilities among the mostly desired. These features, if and when present in TIS are expected to affect the delivery of a specific number of services namely: Information Services (i.e. location-based information services based on history, events, facts, news), Transaction Services (i.e. decision support services such as travel recommendation, route advisory support, map guide, accommodation search, booking, query processing), Third Party Services (i.e. all other external e-commerce services like bookstore, car rental, online shop that are available in the TIS). These categories of services constitute the core functionality of many TIS.

Interestingly, this scenario makes SPLE very viable and promising in this domain, because it will not only engender the development of adaptable core reusable components that will deliver many of these desirable services but also provide a way to effectively manage future user requirements variations. This is because SPL enables the definition of system instances dictated by marketing and product plan specifications from prospective users and make dynamic software evolution a part of its core practice.

In this paper, we present a TPLA for the development of TIS product family. The TPLA is presented as a c2-style layered architecture (Buschmann et al., 1996) that offers a platform for evolving intelligent component services. The components are formally specified using an Architecture Description Language (ADL) as possessing the intrinsic intelligent attributes that make them suitable for development of next generation TIS.

The remainder of this paper is organized as follows. In Section 2, we present a review of related work. Section 3 gives a detailed description of the TPLA. Section 4 presents an architectural modelling and specification of the TPLA. The paper is finally concluded in Section 5 with a brief note.

2 Related work

A number of efforts reported in literature have focused on evolving architecture for SPL. Perry (1998) suggested useful ways of 'genericizing' architectural descriptions with an analysis of the strength and weaknesses of each approach. Among those suggested are: 1) use of software architectural style, 2) defining a variance-free architecture, 3) use of a parametric description using varying binding times, 4) use of service-oriented description for selective provisioning and 5) use of under-constrained architecture. The architecture being proposed in this work (TPLA) is a product of an integration of all five underlining concepts, which makes it sufficiently generic for our domain of consideration.

The work done by Deng et al. (2007), deals with the challenges of evolution in Model-Driven Software Product-line Architectures respectively. The Koriandol system (Balzerani et al., 2005) is a product line architecture for general web applications. The special feature of Koriandol in contrast to other component-based systems is that its components have variability handling mechanism built into them. Koala is an implementation of software component model designed for creating a large variety of products (van Ommering, 2002; van Ommering et al., 2000). It is specifically dedicated to the modelling of embedded systems. The modelling and specification of a PLA for a family of meshing tools was given by Bastarrica et al. (2006). Meshing tools are pieces of software that are used to generate and manage discretization of a domain that find application in mechanics design and medicine. The PLA was modelled with Archstudio tool and formally specified using xADL. This shares some similarity with our work in the choice of tools for architectural modelling and specification, but our focus in this work is the e-Tourism domain. The case studies reports in Lutz and Gannod (2003), Schwanke and Lutz (2003), Bosch and Svahnberg (1999), Clement and Northrup (2002) give details of some product line architectures, but none of these reports was specific to the tourism domain.

At this point, it is important to mention some of the novel efforts aimed at boosting intelligent behaviour in TIS. Staab et al (2002) discussed the need for intelligent systems in tourism. Some of the need areas identified include: semantic interoperability and medicated architectures, mobility and embedded intelligence; natural multi-lingual interfaces; personalization and context-based services; information management; and knowledge discovery. Maedche and Staab (2002) gave a proposal for the application of semantic web technologies in TIS. For a detailed profile of research projects based on the implementation of intelligent systems for tourism (see ftp://ftp.cordis.europa.eu/pub/ist/docs/transport-environment/intelligentsystems_for_tourism_en.pdf). Some of the notable projects included in this

report are: PALIO (Zarikas et al., 2001), AMBIENSENSE (Lech and Wienhofen, 2005), DIETOREC (Pühretmair et al., 2002). CATIS (Pashtan et al., 2004) is a context-aware tourist information system on mobile devices that leverages Web services and XML technologies for its implementation. The CATIS system incorporates a number of context variables relating to mobility, such as time and location, and type of device. An important point to emphasize is that these research challenges are still open and there is the need for further investigations. The main contribution of this work is to develop an asset-base of reusable software components with intrinsic intelligent attributes that can be leveraged in the development of next generation TIS. The TPLA being proposed in this paper will be used as a foundational platform for such systems.

3 The Tourism Product Line Architecture

A detailed study of tourism domain clearly reveals that most TIS share similar visions, objectives and similar functionalities. A detailed survey of the e-Tourism domain and interaction with TIS development experts shows that the features found in TIS can be grouped into three main functional service categories namely: 1) *Information services*: these involve the provision of relevant information to the user. The information service provider builds its content and publishes it for specific purposes, 2) *Transaction Service*: here the service provider may receive inputs that are consumed in the process of constructing something of value for an actor with specified minimum level of quality and 3) *Third Party Service:* these are services provided by external e-Business and e-Commerce entities that interoperate with the TIS through web services. The proposed TPLA is shown in Fig. 1. as a layered architecture of five layers.

3.1 Description of the TPLA

The reference architecture for e-Tourism product line (TPLA) is a layered architecture consisting of five layers, each layer representing specific infrastructural abstractions of the product line architecture. The description of the specific layers is given as follows.

1. Client Layer: The client layer abstraction is comprised of client devices through which the services of the TIS can be requested. This includes PDA, web browser (through Laptop and PC) and i-Mode device. Components at this level consume the services of the architecture.

2. Technology Service Layer: The Technology Service layer defines the implementation platform for all the services in the PLA. This can be WAP for WAP-enabled mobile applications, i-mode for i-mode-enabled applications or HTTP for web clients. The Technology Service layer is augmented with the implementation of a set of four graphic user interfaces (GUI) collectively referred to as Basic Utility Services. These are:

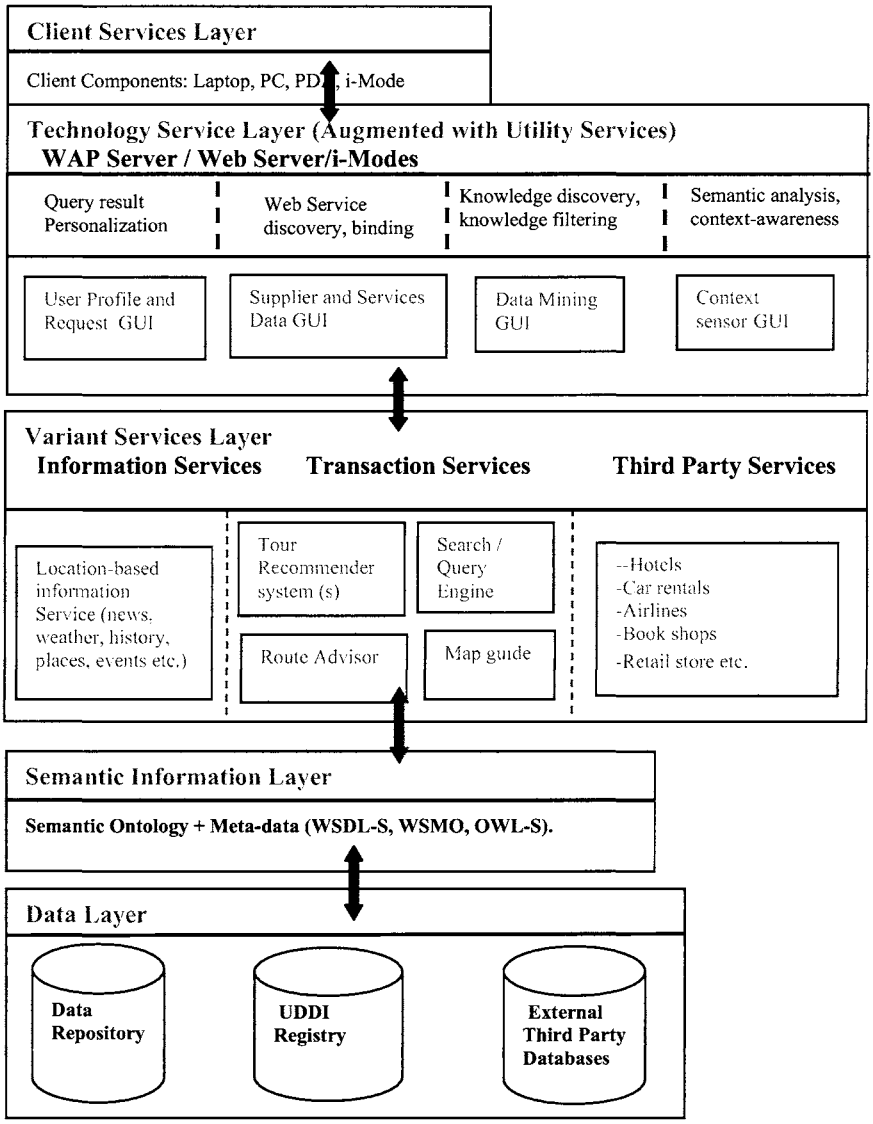

Fig. 1. A Layered Reference Architecture for Tourism Product Line

User profile and request interface: responsible for collection of information on the preferences of users and rendering personalized services by exploiting the knowledge gained from previously stored user profile.

- ***Data mining interface***: responsible for knowledge discovery services using in-built association rule mining, collaborative filtering and classification algorithms.
- ***Supplier and services data***: responsible for content upload and data storage services.
- ***Context sensor services***: responsible the tracking of the environment, social, task, and spatio-temporal (time, location, direction, speed, shape) contexts of the user [20]. A comprehensive context list is built by this component and is used to aid the delivery of services.

These four distinct functionalities in the Technology Service are provided for every system in the product line. Every system in the product line (PL) must be able to hold a conversation with Technology Service before it can request any of the utility services in line with the principle of conversation before composition. This is for the determination of appropriate communication protocol depending on the nature of requesting client and the provision of data-aware and context-aware services, which only Technology Service is mandated to provide on demand.

3. Variant Services Layer: The Variant Services Layer consists of the class of all services that are not basic to the architecture. This set of optional services can be further sub-classified into information services, transaction services and third party services. Information services component represent a loci of computation that are responsible for the provision of location-based information contents such as: news, events, places, accommodation and weather reports. Transaction services are logic components that are responsible for the delivery of services such as travel recommendation, destination recommendation, route advisory services, query search, map guide. While third party services are the external e-Commerce sites, which provide web services that can be discovered and consumed by the TIS. Examples of these include car rental services, hotel accommodation booking services, bookshops and shopping stores.

4. Semantic Information Layer: This layer of abstraction defines the semantic awareness that is exhibited by all components in the architecture. The components of this layer are the various middleware semantic models of knowledge representation specifically designed to enable intelligent attributes like context-awareness, personalization and semantic awareness in the logic components of the TPLA. Candidate semantic models available in this layer include OWL-S, WSMO, WSDL-S, and XML (Cardoso, 2004). The implementation of these semantic models will facilitate improved query processing, information exchange and cross platform interoperability among various information systems yielding high quality services. Three of the specific services that will be provided at this layer of abstraction include:

i) *Context-awareness*: this refers to the ability of a system to make use of information about the device platform, the user, and the surrounding environment in the delivery of its services ((Pashtan et al., 2004).

ii) *Personalization*: this is a form of context-awareness in which the system gathers user-information during interaction with the user in order to construct a response that uniquely fits the user's preferences (Jembere, 2006).

iii) *Semantic Web Services*: this will enable the automatic annotation, advertisement, discovery, composition and execution of inter-organization business logic, making it possible for several organizations and individuals to communicate with each other to carry out various commercial activities and to provide value-added services (Cardoso, 2004).

5. Data Layer: The data layer is composed of a set of database abstractions that stores the information content delivered by the TIS. These include data repositories, the UDDI registry from which third party web services are discovered, and all other external databases to which the TIS can bind.

4 Architectural Modelling and Specification of the TPLA

The success of any software project depends on the architecture because it is a primary and important fundamental artifact of a system. Also, the quality attributes of a system such as performance, modifiability, reusability and usabilibity are all derived directly from the architecture. In a product line, the dominant core asset is the reference architecture of the product line, which is used at every product instantiation. Hence, the need for the engagement of formal mechanism to precisely define, evaluate and document the software product line architecture. Formal specification of architecture has the potential to improve both quality and productivity in the software development process because it facilitates the promotion of insight and understanding of system properties at a higher level of abstraction than at module and codes levels. It provides a basis for formal reasoning and a rigorous analysis of critical non-functional system properties like modifiability, flexibility, reliability, extensibility and reusability.

The TPLA has been modelled as C2 style architecture in Archstudio 4 (ArchStudio 4, 2007), while an architecture description language (ADL) xADL 2.0 has been used to formally describe its components. ADLs are a class of formal specification languages that are equipped with formal constructs for describing the elements of software architecture such as components, connectors and their configurations. Wright (Allen & Garlan, 1997), Rapide (Luckham & Vera, 1995), DARWIN (Magee, 1995), ACME (Garlan, 1997), ADML (Spenser ed., 2000) are examples of other ADLs that are also being used to formally specify software architectures. The xADL 2.0 that is used for the specification of the TPLA is a highly extensible XML-based ADL embedded within the Archstudio 4 modelling framework. It was chosen for this work because it

makes a logical distinction between design-time (architectural prescriptions) and run-time (architectural description) state of a system while the other ADLs assume the two to be the same which is not realistic). Also, xADL has a rich tool support and it's highly extensible nature enables users to independently extend its XML-based schema to suit their preferred semantic contexts. Additionally, it provides support for product line modelling and model-based system instantiation (Dashofy et al., 2001).

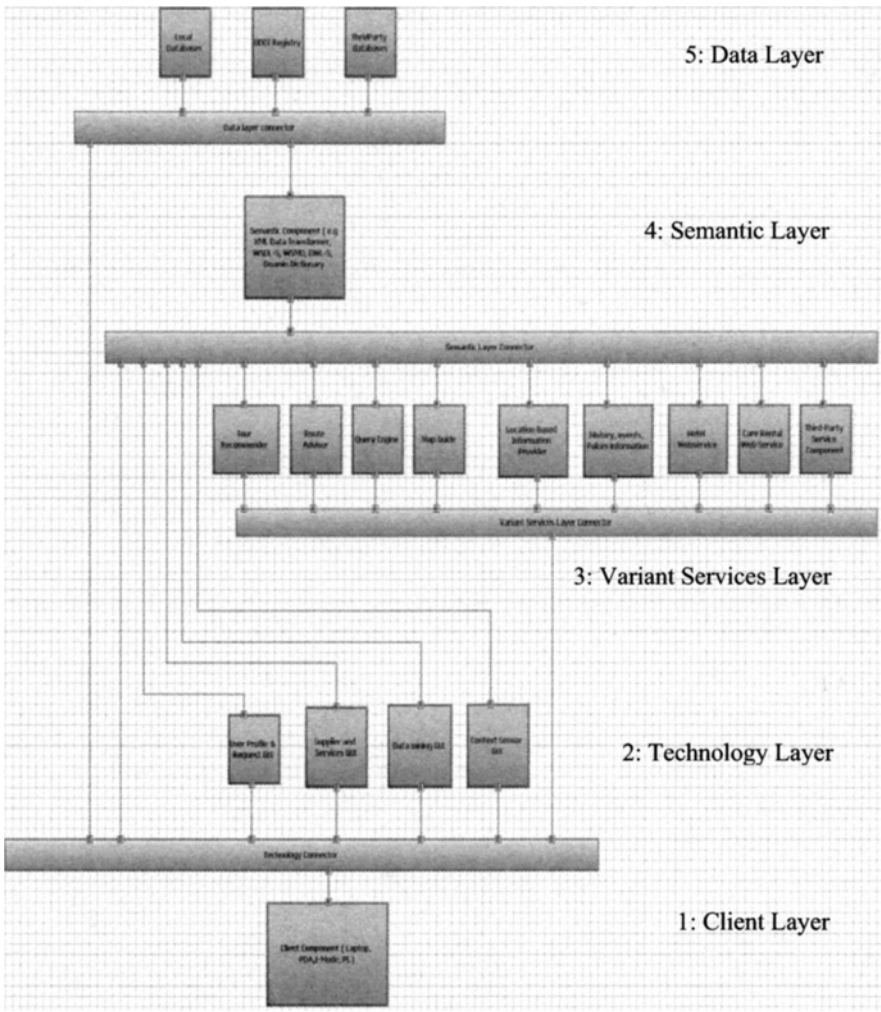

Fig. 2. The c2-style layered view of the TPLA in ArchStudio

4.1 C2 style Modelling of the TPLA

The TPLA is an aggregation of concurrent components tied together by message routing devices, which are the connectors (see Figure 2). Request is sent from the client layer at the bottom and a notification from the top after a response has been constructed. Every component in the architecture communicates with the technology layer where the protocol for interaction is defined. Also, all service rendering components in the architecture leverages the semantic knowledge representation at the semantic layer in order to improve the quality of service delivery to requesting clients. The rule of interaction among the components of the TPLA follows the c2 architectural style (Whitehead Jr, et al., 1995). Hence the choice to model the TPLA as c2 style architecture using Archstudio 4, which also has the advantage of automatically generating the equivalent formal description of the architecture using xADL 2.0. The c2 style imposes the principle of substrate independence on the components of the architecture in which a component in the architecture hierarchy can only be aware of the component above it. This enables high substitutability that offers a boost for modifiability and extensibility, especially in a product line context as it provides a platform for evolving new products. The c2 style also supports the use of parameterizable components thereby facilitating the reusability of the architecture. Customization of components is also possible based on the c2 style model of the TPLA (Whitehead Jr, et al., 1995). Thus the c2 style of the TPLA gives an insight into a measure of elasticity and extensibility of the architecture, which makes it potentially suitable as reference architecture for a product line.

4.2 Specification of Semantic Attributes of Components in xADL

The xADL schemas for our component type structures have been extended in order to capture the semantic attributes of specific components of the TPLA. Each layer of the architecture is defined as a structure in xADL. The complete specification of the TPLA (see Figure 3) shows that it consists of 5 structures. Figures 4 and 5 show xADL specifications of the User profile and Request (a basic component) and tour recommender system (an optional component) components of the TPLA.

The extensible nature of xADL schemas, has been exploited to extend the specification of the User Profile and Request component with the addition of the *"<UseResource>"* schema to indicate the essential resources required by the component to realize its functionality and the prevalent context. In Figure 5 the Tour Recommender component is specified as an optional component in the product line that requires the services of the technology and semantic components of the TPLA with an awareness of the user's context. This is shown with the addition of the *"<Context>"* extension schema to xADL. These extensions have been made to promote a better understanding of the semantic properties of the components concerned in contrast to normal xADL descriptions where components are specified as opaque components that are semantically neutral (see (http:// www.isr.uci.edu/projects/xarchuci/)). In Figure 6, the specification of the Semantic

component type is shown with the lookup implementation extension schema in xADL used to indicate the implementation source of the semantic ontology definition for the component.

```
+<types:archStructure types:id="ClientLayer" xsi:type="types:ArchStructure">
+<types:archStructure types:id=" TechnologyLayer" xsi:type="types:ArchStructure">
+<types:archStructure types:id=" VariantServicesLayerStructure "types:ArchStructure">
+<types:archStructure types:id="SemanticLayerStructure" xsi:type="types:ArchStructure">
+<types:archStructure types:id="DataLayerStructure" xsi:type="types:ArchStructure">
```

Fig. 3. Structures in the TPLA

```
<types:component types:id=" UserProfileComp " xsi:type="types:Component">
<types:description xsi:type="instance:Description">User Profile and Request</types:description>
<types:interface types:id="UserProfile_upper" xsi:type="types:Interface">
<types:description xsi:type="instance:Description">Upper Interface</types:description>
<types:direction xsi:type="instance:Direction">inout</types:direction>
</types:interface>
<types:interface types:id=" UserProfile_bottom " xsi:type="types:Interface">
<types:description xsi:type="instance:Description">Bottom Interface</types:description>
<types:direction xsi:type="instance:Direction">inout</types:direction>
</types:interface>
<types:interface types:id=" UserProfile_bottom " xsi:type="types:Interface">
<types:description xsi:type="instance:Description">Bottom Interface</types:description>
<types:direction xsi:type="instance:Direction">inout</types:direction>
</types:interface>
<types:useResource type:id="UserProfileComp_neededResource1 " xsi:type="types:useResource">
<types:description xsi:type="instance:Description">uses Technology Layer
Service</types:description>
<types:resourceid xsi:type="instance:resourceid">#TechnologyComponentType</types:resourceid>
</types:useResource>
<types:useResource type:id="UserProfileComp_neededResource2 " xsi:type="types:useResource">
<types:description xsi:type="instance:Description">uses Semantic Layer
Services</types:description>
<types:resourceid xsi:type="instance:resourceid">#SemanticComponentType</types:resourceid>
</types:useResource>
</types:component>
```

Fig. 4. User Profile & Request Component Specification

```
<types:component types:id="TourRecommComp" xsi:type="options:OptionalComponent">
<types:description xsi:type="instance:Description">Tour Recommender</types:description>
<types:interface types:id="UpperInterface" xsi:type="types:Interface">
<types:description xsi:type="instance:Description">Upper Interface</types:description>
<types:direction xsi:type="instance:Direction">inout</types:direction>
</types:interface>
<types:interface types:id="BottomInterface" xsi:type="types:Interface">
<types:description xsi:type="instance:Description">Bottom Interface</types:description>
<types:direction xsi:type="instance:Direction">inout</types:direction>
</types:interface>
<types:useResource type:id="TourRecommComp _neededResource1 "
xsi:type="types:useResource">
<types:description xsi:type="instance:Description">uses Technology Layer
Service</types:description>
<types:resourceid xsi:type="instance:resourceid">#TechnologyComponentType</types:resourceid>
</types:useResource>
<types:useResource type:id="TourRecommComp_neededResource2 "
xsi:type="types:useResource">
<types:description xsi:type="instance:Description">uses Semantic Layer
Services</types:description>
<types:resourceid xsi:type="instance:resourceid">">#SemanticComponentType
</types:resourceid>
</types:useResource>
<types:Context type:id="TourRecommComp _c1" xsi:type="types:Context">
<types:description xsi:type="instance:Description"> User Context Definition
List</types:description>
<types:ContextListid xsi:type="instance:ContextListid">#UserContextList</typesContextListid>
</types:Context>
<options:optional xsi:type="options:Optional"/>
</types:component>
```

Fig. 5. Tour Recommender System Component Specification

```
<types:componentType types:id="componentTypeffffffe2-4a984615-9d77efed-b67854e9"
xsi:type="implementation:VariantComponentTypeImpl">
<types:description xsi:type="instance:Description">SemanticComponent Type</types:description>
<types:signature types:id="SemanticTypeUPsignature" xsi:type="types:Signature">
<types:description xsi:type="instance:Description">Semantic Component upper
Signature</types:description>
<types:direction xsi:type="instance:Direction">inout</types:direction>
<types:serviceType xsi:type="types:SignatureServiceType">Provides</types:serviceType>
</types:signature>
<types:signature types:id="SemantictypeBTSgnature" xsi:type="types:Signature">
<types:description xsi:type="instance:Description">Semantic Component Lower
Signature</types:description>
<types:direction xsi:type="instance:Direction">inout</types:direction>
<types:serviceType xsi:type="types:SignatureServiceType">Provides</types:serviceType>
</types:signature>
<implementation:implementation xsi:type="lookupimplementation:LookupImplementation">
<lookupimplementation:name
xsi:type="lookupimplementation:LookupName">http://sample.org/tourontology</lookupimplementat
```

Fig. 6. Semantic ComponentType Specification

5 Conclusion

The Tourism Product Line Architecture (TPLA) presented in this paper provides a candidate starting point for evolving next generation TIS capable of providing improved intelligent value added services. It will also serve a platform to respond proactively to the problem of dynamic user requirements in e-Tourism. The composition of the TPLA is a product of a detailed study of attributes of today's TIS and the nature of emerging requirements in the e-Tourism domain. We have shown through formal specification using xADL that the components of the TPLA possess the intrinsic intelligent attributes that are desirable in next generation TIS. The interaction of component within the TPLA was modelled as a c2 style layered architectural pattern in order to show that it is sufficiently elastic and highly reusable, capable of initiating the emergence of credible TIS families.

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Mash-up Applications for Small Destination Management Organizations Websites

Maria Teresa Linaza[a], Frederik Lölhöffel[a], Ander Garcia[a], Carlos Lamsfus[b], Aurkene Alzua-Sorzabal[b] and Ainhoa Lazkano[c]

[a] Dept. of Tourism, Heritage and Creativity
Visual Communication Technologies VICOMTech, Spain
{agarcia, floehfel, mtlinaza}@vicomtech.org

[b] CIC-tourgune, Spain
{carloslamsfus, aurkenealzua}@tourgune.org

[b] Debabarrena, Spain
komunikazioa@debegesa.com

Abstract

Multimedia plays a role on the Web which is guaranteed to grow in significance as individuals and organizations increasingly generate digital content. Parallel to the development of richer media online is the discovery of "Web as platform", termed Web 2.0 in some quarters.. As rich media and Web 2.0 converge, new requirements arise which need new solutions. In this paper, we describe the SOCITUR project, which aims at implementing innovative user-friendly interfaces for destination marketing and promotion portals based on Web 2.0 technologies that will encourage and simplify the indexation, aggregation and sharing of multimedia content generated by both DMO and tourists. This paper focuses on the architecture and developed components of the system.

Keywords: Destination Management Organizations; Mash-Ups; Web 2.0; multimedia.

1 Introduction

A new term has been introduced to the Web community: "Web 2.0". A Web site is no longer a static page to be viewed in a browser, but a dynamic platform upon which users can generate their own experience. Another aspect of this Web as platform is sites which provide users with access to their data through well-defined Application Programming Interfaces (API) and hence encourage new uses of that data, for example through its integration with other data sources.

However, we must also take into account another growing trend on the Web - the growth of multimedia content. Technological progress has led to too multimedia content being accessible. Therefore, the meaningful organization of this amount of online multimedia content, as well as its meaningful delivery to the user, are still challenges. Current trends (Flicker, podcasts, Google Video) are indicators of how Web 2.0 will have to provide appealing dynamic platforms with multimedia content.

The growth of rich media on the Web together with the accessibility to rich data sources through Web platform APIs holds the promise for discovering new added value services through the synergy of both media and content streams. Nevertheless, the current state of the art of media and Web technologies prevents richer integration.

Web 2.0 technologies have also created a cultural change also in the tourism sector. DMOs are dealing with a different consumer profile as Internet users are becoming familiar with much more informal, transparent and collaborative forms of communication. The SOCITUR project aims at implementing innovative user-friendly interfaces for destination marketing and promotion portals based on Web 2.0 technologies. The project considers two areas to incorporate these new technologies on the same user interface: the official information about a destination provided by the DMO; and user-generated content provided by consumers.

This paper presents the components and technical description of the DMO Web portal using extended mash-up technologies. Section 2 summarizes the related work. Section 3 describes the SOCITUR project including objectives, the application scenario and some use cases. The technical implementation for the DMO application is described in Section 4. Finally, conclusions and future work are presented in Section 5.

2 Related work

The parallel development of concepts like the Semantic Web, Web Services or Web 2.0 has resulted in a multitude of new services, Web sites, technologies and protocols (Floyd et al, 2007). Web 2.0 describes the second generation of Web Services that let people collaborate and share information online in previously unavailable ways. Examples of the use of Web 2.0 are social networking sites, wikis, blogging and podcasting (Lee & Gretzel, 2006). Web mash-ups - Web sites which combine data and services from across the Web - are an emerging trend within this Web 2.0 framework.

The concept of a mash-up originated in the DJ music culture, where the development of inexpensive software allowed musicians to create high-quality remixes and to easily sample and recombine digital music (Gunderson, 2004). Thus, a Web mash-up describes the seamlessly combination of two or more different sources of content and/or software to create a new added value service for users (Sigala, 2007). From a computer science perspective, the underlying technology and practices in Web 2.0 platforms are not really innovative (Weiss, 2005). What is innovative is how mash-ups are being widely used for the rapid implementation of creative ideas which would be too time consuming or expensive otherwise. However, it has not been until after the release of the Google Maps system and the development of housingmaps.com site in 2005 that the term mash-ups was used to characterize Web sites. The Web site programmableweb.com lists 221 different APIs which can be mashed-up. The available APIs span a wide range of applications, including search engines, mapping

applications, blogs, RSS aggregators, image and video sharing, social networking, information management systems, social bookmarking and wikis (Anderson, 2007).

Mash-ups have already been embraced by the travel and tourism industry to a great extent, the most common being the combination of Google Maps with other sources of information such as hotel locations (Reactive, 2006). Still an emerging technology, currently only a small number of technology companies are providing Open APIs for their software and Web sites. For instance, the Random Day Out Generator by Locale combines a number of data sources to create a itinerary using Virtual Earth (Microsoft's equivalent of Google Maps). Moreover, Virtual Tourism combines travel destination information from a variety of sources: text from Wikipedia, maps from Google Maps and video from YouTube. Finally, 43Places works in a similar way and combines Flickr photos, RSS feeds and Google Maps with tagging and user-generated content, allowing users to share their favourite destinations.

Regarding the application of Web 2.0 technologies to DMO Web portals, Tourism British Columbia (BC) has been one of the first destinations to include blogs and user-generated content in their online marketing strategy. The process started in 2005 with a blog written by their staff to share insider information with website users. Although not directly connected to its Web portal, Chester City Council has its own geo-referenced information system (http://www.chestertourist.com, [Aug 31, 2007]). This "unofficial" DMO Web site of Chester enhances Google Maps with the tourist information of the city. However, the map only shows contact information, so tourists have to search for the attraction at the bottom of the web page for further information. Finally, the Florence Official Tourist Office includes geo-referenced contents about several Points of Interest (PoI) on Google Maps (http://www.firenzeturismo.it/, [Aug 31, 2007]). Tourists can customize the map to show only the type of PoIs they are interested in. Selecting any of the PoIs opens a new window, showing the most relevant information and linking to the web page of the PoI when available.

3 The SOCITUR project

3.1 Objectives of the project

The SOCITUR project aims at implementing innovative user-friendly interfaces for destination marketing and promotion portals based on Web 2.0 technologies that will encourage and simplify the indexation, aggregation and sharing of multimedia contents generated by both the DMO and tourists. This aim can be divided into the following specific objectives and challenges:

- Integration of geo-referenced applications and services in the DMO Web portal based on a mash-up approach, combining already existing services and innovative functionalities. The portal interface will be based on an interactive geo-referenced map of the destination, where information about tourist assets will be available.

Although not technically very complicated, the main challenge of this new promotion interface will be social acceptance.

- Implementation of a custom tile layer based on the Geographical Information System (GIS) provided by several institutions, in case the resolution of Google Maps is not very accurate in the selected tourist destination. Although currently applied to the SOCITUR validation scenario, the developed methodology should be easily applied to other cases where accurate maps are provided local and national governmental bodies.
- Extension of the existing tourist integrated Open-Source Content Management Systems (CMS) to handle multimedia contents, both generated by the tourist agents (DMO, service providers) and by tourists using the same user interface. Contents will be stored in separate databases due to their quality and copyrights.
- Implementation of authoring tools for the semantic indexation of DMO-generated contents based on MPEG standards. The feasibility of applying such standards to tourist multimedia indexation is one of the main challenges of the project. One of the key aspects of these tools will be related to the Digital Rights Management and copyrights.
- Implementation of annotation tools for user-generated contents based on multimedia retrieval standards. The system will provide tourists with a very simple interface in order to upload several types of multimedia contents (audio, video, photos) about the destination on the map-based interface and some tools for a brief annotation for further retrieval.

The SOCITUR project targets DMO marketing and promotion portals, focusing on tourists as their target visitors. Its main objective is to satisfy the information needs of tourists, including communication among tourists and between tourist and tourism professionals such as DMO (Ban & Fesenmaier, 2000).

3.2 Application scenario: Debegesa

The project has been designed and implemented in the Debabarrena region, in the north of Spain. The Debabarrena DMO called Debegesa coordinates the tourist promotion of eight Town Halls of the region (Deba, Eibar, Elgoibar, Ermua, Mallabia, Mendaro, Mutriku and Soraluze), which is placed in a privileged geographical location in the middle point from the three Basque main cities. Therefore, it is a good location from which to tour round the Basque Country. Debegesa was founded in 1985, with the aim of encouraging the sustainable development of the area, taking specific measures to answer the needs of the region.

Tidal area of flyshc at Sakoneta beach.

Lastur valley in Deba.

Machine tools museum in Elgoibar.

Valley of Aranerreka in Mendaro.

Fig 1. Some of the Debabarrena tourist attractions.

The current Web site of the destination is managed by Debegesa (http:\\www.debabarrena.org, [Aug 31, 2007]). It currently includes several contents related to outdoor tourist activities such as walks, water sports or paintball; description of accommodation and restaurants for each of the eight cities; and other activities such as craftsmanship, festivals and traditions, gastronomy, museums or guided tours.

3.3 Use cases

SOCITUR targets three types of users within the tourist value chain: the DMOs; the primary service providers and intermediates, mainly those related to accommodation and food and beverage; and tourists.

DMO. Destination managers are the administrators of the system, with rights to index, edit, manage and even delete content. Several authoring tools have been implemented for them to fulfil the following tasks:

- Indexation of multimedia content about the destination. The content owned by the DMO should be first indexed to be reusable for promotion and marketing activities, such as brochures or the Web portal. A multimedia content indexing

tool based on MPEG-based standards will be developed. The selected descriptors for indexation include a brief text-free description of each piece of content, key words, format and resolution, author or IPR.

- Addition of geo-referenced tourist content using a user-friendly authoring tool. The personnel from the DMO will be able to add any multimedia content associated to a physical location or PoI. For instance, the personnel of the DMO can choose a location in one of the towns of the destination on the map, click directly on the point on the map and add multimedia content filling a simple template.

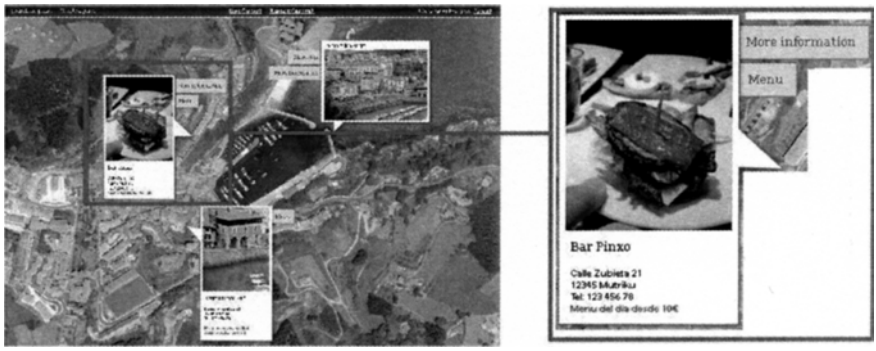

Fig. 2. Graphical User Interface (GUI) for the DMO.

Service providers. In order to avoid current difficulties faced by the DMOs in updating information about the destination, the DMO will give permissions to primary service providers and intermediates so that they can handle the information about their services themselves on the same platform as the DMO. For instance, the owner of a restaurant of Mutriku will click on the location of his/her restaurant on the map, fill in a previously defined template by the DMO and publish it on the Web portal of the destination.

Tourists. The third use case is the tourists, who generate comments about the existing Web portal information and add new geo-referenced contents after a tourist experience. The Graphical User-Interface (GUI) for this application is also based on the same Google Maps interface. Therefore, they can select and click on the location on the map and fill in a template with information dependent of the tourist asset. The template will be based on a simplified version of the MPEG-based standard used to index the official content from the DMO. These annotation tools will include aspects related to the ownership of the content and further reuses of the user-generated content by third parties. In such a way, this content will be shared with the rest of the tourist community.

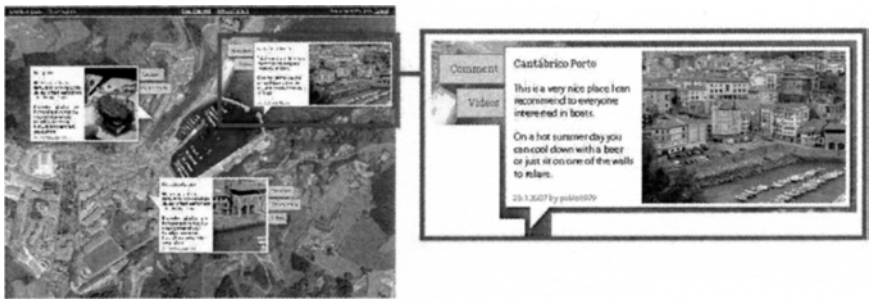

Fig. 3. Graphical User Interface (GUI) for user-generated content.

4 System components for the DMO application

SOCITUR is based on a mash-up architecture, combining existing Web Services and their innovative extensions and user-generated content to enhance tourist experiences provided by the Debabarrena destination. All the services have been added to the destination Web portal without modifying the existing Content Management System (CMS) based on the Zope Open Source tool. Among the implemented advanced services for the DMO, the following ones can be mentioned:

- Google Maps interface is the basic service over which the DMO Web portal has been implemented, as this tool allows adding and visualizing geo-referenced information through its interface in an intuitive and easy way. Its API includes maps, new visualization layers and management tools for the interaction with the user.
- Accuracy of geo-referenced data has been improved with the addition of a custom tile layer based on more accurate cartography of the destination provided by the topological data of the Basque Government. Both layers have been aligned in order to take advantage of the accuracy of the cartographic data from other resources and providers.
- An innovative service allows indexing multimedia content for destination marketing based on MPEG standards, taking into account the Intellectual Property Rights (IPR). This indexing tool will annotate contents generated by both DMO and tourists for further retrieval.

The architecture of the system is based on the Web 2.0 concept, following the same approach as other existing applications. Several services are connected to create the mash-up that provides the functionalities to the DMO Web portal. The core of the mash-up is the Google Web Toolkit (GWT), which is an Open Source Java software development framework that facilitates the implementation of AJAX applications. GWT allows implementing the front-end in Java, while the GWT compiler creates the final browser-compliant JavaScript and HTML code that provides the experience in Internet. Besides shortening the development time, the Toolkit protects the developers

from changes on browsers and avoids programming directly in JavaScript. Moreover, it coordinates the flow of the data from Google Maps, Flickr and the database. The compiled code is inserted into a Zope template.

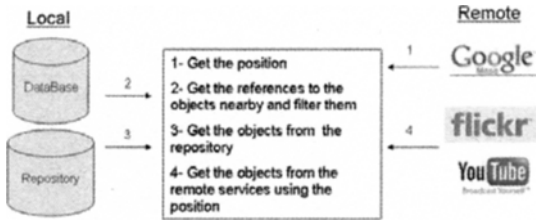

Fig. 4. Architecture of the SOCITUR system.

The following sections describe more deeply each of the components of the SOCITUR system.

4.1 Google Maps APIs as a location-based user interface

SOCITUR uses Google Maps, the map service for Web implemented by Google which offers cartographic information worldwide, as its Graphical User Interface (GUI). There are not many applications for destination promotion based on such interfaces although they are very used in booking accommodations. Google Maps includes a user-friendly and powerful GUI to navigate the map and select the visualization approach. Moreover, it provides a public API so that its maps can be added to other third-party webs. Finally, the GUI allows adding new data, such as PoI or new graphical layers, just clicking on the real location.

However, due to the low resolution of the Google Maps cartography of the Debabarrena region, it has been replaced with the ortophotos provided by the Basque Government. Therefore, a custom tile layer has been implemented in order to allow superimposing the high resolution ortophotos of the Debabarrena region on the Google Maps GUI. A tile is a square that covers a specific area on the globe. The area covered depends on the map scale (zoom level) and the map projection. The cartographic data provided by the Basque Government has been cut into tiles of the same dimensions of the tiles used in Google Maps. An own-developed application names each tile following the Google Maps naming convention (latitude, longitud and zoom level) and stores the tiles in the Debegesa database. When the maps are generated, the created tiles are overlaid and aligned properly on the Google Maps interface. This methodology is flexible enough to add any further information coming from other local and regional institutions. Moreover, it is generic enough to be implemented in other destinations with such accuracy restrictions.

4.2 Content Management System (CMS)

SOCITUR is based on the Zope CMS, an Open Source tool used already by the Debegesa DMO (http://www. zope.org, [Aug 31, 2007]). As widely known, a Content Management System (CMS) is a tool for content management along all the value chain: creation, storage, management, publication and display. There are several types of systems with different functionalities. Although all of them fulfil the requirements for the tourism sector, the general CMS are the most implemented ones.

There are many reasons for choosing Zope for this project. First, it is a powerful and complete tool, which fulfils the technical requirements of the project. Moreover, we primarily use Open Source technology because Open Source software is based on industry standards, which contributes to ease the integration with other systems and also does not lock the clients into a costly proprietary system as there are no software license fees. Finally, one of the project requirements is to minimally impact on the current tools used by Debegesa. As Zope can be easily extended, we have decided not to change the existing CMS.

Technically speaking, Zope is an Open Source, object-oriented Web application Server written in Phython programming language. Basic object types, such as documents, images, and page templates, are available for the user through the Web. Specialized object types, such as wikis, blogs, and photo galleries, are available as third-party add-ons. It must be mentioned that Zope is more than a standard CMS, as it includes a Web Server based on such objects instead of files. The use of objects and the implementation based on standards makes Zope a very powerful tool to develop new applications.

4.3 DMO multimedia content indexing based on standards

Content indexation is a critical process, as the system will not be able to retrieve the correct multimedia content for each PoI if the process is not correctly fulfilled. The more thoroughly the process is accomplished, the more accurate will be the retrieval of content to queries from users. Regarding the indexing of the content by the staff of Debegesa, a Java application based on the Open Source tool Caliph has been extended to satisfy the concrete needs of the project. The indexing is done on the same application in a semi-automatic manner, being compliant with the MPEG-7 annotation standard. The most important fields collected during the indexation process include the owner of the content, some keywords and semantic categories and other Digital Rights Managements (DRM) issues. Once the indexation process is finished, the DMO database is updated and the multimedia content is stored on the Debegesa server.

If they are allowed by the DMO, primary service providers will also access this indexation tool through a web browser. Depending on their rights, they will be able to edit the information related to their services using simple templates. The template is

based on existing tourist service standards and changes according to the category of the service. The multimedia content used to fill these templates is also indexed.

4.4 Annotating user-generated content

Currently, one of the main multimedia sources is the content generated by the tourists, who add new geo-referenced contents after a tourist experience on the existing Web portal information. The GUI for this application is also based on the Google Maps interface. Therefore, they can select a location on the map, click on it and fill in a template with information dependent of the tourist asset. The template is based on a simplified version of the MPEG-7 standard used to index the official content from the DMO. These annotation tools also include aspects related to the ownership of the content, as this information is crucial for DMOs in order to know whether this multimedia content could be reused in further promotion campaigns of the DMO.

Once the annotation process has been completed, the content is stored on an external database using Web Services. Although the multimedia content can also be stored on the Debegesa server, the decision of separating both storage systems is based on the need of pre-filtering some of the possible comments from users.

5 Conclusions and future work

This paper provides a technological overview of the SOCITUR project, which aims at implementing innovative user-friendly interfaces for destination marketing and promotion portals based on Web 2.0 technologies that will encourage and simplifiy the indexation, aggregation and sharing of multimedia contents generated by both DMO and tourists.

SOCITUR has been implemented as an innovative user-interface for DMO Web portal based on a mash-up approach. The portal interface is based on a geo-referenced map of the destination using Google Maps tools to provide location-based information about tourist assets. The social acceptance of this kind of interface will be evaluated in the following months, assessing the number of visits to the web site and other parameters. Moreover, SOCITUR has developed a new methodology to implement a custom tile layer on destinations where the resolution of Google Maps is not very accurate and alternative cartographic sources are available.

SOCITUR is based on the Zope CMS, an Open Source tool used already by the Debegesa DMO. One of the most important requirements for systems such as SOCITUR to be successfully applied to DMOs is the further extension of the existing CMS to handle multimedia contents, both generated by the tourist agents (DMO, service providers) and by tourists using the same user interface. Although using the same input user interface, multimedia contents are stored in separate databases due to their quality and copyrights.

A Java application based on the Open Source tool Caliph has been implemented as an authoring tool based on MPEG-based standards for the semantic indexation of DMO-generated contents. The feasibility of applying such standards to tourist multimedia indexation has been validated with the personnel of the DMO. Further publications will provide additional information about such a tool. Moreover, annotation tools for user-generated contents based on multimedia retrieval standards have also been implemented. It is enough to click on the map to upload several types of multimedia contents (audio, video, photos) and fill in a questionnaire with the main descriptors in order to store and retrieve multimedia content in an efficient way.

Further works will include the public launching of the Debegesa Web portal, including the authoring tools for content indexation by the personnel of the DMO and primary providers, and the tools to add user-generated contents. Several assessment campaigns will be completed on the basis of measurable impact indicators (number of visits, navigation time) and other subjective data. For small DMOs, it will no longer be sufficient to maintain and develop an information rich destination website, but build a platform to facilitate the dialog between past and potential future visitors. In the globalization era, innovative approaches such as SOCITUR could provide additional value to the promotion strategies.

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Websites and Virtual Realities: a Useful Marketing Tool Combination? An Exploratory Investigation

Brigitte Stangl,
Christian Weismayer

Institute for Tourism and Leisure Studies
Vienna University of Economics and Business Administration
brigitte.stangl@wu-wien.ac.at
christian.weismayer@wu-wien.ac.at

Abstract

Websites offer an easy way to reach one's target groups. However, even in times of Web 2.0 websites generally are asynchronous and to a large extent are descriptive rather than experiential. The aim of this study is to find out if an appearance in a virtual reality (VR) is a useful combination with a hotel's website to offer tourists both synchronous and experiential information. For this purpose an experiment was conducted. Respondents' attitude towards a hotels' appearance in a VR - more precisely in Second Life (SL) - Association patterns are revealed through the comparison of SL with the website.

Keywords: marketing; tourism; websites; web 2.0; virtual realities (VR); second life (SL).

1 Introduction

Thanks to the Internet nearly a billion individuals worldwide have the possibility to communicate in various ways (Ondrejka, 2005). Many industries including the hospitality sector use the Internet as a marketing tool.

The medium sized hotel under investigation in the present study called "Übergossene Alm" uses its website intensively as a promotional tool. The website offers general information about the hotel (e.g. prices, news, package/special offers, picture gallery, links), features like transmission of inquiries, a webcam and the ability to recommend the website to friends and also the feature to watch a video or have a look at 3D pictures of special points of interest (e.g. dining-hall). The hotel tried to increase the website's success by implementing an appearance of the hotel in Second Life (SL) to offer synchronous and experiential features because websites are asynchronous (i.e. users can not communicate at the same time) and descriptive (Ondrejka, 2005).

SL is a slightly modified example of a massively multiplayer online game (MMOGs). SL is a 3D virtual world launched in 2003 by Philip Rosedale (CEO at Linden Lab). A virtual or online world is defined as a place where people come to interact, play, and socialize simultaneously (Lastowka & Hunter, 2003). Currently (August 2007) in SL there are about nine million residents from almost 200 countries around the world. Noticeable 35 to 45 thousand players are active every day (Lindenlab, 2007)). All

contents in SL are created by its residents, which is possible because the system is based on grid computing combined with streaming technology (Rosedale & Odrejka, 2003). Therefore it belongs to the category of Web 2.0 applications and its success depends on its users. Another difference of SL compared to conventional MMOGs is that there is a tight legal and economic connection to the real world (Ondrejka, 2004).

The remainder of the present paper is divided into the following sections: In the first one an overview of literature is given. Websites as a marketing tool are discussed, followed by implications for the hospitality industry. Then the potential of Web 2.0 and VRs respectively for marketing is addressed. The methodology used in this study is then presented, followed by the description of the sample and the results. Finally important findings are summarised and recommendations made for futher research.

2 Theoretical background

2.1 Web as a marketing tool

The success of online marketing revolves around the following five elements: attract users, engaging users' interest and participation, retaining users, learning about their preferences, and customising interaction with them (Kierzkowski et al, 1996). Provided information and service quality, usability, playfulness and design were identified as critical factors for a website by Liu and Arnett (2000). A website can only succeed if it is able to raise the likelihood of consumers experiencing an optimal flow (Hoffman & Novak, 1996). The concept of flow originates from motivational psychology and has been used to denote *"the episodes when life is heightened, when one is deeply involved and mental energy is highly focused on the activity or experience"* (Csikszentmihalyi, 1990; Kubey & Csikszentmihalyi, 1990). Online "flow" is *"the state occurring during network navigation which is: (i) characterized by a seamless sequence of responses facilitated by machine interactivity; (ii) intrinsically enjoyable; (iii) accompanied by a loss of self-consciousness; and (iv) self-reinforcing"* (Hoffman & Novak, 1996).

2.2 Implications for the hospitality industry

Online travel sales increased by 31 % from 2005 to 2006 and reached EUR 38.3 billion in the European Market in 2006 (Marcussen, 2007). With millions of tourism websites struggling for attention, especially small and medium sized hotels (SMEs) lacking budgets for expensive advertising campaigns (Wong & Law, 2005), suppliers have to think about how to best compete in this dynamic market and reach their target groups (Haas, 2002). According to Scharl, Wöber and Bauer (2004), the effectiveness of a website is investigated through the relationship between website characteristics and the desired outcome. They identified nine core capabilities of websites/systems, whereby only three of them (namely layout, interactivity and services) are relevant for the present study. To be successful with a website, a hotel has to increase the likelihood of consumers to experience an optimal flow (Hoffman & Novak, 1996) and to increase the degree of re-visitation of a website. Both would be augmented if

websites were not asynchronous and solely descriptive, but had a synchronous and experiential component as well (Ondrejka, 2005). Therefore, and because of the inherently experiential nature of tourism, it seems to be desirable for hotels to offer additional information and the possibility to explore a hotel (incl. provided attractions/services) in virtual worlds (VRs).

2.3 Potentialities of Web 2.0 and VR respectively for marketing

Technological progress in the web, MMOGs, VR, and the avatar world form the basis for digital worlds. Due to developments in these fields users can contribute to online spaces. Under the term Web 2.0, new forms of getting into and staying in contact with customers emerged (e.g. blogs, wikis). Wikipedia is an impressive example of communal productivity (Ondrejka, 2005). SL is another example of a Web 2.0 application. It is a VR designed to come as close as possible to face-to-face interactions, as VRs per se should facilitate user-to-user interaction which is essential for participants (Moore, Duceneaut & Nickell, 2006). In these worlds residents build communities, which is seen as fundamental to retaining players long-term (Bartle, 2003). Many enterprises have begun to integrate virtual communities into their online strategies in search for the following benefits: increased sales (Brown, Tilton & Woodside, 2002), positive word of mouth (Bickart & Schindler, 2001), more effective market segmentation (Armstrong & Hagel, 1995), increased website traffic (Bughin & Hagel, 2000), stronger brands (McWilliam, 2002), higher advertising and transaction fee revenue (Rothaermel & Sugiyama, 2001; Schubert & Ginsburg, 2000), better product support and service delivery (Armstrong & Hagel, 1995; Walden, 2000) and a source of marketing research data (Kozinets, 2002).

This potential of virtual communities for marketing - which are more easily established by Web 2.0 and VR, respectively - seem to be relevant for the hospitality industry as well. Moreover as websites normally are asynchronous and to a large extent descriptive rather than experiential (Ondrejka, 2005), and the fact that users seek variety and pleasure, there seems to be a lot of reasons for assuming that people are interested in an additional appearance of hotels in VRs. As there are hardly any studies considering websites and VRs as a combined marketing tool, the present exploratory investigation attempts to shed some light on this issue by testing the following hypothesis:

H1: Previous non-users of SL associate more positive attributes with the hotel's appearance in SL than previous SL users.

Teo, Lim and Lai (1999) stipulate that with increased usage time novelty declines. Hence SL users are less impressed about the SL appearance than non-users. This leads to hypotheses H2a and H2b.

H2a: Participants' perceived amount of pleasure and fun in SL decreases with increasing Internet usage-time per week.

H2b: Previous SL-users' perceived amount of pleasure and fun in SL decreases with increasing SL usage-time per week.

Most current travel websites are designed based on the assumption that users compare product/service attributes when purchasing a product. Therefore they fail to provide experiential aspects of the product/service (Hwang, Gretzel, Xiang & Fesenmaier, 2006). According to the First Opinions Panel in SL by the Social Research Foundation (2007) primary interest in SL is experimenting/exploring (29 %) followed by fun (25 %). Secondary reasons for being in SL are fun (25 %), socializing (15 %), and experimenting/exploring and designing and building (14 % each). These motivations imply that the usage of SL has very strong entertainment and experiential dimensions. Consequently a combined application of SL and websites should improve marketing.

H3: The hotel's SL appearance arouses more positive associations than its traditional website.

Digital environments increase the likelihood of experiencing flow mainly due to novelty, interactivity of the environment, and volitional control of consumers (Hoffman & Novak, 1996; Novak, Hoffman & Yung, 2000). SL contributes more to these requirements than websites through synchronous communication, for the reason of being experiential and because users are endowed with a high degree of control.

H4: The evaluation in terms of textual content and visual representation of the hotel's SL appearance affects the intention to revisit the hotel in the virtual world.

In e-tailing (Online retailing) customer retention is a key success factor (Ahn, Ryu & Han, 2007). According to Donthu & Garcia (1999) Internet shoppers have a rather positive attitude towards direct-marketing, they are convenience seekers, innovative, and look for variety. Due to the fact that SL is user generated content which is very dynamic it seems to be a place where Internet shoppers feel comfortable. But according to Scharl, Wöber and Bauer (2004), the system has to fulfil several core capabilities like layout and services. These factors imply that the degree of attention is raised by the textual content and by the visual representation. Moreover, Teo, Lim and Lai (1999) point out that continued website usage without specific goals declines over time when the novelty effect wears off.

3 Method

Lacking an analysis dealing with the combined employment of websites and VRs for marketing usage, an experiment was conducted for the hospitality industry. The enterprise under investigation is the above introduced Austrian spa hotel called 'Übergossene Alm' and it's SL-counterpart 'First Spa Hotel'.

The experimental design includes three different groups out of a convenience sample. Each group had to answer three questionnaires hence *a priori* and *ex-post* attitude were levied. The very first questionnaire (Q1) of all participants examined the usage

of the Internet as an information source in tourism, computer and gaming usage as well as demographical data. People who had no experience with SL prior to this study (further on named non-users) were invited to a PC-laboratory, where the SL-client software was installed on computers and the login already prepared. These inexperienced participants had to go through their tasks in two slightly different ways:

- The first non-user group (G1) was asked to visit the website www.uebergossenealm.at to get an impression of the website. They did not get a special task for the website. They were only requested to click through the website and find out which information is offered and how it is presented. They then evaluated the website and were asked about their prior expectations of the spa hotels' SL appearance in the second questionnaire (Q2). Afterwards they effectively visited the hotel in SL. There they had to fulfil several tasks (e.g. getting a massage, doing a round trip by chairlift, chatting with other avatars). They were allowed to choose between eight offered tasks but they had to do at least five of them. Finally they reported on their experience in the third and last questionnaire (Q3).

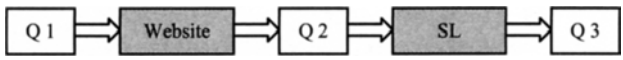

Fig. 1. Flow-diagram of the experimental chronology of group G1

- The second non-user group (G2) immediately visited SL to fulfil five tasks. Afterwards they answered the second questionnaire (Q2) concerning their experience in the VR. Then they visited the hotel's website like G1. Finally they reported ex-post on their impressions of the website and SL, respectively in the last questionnaire (Q3).

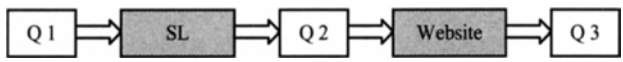

Fig. 2. Flow-diagram of the experimental chronology of group G2 and G3

Individuals who had experience with SL prior this survey (further on named users), i.e. who are residents in SL, were asked to participate through a call for attendance in several SL and gaming forums, chats and blogs.

- The third group (G3) is composed of SL users who visit SL as a leisure time activity. The experimental chronology of the study of this group was the same as that of G2.

4 Results

4.1 Description of the sample

All in all the convenience sample consisted 155 people, whereby G1 consists of 54 people, G2 of 58 and G3 of 43. However, one has to consider that not all of them went through the whole procedure. All three questionnaires were completed in G1 by 44 people, in G2 by 41, and in G3 by 27. The whole sample consists of 42 % male and 58 % female test persons. Impressive 46.5 % of all SL users (G3) graduated from university and further 30.2 % have the general qualification for university entrance. In the group of non-users (G1 and G2) 27.4 % graduated from university and 29.8 % have the general qualification for university entrance.

There were no differences between the Internet information search behaviour of the examined groups. All of them tended to search for hotel information before a journey. 74 % of the participants always search for information prior to a trip, 17 % sometimes, and the rest of them use other sources. But there is a difference in the Internet usage as users spend on average 22.3 hours per week on the Internet while non-users only spend 16.4 hours. SL users spend 13.5 hours per week in all kinds of VRs (e.g. SL, Papermint, World of Warcraft, The Sims) while non-users spend 0.6 hours per week in VRs (not in SL, as they did not have any experience with this technology).

4.2 Revealed patterns

H1: Participants evaluated SL on a 7-point-Likert-scale (1 = strongly agree to 7 = totally disagree) being confronted with the following ten associations: 'interesting', 'needless', 'comfortable', 'informative', 'unconcerned', 'credible', 'useful', 'childish', 'without content' and 'cool'. To find out if users evaluate SL differently than non-users a Mann-Whitney-U-test was conducted.

Table 1. Comparison of users and non-users associations with SL

	non-users	users	significance
interesting	5.082	5.593	0.351
needless	3.753	2.444	0.001**
comfortable	3.741	4.741	0.008**
informative	4.000	4.889	0.018*
unconcerned	3.929	2.407	0.000**
serious	3.800	5.074	0.000**
useful	3.577	5.037	0.000**
childish	5.894	4.222	0.000**
without content	3.765	2.370	0.000**
cool	4.165	4.926	0.034*

* significant at the 0.05 level (two-tailed)

** significant at the 0.01 level (two-tailed)

According to mean values, the wish to discover new things is probably the reason for the fact that non-users significantly associate attributes more positively to the SL appearance than users. Therefore H1 is supported.

H2a/H2b: Study participants were able to try out the following tasks in the hotel's virtual area: 'sitting at the bonfire' (task1), 'chatting with other visitors' (task2), 'chatting with employees of the spa' (task3), 'getting a massage' (task4), 'jumping into the pool' (task5), 'dancing' (task6), 'doing a round trip with the chairlift' (task7) and 'playing hangman' (task8).

H2a: Taking all participants into account Pearson correlations between the amount of *hours spend on the Internet per week* and the aroused pleasure with the tasks carried out (4-point-Likert scale: 1 = amusing vs. 4 = nothing for me) show that there are no significant correlations. Therefore, H2a is rejected.

H2b: Here only users are taken into account. So Pearson correlations between *hours spent in SL per week* and the pleasure with the fulfilled tasks are tested. Due to non-significant correlations H2b is rejected.

H3: The following table shows significance values of Wilcoxon tests comparing associations with the hotel's website and SL between users and non-users.

Table 2. Significance matrix of associations

	inter-esting	need-less	com-fort-able	infor-mative	uncon-cerned	serious	useful	childish	without content	cool
user	0,78	0,34	0,73	0,07	0,19	0,12	0,10	0,00	0,10	0,42
nonuser	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,58

Furthermore, for non-users the hotel's SL appearance arouses significantly more positive associations than the traditional website (not shown). Users did not differentiate between website and the hotel in the virtual world. Therefore H3 can only be supported for non-users, but not for users. Therefore non-users obviously experience flow through novelty.

Since Hoffmann & Novak argue that another factor for experiencing flow is interactivity a comparison of attitudes towards the fulfilled tasks between users and non-users is made. Analyzing the mean values shown in Table 3 the only exception concerning the attitudes of SL is playing hangman (task 8), probably because this is a game which is rather well known by all participants and therefore the explorative aspect is too low for SL residents. The most liked tasks are 'doing a roundtrip with the chairlift' (task 7) and 'chatting with other visitors' (task 2).

Table 3. Mean values of attitudes towards completed tasks

		task1	task2	task3	task4	task5	task6	task7	task8
mean values	users	2.2692	1.4000	1.6111	1.7647	2.0357	2.0714	1.2381	2.5000
	non-users	2.7778	1.8036	1.9268	2.6981	2.5476	2.4545	1.8421	2.2286

Results indicate that people appreciate synchronous communication, which is not possible on a traditional website. Moreover the positive attitude towards doing a round trip with the chairlift shows that test participants are delighted about the possibility to discover things on their own in the VR.

H4: A principal component analysis (rotation method: Varimax with Kaiser-normalization) was used to find out if users differentiate the two dimensions textual content (content aspect) and visual representation (design aspect). Results show that they do. The first dimension describes 45.84 % and the second 24.67 % of the variance (in sum 70.51 %). The following figure visualizes these dimensions which are two preconditions a system/website has to fulfil (Scharl, Wöber & Bauer, 2004).

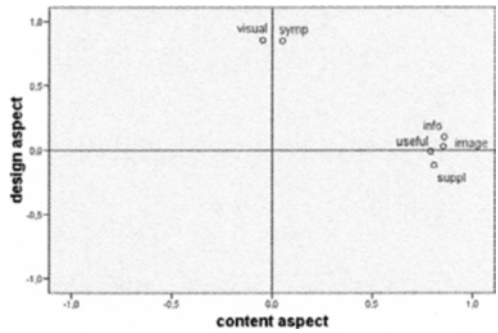

Fig.3. Diagram of the components content and design

The first component represents the content aspect, it includes responses to the following questions: 'info' (SL appearance complements the hotel's website appearance), 'suppl' (visitation of SL gives supplementary information not offered on the website), 'image' (SL appearance suits the communicated image of the hotel), and 'useful' (VRs are exciting and I advocate the presentation of the hotel in SL as a pilot project). The second component named design aspect contains the variables 'visual' (the hotel's homepage is attractively arranged) and 'symp' (the whole appearance makes a sympathetic impression). As one can see from Table 4, the two dimensions have high intra-correlation but there is no significant inter-correlation. All variables are significantly positively correlated within each dimension.

Table 4. Correlation matrix of the aspects content and design

			visual	symp	info	suppl	image	useful
Spearman's Rho	visual	corr-coeff	1.000	.494**	0.019	-0.136	-0.031	-0.050
		sign		0.000	0.880	0.267	0.800	0.687
	symp	corr-coeff	0.494**	1.000	0.120	-0.020	0.038	0.105
		sign	0.000		0.329	0.869	0.759	0.394
	info	corr-coeff	0.019	0.120	1.000	0.585**	0.666**	0.540**
		sign	0.880	0.329		0.000	0.000	0.000
	suppl	corr-coeff	-0.136	-0.020	0.585**	1.000	0.565**	0.567**
		sign	0.267	0.869	0.000		0.000	0.000
	image	corr-coeff	-0.031	0.038	0.666**	0.565**	1.000	0.553**
		sign	0.800	0.759	0.000	0.000		0.000
	useful	corr-coeff	-0.050	0.105	0.540**	0.567**	0.553**	1.000
		sign	0.687	0.394	0.000	0.000	0.000	
	revisit	corr-coeff	-0.003	0.022	-0.325**	-0.401**	-0.291*	-0.318**
		sign	0.983	0.860	0.007	0.001	0.016	0.008

* correlation is significant at the 0.05 level (two-tailed)

** correlation is significant at the 0.01 level (two-tailed)

Table 4 includes the row 'revisit'. This variable shows significant negative relationships between the 'content aspect' and the question 'Can you imagine to revisit the hotel in SL?' (4-point-Likert-scale: 1 = not interested to 3 = highly interested). All variables of the first component (content aspect) show a higher revisitation tendency if participants evaluate the questions more positively. The content aspect of H3 is supported. This is not true for the visual aspect.

5 Conclusions

Hypotheses of the present study are based on studies addressing success factors for websites. Results show that just some aspects applying to successful websites also hold true for SL. People who did not know SL before the study associate more positive attributes to the SL appearance than previous users because they are excited about their first experience - as might be expected. This so called novelty effect is also supported by the fact that non-users differentiate between SL and the website but users do not. Highly interesting is that the amount of pleasure and fun of all participants doing several tasks in SL does not decrease with the Internet usage-time. Above all even in the group of users, it does not decrease with SL usage-time. So the opportunity to experience and explore in SL seems to outshine the novelty effect.

The popularity of discovering things is confirmed by the experiential tasks respondents had to fulfil in SL during the study. Hence SL provides an important aspect of experiencing flow. Concerning interactivity which is also responsible for experiencing flow findings indicate that synchronous communication is very much appreciated. The evaluation in terms of textual content and visual representation points out that only the content aspect influences intention to revisit the hotel in SL.

According to the present investigation a combined application of SL and websites is recommended. But since this is an exploratory study based only on a convenience sample, further research is necessary for well-founded management recommendations.

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An Exploratory Field Study of Web 2.0 in Tourism

Roland Schegg[a],
Andreas Liebrich[b],
Miriam Scaglione[a] and
Sharifah Fatimah Syed Ahmad[c]

[a] Institut Economie & Tourisme
University of Applied Sciences Western Switzerland Valais ,
[roland.schegg; miriam.scaglione]@hevs.ch

[b] Lucerne School of Business
Institute of Tourism
andreas.liebrich@hsw.fhz.ch

[c] School of Business,
University of Western Australia, Australia
syedas01@student.uwa.edu.au

Abstract

The Web 2.0 concept comprises a second generation of Web-based services, such as social networking sites and wikis, and is becoming an important element in travel planning and buying. This paper adds to Web 2.0 tourism studies, investigating Web 2.0 applications and technologies present with almost 3,000 tourism businesses – destination management organisations, mountain railways, travel agencies and hotel organisations. The low presence of Web 2.0 technologies and applications on tourism enterprise websites suggests that most tourism enterprises are at an early stage in applying Web 2.0 concepts to their businesses. Using diffusion of innovations theory, the results show that enterprises having adopted websites early (early adopters and early majority) also lead in the adoption of Web 2.0 technologies.

Keywords: Web 2.0; diffusion of innovation; Bass-Rogers model, tourism

1 Introduction

In the last few years, Web 2.0 applications seem to have taken on the status of a phenomenon. A common description of Web 2.0 stems from a 2004 conference focused on this marked shift in the evolution of the World Wide Web (O'Reilly, 2005). Rather than having clearly-defined borders, Web 2.0 has a "gravitational core", with users rather than organisations taking charge of it. The concept comprises a second generation of Web-based services – for example social networking sites, communication tools, wikis, and folksonomies (see Table 1) – that emphasise user-generated content (O'Reilly 2005).

The constant growth of Web 2.0 interests advertisers, who spent $450 million in 2006 on user-generated content sites; this could increase to $4.3 billion in 2011 (Shields,

2007). In Europe, 60% of online users benefited from user- generated content such as "reading or writing blogs, listening to podcasts and setting up RSS feeds, reading and writing online customer reviews, or taking part in social networking sites" (Anonymous, 2007). Alexa.com ranks website traffic and in early September 2007, five of the top ten sites globally – YouTube, MySpace, Orkut, Wikipedia, and Facebook – are Web 2.0 exemplars.

Studies have shown that traditional Internet technologies help tourism SMEs develop their business and gain a competitive advantage (Buhalis & Main, 1998). A few studies of Web 2.0 focus on uses in medicine (Guistini, 2006) and education (Perkel, 2006). One tourism and hospitality study investigated Web 2.0 applications and concluded that few applications were on web-pages of traditional tourism service providers (Conrady, 2007). This paper adds to Web 2.0 tourism studies, investigating Web 2.0 applications and technologies present with almost 3,000 tourism businesses – hotels, destination management organisations and mountain railways.

Web 2.0 specifications and technologies are currently in their early stages of development. Internet use evolves, often beginning with an email address, progressing to simple websites and then adding website features to integrate the business with customers and suppliers (Murphy et al. 2006; Teo & Pian, 2004). The addition of Web 2.0 applications should follow the same process. Thus this paper also investigates if early adopters of Internet technologies lead again the adoption in Web 2.0 technologies.

2 Literature Review

2.1 Diffusion of innovation

Typically, the use of organisational technology evolves over a continuum, from having a technology to using it effectively throughout an organisation (Abrahamson & Rosenkopf, 1993; Rogers, 1995). As organisations evolve in their Internet use (Beatty, Hsim, & Jones, 2001; Chu, Leung, Hui & Cheung, 2007; Daniel, Wilson, & Myers, 2002), this evolution should apply also to Web 2.0 applications. Reflecting this evolution, one study introduced a model characterising Website levels based on features (Teo & Pian, 2004), while another showed a positive correlation between a hotel's adoption of Internet technologies and the age of the hotel's domain name (Murphy et al., 2006).

Originally used to explain individuals' first purchase of new consumer goods, Rogers (1995) and others have extended this model to organisations. The diffusion of innovation theory suggests five adopter categories: "pioneers" (2.5%), "early adopters" (13.5%), "early majority" (34%), "late majority" (34%) and "laggards" (16%) (Rogers, 1995). For individuals as well as for organisations, Bass and other models are excellent at predicting market size and adoption rates of new technologies (Mahajan, Muller, & Wind, 2000). Although the diffusion rate of adopter categories

varies widely, a coupled Bass and Rogers' diffusion model (Mahajan et al., 1990; Mahajan et al., 2000, pp. 4-7) – hereafter called the B-R model – helps predict the diffusion rate. For example, Scaglione et al. (2004) used the B-R model to predict the categories of the adoption of domain names by Swiss hotels.

The approach based on Bass' (1969) parameters classifies Rogers' adopter categories into *imitators* influenced only by internal communication channels such as word of mouth, and *innovators* influenced by mass communication channels. The following equation shows the Bass function (1969) that captures the growth of a new product. N(t) is the cumulative number of adopters at time t, and m is the total market potential for new products.

$$\frac{dN(t)}{dt} = p(m - N(t)) + q\frac{N(t)}{m}(m - N(t))$$

Parameters p and q, the coefficients of *innovation* and *imitation* respectively, fuel the adoption (Bass, 1969). External influences such as mass-media drives, innovation and internal influences such as word of mouth or interpersonal communication drive imitation. Rather than using fixed percentages, the authors revised Rogers' adopter types based on Bass' parameters and properties of the bell-shape function of non-cumulative adopter frequencies. Three characteristic points – peak and inflection (inversion of growth rates), points T1 and T2 in table 3 – of the distribution determine the adopter categorisations in the model (Mahajan et al., 1990; Mahajan et al., 2000).

2.2 Web 2.0 development

Travellers seek to use their holiday time efficiently. To reduce risks during the decision process, travellers plan and get information in multiple ways. An analysis of 1997 and 2005 large-scale European surveys suggested a dramatic and seemingly obvious change in information sources used by travellers (Ingvar, Tussyadiah, & Oterholm-Hoem, 2007). The Internet became the preferred information source for approximately one out of two travellers, complemented by other sources such as friends and relatives, brochures, guidebooks, and travel agents.

Online social networking sites, which leverage the trend towards online information combined with trusted recommendations from other travellers and friends, have an impact on travellers. These sites are virtual meeting places to exchange experiences and travel souvenirs, transforming the online interaction from a solitary into a social experience. Web 2.0, which puts customers at centre-stage, seems to become crucial in travel planning and buying. For example, reviews on these sites – especially tripadvisor.com – influenced almost three out of four young British professionals' travel plans (eyefortravel, 2007).

Web 2.0 refers to two main streams of actions (Alby, 2007):

- User-generated content and collaborative evaluation

- Technologies that improve user interfaces such as AJAX, RSS, APIs, mashups and tagging (see Table 1 for explanations).

Recommender websites such as TripAdvisor (tripadvisor.com) disseminate word of mouth recommendations and reviews by travellers widely. Furthermore, research suggests that consumers who consulted online recommendations selected products twice as often as subjects who did not read them (Senecal & Nantel 2004). In early September 2007, the TripAdvisor home page noted that almost 20 million travellers planned trips using their tool.

Web 2.0 introduces travel researching and planning approaches that offer a range of compelling value propositions for both the consumer and the supplier. *Mashups*, for example, combine data from multiple web services such as Google Maps (maps.google.com) and Flickr (flickr.com) into websites such as placespotting.com, iphonemaniacs.com and topin.travel. With Web 2.0 applications and services, travellers can review entire trips, rather than trip segments through individual supplier websites. Planning tools such as interactive maps and traveller discussion boards facilitate travel planning and provide additional communication channels and opportunities for direct customer feedback for travel/tourism providers. Web 2.0 applications also apply to websites of traditional tourist enterprises, such as hotels, travel agencies and destination management organisations.

3 Methodology

The complex infrastructure of Web 2.0 is an array of evolving technologies and application or services (Anderson, 2007). Table 1 gives an overview on the 13 Web 2.0 technologies addressed in this study. Each criterion was a binomial variable, present or not present. A second step summed the variables into a new variable - total Web 2.0 applications.

Table 1. Web 2.0 technologies and softbot search criteria

name	description	search expressions in softbot
AJAX	AJAX (Javascript and XML) comprises of "several technologies, each flourishing in its own right, coming together in powerful new ways""AJAX is also a key component of Web 2.0 applications such as Flickr... as well as other Google applications like Gmail, Orkut and Google Maps" (O'Reilly, 2005)	XMLHttpRequest(; ActiveXObject("Msxml2.XMLHTTP"); ActiveXObject("Microsoft.XMLHTTP");
XHTML	"The Extensible HyperText Markup Language, or XHTML, is a markup language that has the same depth of expression as HTML, but also conforms to XML syntax." http://en.wikipedia.org/wiki/XHTML	<html xmlns=; xhtml; xmlns="http://www.w3.org/1999/xhtml"
DOM	Document Object Model (DOM) is a platform- and language-independent standard object model for representing HTML or XML and related formats.	new dom
XHR	"XMLHttpRequest (XHR) is an API that can be used by JavaScript. XMLHttpRequest is an important part of the Ajax web development technique, and it is used by many websites to implement responsive and dynamic web applications." http://en.wikipedia.org/wiki/XMLHttpRequest	xhr
Atom	"The Atom Syndication Format is an XML language used for web feeds, while the Atom Publishing Protocol (APP for short) is a simple HTTP-based protocol for creating and updating Web resources." http://tools.ietf.org/html/rfc4287	xmlns="http://www.w3.org/2005/Atom"
folksonomy	Folksonomy is "a style of collaboration categorization of sites using freely chosen keywords often referred to as tags"(O'Reilly, 2005)	/tag/
del.icio.us	del.icio.us website assists in online bookmarking with users able to gather, share and find websites on topics of interest (http://del.icio.us/about/[September 10, 2007])	del.icio.us/html/;http://del.icio.us/post
wiki	"Collaborative efforts among large number of volunteers rapidly creates useful and free new products" (Hanson & Kalyanam, 2007, p. 383)	class="mediawiki; /wiki.php; /index.php?title=MediaWiki;
geo tagging	"GeoTagging, sometimes referred to as Geocoding, is the process of adding geographical identification metadata to various media such as websites, RSS feeds, or images. This data usually consists of latitude and longitude coordinates." http://en.wikipedia.org/wiki/GeoTagging	meta name="geo.position"
podcast	"A digital audio or video program available for download, either manually or by automatic subscription, and playable through a computer or digital player such as an iPod" (Hanson & Kalyanam, 2007, p. 600)	podcast.; /podcast;xmlns:itunes="
blog	"A web site containing frequent postings of material, often centered on a specific topic, and typically organized chronologically. Blogs may be the product of a single individual or a collaborative effort among many contributors." (Hanson & Kalyanam, 2007, p. 594)	blog.;/blog
videoblog	A blog that consists of videos	/vblog;vblog.;videoblog.; /videoblog
RSS	Really Simple Syndication (RSS) "allows a reader to subscribe to a blog or other content source as an actively monitored channel. Whenever content changes, the system automatically notifies and forwards descriptions of the changes" (Hanson & Kalyanam, 2007, p. 80)	<rss

Since this analysis could be a Herculean manual task, a softbot tackled the job, using exploring and parsing techniques (Steiner, 1999). A softbot (or web crawler) is a software application that runs automated tasks over the internet. Now over half a century old, softbots or software robots are common in information technology (Bradshaw, 1997). A proprietary softbot (Evéquoz et al., 2007) processed all static and semi-dynamic HTML-pages, starting at the top URL and then following all links in that website, but ignoring links in graphics or behind dynamic scripting techniques. Then the softbot generated a report containing the counts for each criterion.

A wide sample helped explore the use of Web 2.0 by tourism enterprises. The study sample (see Table 2) was almost 3,000 websites from Swiss and international tourism enterprises across five sectors. The samples for the Swiss tourism sectors represent over 90% of the population and stem mainly from member lists of trade associations (see table 2). The international hotel chain sample stemmed from a ranking of major hotel chains published by hotelsmag.com in 2006. Although not exhaustive, the tour

operator sample should give insights on technology adoption by major industry players in Europe.

Table 2. Study sample

Sector	Abbreviation	n (URL)	n (website age)	Source
Swiss cable car companies	cable CH	192	192	Seilbahnen Schweiz (www.seilbahnen.org)
Swiss destination management organisations	DMO CH	134	129	myswitzerland.ch
Swiss hotels	hotel CH	1771	1766	Scaglione et al. 2005
Swiss travel agencies	TA CH	253	229	Schweizerischer Reisebüro-verband (www.srv.ch)
International hotel chains	hotel chain	274	265	hotels corporate ranking from www.hotelsmag.com (July 2006)
European tour operators	TO Europe	112	108	European Tour Operator Association (www.etoa.org), www.european-travel-market.com
	total	2736	2689	

To classify the organisations into adopter categories, the study relied upon the Internet Archive (www.archive.org), a non-profit organisation that began archiving websites in 1996 (Archive.Org, 2006). While domain name registration dates suggest when an organisation started to go online, ages available through the Wayback Machine in the Internet Archive also suggest when a website first went online (Hashim et al., 2007). Estimating diffusion of innovation with the Bass-Rogers model yielded the limit dates and subsequent classification of Rogers' categories (Scaglione et al., 2004).

4 Results

4.1 Investigating website adoption behaviour with the Bass model

Table 4 shows the dynamic of website adoption for each sector. The sectors with peak adoption before 2000 were Swiss DMOs, hotel chains and Swiss cable car enterprises. Swiss DMOs and hotel chains as well as travel agencies had low q/p ratios, indicating that external factors drove adoption. Swiss hotels and cable car companies as well as European tour operators had low innovation coefficients and high q/p ratios, suggesting that in their case adoption was driven by imitation. Cable car companies and tour operators were extremes cases, as the innovation coefficient was almost nil. These sectors adopted websites owing solely to imitation - but they did so quickly, until peak adoption time. Mobile phones have also shown this diffusion pattern with a nil innovation coefficient (Mahajan et al., 2000, p. 302).

Compared to other sectors, basic tourism suppliers such as accommodation enterprises do not lead in ICT developments. Furthermore, technology adoption in the

hospitality sector often shows bandwagon effects, whereby organisations adopt an innovation owing to social pressure rather than to address strategic objectives (Murphy, Olaru & Schegg, 2003). Other sectors of the tourism industry, such as destination management organisations and travel agencies, act as intermediaries in the travel industry and focus strongly on information, marketing and sales processes. To satisfy their stakeholders – customers and suppliers – processes need ongoing optimisation, for example by ICT-supported process innovations. External influences may therefore push these relatively small players to re-engineer their business processes by adopting Internet technologies more than in the case of enterprises in other tourism sectors.

Table 3. Bass model coefficients for the different tourism sectors and dates of the peak and the two inflection points (T1 and T2).

	T1	*peak*	*T2*	*p*	*q*	*q/p*
	inflection point	*maximum*	*inflection point*	*innovation*	*imitation*	
cable CH	aug. 1998	aug. 1999	oct.02	0.0000	0.0875	nill (∞)
DMO CH	jan. 1997	febr. 1998	nov.01	0.0052	0.0416	8.0
hotel CH	jan. 1997	feb. 2002	nov.01	0.0038	0.1381	36.8
TA CH	dec. 1996	oct. 2000	dec. 2003	0.0063	0.0676	10.7
hotel chain	dec. 1998	june 1998	nov.02	0.0043	0.0455	10.7
TO Europe	dec. 1996	oct. 2000	dec. 2003	0.0001	0.0693	746.1

4.2 Investigating web 2.0 adoption behaviour

The presence of the Web 2.0 technologies studied and of applications in the websites analysed was low. The top feature, XHTML, was present on 417 websites, or 15% of the study population. Although XHTML is a core Web 2.0 application, it would take a leap of faith to assume that every site using this standard did embrace Web 2.0.

All other technologies generally showed frequencies of less than 40 (<1%) and no website had wikis, geo-tagging or videoblogs. Web 2.0 applications for travel planning seem restricted to innovative newcomers such as TripAdvisor or GoogleMap, whereas traditional tourism enterprises are slow to test the new opportunities.

Table 4. Presence (in %) of Web 2.0 features by industry sector (% values refer to sector-specific occurrences)

Sector	cable CH	DMO CH	hotel CH	TA CH	hotel chain	TO Europe	ALL
geo tagging	0	0	0	0	0	0	0
wiki	0	0	0	0	0	0	0
videoblog	0	0	0	0	0	0	0
Atom	0.5	0	0	0	0	0	0.0
del.icio.us	0	0	0	0	0.4	0	0.0
DOM	0.5	0	0	0	0.36	0	0.1
folksonomy	0	0	0.1	0	0.4	0	0.1
AJAX	0	2.2	0.1	0	0.7	1.8	0.3
podcast	0.5	1.5	0.1	0	0.4	3.6	0.3
RSS	3.1	1.5	0.1	0.4	2.2	0.9	0.6
blog	2.1	4.5	0.2	0.8	1.5	5.4	0.9
XHR	3.1	3.0	0.4	1.6	4.7	1.8	1.3
XHTML	17.7	16.4	9.4	25.7	33.6	33.9	15.2
Total Web 2.0 features	***27.6***	***29.1***	***10.2***	***28.5***	***44.2***	***47.3***	***19.0***
Total Web 2.0 features without XHTML	***9.9***	***12.7***	***0.8***	***2.8***	***10.6***	***13.4***	***3.7***

The results in Table 4 show differences in the presence of Web 2.0 technologies by industry sector. International tourism enterprises and intermediaries such as Swiss travel agencies had more Web 2.0 technologies than did Swiss cable car companies, Swiss hotels and travel agencies. RSS feeds were mainly on mountain railway websites, perhaps for up-to-date weather and snow information. Blogs and podcasts seem to be more frequent on websites of destination organisations and tour operators, probably reflecting the stronger CRM focus of these intermediaries which try to engage customers in after-sales interactions.

The analysis of the data by Bass-Rogers categories (BRC), established on website adoption in section 4.1, indicated higher use of Web 2.0 technologies in the advanced adopter categories of early adopters and early majority than in the less advanced categories.

Table 5. Presence (in %) of Web 2.0 features by Bass-Rogers Adopter Category (% values refer to BRC)

Adopter category	Innovator	Early Adopter	Early Majority	Late Majority	Laggards	ALL
wiki	0	0	0	0	0	0
geo tagging	0	0	0	0	0	0
videoblog	0	0	0	0	0	0
Atom	0	0	0	0.1	0	0.0
del.icio.us	0	0	0.2	0	0	0.0
DOM	0	0	0.2	0.1	0	0.1
folksonomy	0	0.1	0.2	0	0.2	0.1
AJAX	0	0.1	0.8	0.1	0.2	0.3
podcast	0	0.4	0.5	0.2	0.2	0.3
RSS	0	0.7	1.0	0.5	0.4	0.6
blog	5.9	1.1	2.0	0.5	0	0.9
XHR	11.8	1.6	1.8	0.7	1.1	1.3
XHTML	29.4	17.0	21.5	11.9	10.7	15.0
Total Web 2.0 features	***(47.1*)***	***21.2***	***28.1***	***14.2***	***12.7***	***18.7***
Total Web 2.0 features without XHTML	***(17.7*)***	***4.1***	***6.6***	***2.3***	***2.0***	***3.7***

* values based on only 17 innovators

A test of association suggested a significant link between adopter categories and the presence of Web 2.0 features ($\chi 2(4)=64.57$, $p<0.00001$). A similar test result showed significant over-representation of Web 2.0 features on websites of hotel chains and tour operators and an under-representation by Swiss hotels ($\chi 2(5)= 183.28$, $p<0.00001$).

5 Discussion and conclusions

As the spread and performance of ICT technologies increases, access to tourist and booking information must become simpler, faster and cheaper. Tourism enterprises, especially SMEs, which cannot cope with this evolution, may face difficulties. Knowledge on the needs and wants of today's Internet-savvy traveller seems a key element for long-term success in tourism.

Today's travellers are keen to take control, finding and creating a great trip, rather than the cheapest trip. Web 2.0 researching and planning approaches empower travellers in unique ways and open interesting opportunities for tourism enterprises. Web 2.0 goes beyond technology and requires designing, testing and transcribing new marketing paradigms into business processes. Web 2.0 shifts from the Web 1.0 booking-oriented web development wave towards interactivity and integrating user-

generated content. Empowering the online traveller in the planning and buying process, as well as including services that are really perceived by customers as value-added offerings, represent important service innovations.

Assimilating new technologies is important because these can add customer value. The results of this study indicate that across all tourism sectors Web 2.0 uptake is slow. Only a few enterprises seem to leverage the value proposition of this trend, perhaps intermediaries under strong competitive pressure from suppliers and travellers. Nevertheless, the results in tables 4 and 5 illustrate areas for keeping up with or ahead of the competition. The study extends previous diffusion research to Internet adoption by using a coupled Bass and Rogers' diffusion model. The results show characteristic adoption behaviour across different sectors in the tourism industry. In addition, early adopters of websites tended to lead the uptake of Web 2.0 technologies.

The paper has several limitations. For example, the softbot simply searched pages for the presence of common Web 2.0 technologies and applications. As Web 2.0 applications often connect with Web 2.0 technologies or Web 2.0 specifications, the match is seemingly high. The technologies could, however, apply to applications unrelated to Web 2.0. In addition, there was no manual check of how websites used the technologies analysed. In addition, some Web 2.0 applications may not make sense for small tourism suppliers as their objectives may differ from those of large tourism portals.

Further research should investigate how much customer value the implementing of Web 2.0 applications can yield, as Internet technologies are a double-edged sword. Successful implementation of Web 1.0 technologies benefits travel companies, for example through increased customers and sales, higher customer satisfaction and lower expenses. Conversely, however, poor implementation of technologies can challenge an industry which is built on customer service (Murphy et al. 2003).

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A Web 2.0 Tourism Information System for Accessible Tourism

Wolfgang Drews[a]

[a] University of Trier
Chair for Organisation und Strategic Management
drews@strama.info

Abstract

This paper discusses the principle of *tourism for all* and highlights the fact that the market of disabled and elderly travellers is far from being a niche market. It demonstrates how destinations and suppliers of tourism-related products and services can gain competitive advantages and capture profitable market segments of the growing but neglected market requiring accessibility. The newly introduced, open Web 2.0 platform, nobatravel.at on the one hand aims at facilitating the search and findings of up-to-date and trustable, accessible information for the disabled and elderly traveller as well as enabling these people to share their experiences in an easy and appealing way. On the other hand it supports suppliers in offering their tourism-related products and services directly to the target audience and in gaining new knowledge about them. The technology of the platform bases on a Web 2.0-Framework, that was designed and co-developed by the author and is used to create social network communities with web accessibility in mind.

Keywords: accessible tourism, tourism for all, web 2.0, community, market intelligence, travel planning, online platform, impairment/disability, tourism information system

1 Introduction

There are an estimated 37 to 45 million disabled people living in the European Union (Buhalis et al, 2005). Based on the assumption that in every country there are about 10 to 20 percent disabled people one can assume that there are 600 to 900 million of them worldwide (Horn, 2002; Elwan 1999). The term disability itself is complex and is used and interpreted in different ways depending on the way disability is seen, as well as on laws and objectives of the country in question. The definitions range from purely medical understanding, which sees disability as a biological deficiency, to the notion of disability as a social construct, which does not see it as a person's individual characteristic, but as an impairment caused by social circumstances. As a rule, this universe of definitions is used in legal texts in order to regulate financial or social matters as well as matters concerning industrial law. At the same time, legal definitions constitute the basis for the laws against discrimination, official data capture and an environment without restrictions.

The European Commission has designated 2007 as "European Year of Equal Opportunities for All". Diversity is celebrated and equality of opportunities and non-discrimination for all people living in the European Union are promoted. According to

results of the Special Eurobarometer Discrimination in the European Union every other European thinks that discrimination related to disability is widespread (European Commission, 2007). A total of 79 percent take disability as a disadvantage. Furthermore there is a consensus among 91 percent of the citizens of all member states of the European Union that more money should be spent in order to facilitate accessibility for disabled people.

In the European Union there are about 127 million people suffering from limitations on their mobility (Buhalis et al, 2005). These are mainly people with neuromuscular and skeletal impairment, the visually impaired and the blind, the hearing impaired and the deaf, the mentally disabled as well as elderly people, whose number will be rising due to a decline in mortality in Europe and other industrial nations. Moreover families with little children or members with chronic or post-operative limitations belong to this group. About two thirds of all these people are possible customers for the tourism industry. There is also the fact that often there are people accompanying the latter so that one can assume a total volume of about 200 million people. Research in Germany has shown that 54.3 percent of disabled people travel. That is 21 percent less than people without a disability (Bundesministerium für Wirtschaft und Technologie, 2004). 37 percent have already abstained from travelling because of a lack in accessibility and 48 percent would travel more often, if there were more offers with accessibility for disabled people. This is certainly not only due to a shortage in supply, but also due to a lack of information about the existing offers and thus to a lack of transparency on the market.

Up to now people with impaired mobility have been considered a niche market by the tourism industry and if they are addressed at all, it is only by means of special offers or specialized tour operators. In view of increasing competition between destinations, and the above mentioned facts, the destinations are required to grasp the opportunity and appreciate this target group by supplying them with appropriate offers and communicating these offers to them.

2 Theoretical Issues

In order to deduce tourist demands for the target group of the impaired, it first requires a reference framework with which different kinds of impairments can be recorded and classified. This paper refers to the official classification of the World Health Organisation (WHO). The *International Classification of Functioning, Disability and Health* (ICF) makes a bio-psycho-social model of the components of health available and supplies an organisational framework for the structuring of information about situations with regard to human functioning and disability (World Health Organisation, 2005). This information is always described in connection with environmental and personal factors. These so-called context factors can both positively and negatively affect the components of functioning and disability and thus are in an interactive relationship (see Fig. 1).

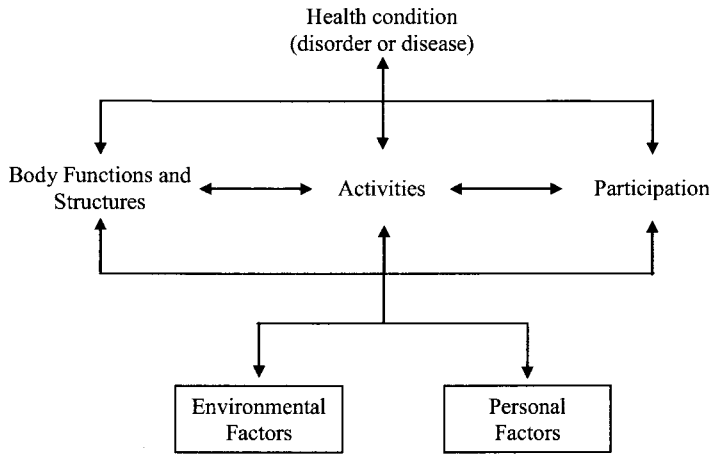

Fig. 1. International Classification of Functioning, Disability and Health

Consequently the ICF represents an open, dynamic and interactive model of disability and offers a multi-perspective access to the term disability. The component of activity is central to these relations and expresses that any occurrence of the other components can have an effect on the possibilities of being active, which is - in this case - an important fact for tourism.

For the tourism industry, the following classes, which have the same or similar needs with regard to the tourism infrastructure and the same or similar restrictions in their activities, can be deduced from:

- Limitations on the musculoskeletal system
- Visual limitations
- Limitations on hearing and speech impediments
- Mental limitations, i.e. people with a mental or learning disability

In the tourism sector, the concept *Design for All* has been further developed into the concept of *Tourism For All*. It is the aim of this campaign to enable each person - in spite of their impairment - to travel to a destination and to assure the accessibility and usability of a destination for *all* travellers without disadvantage. This means guaranteed accessibility and usability of a destination and its infrastructure by means of *one* access for *all* travellers instead of an alternative access. If one takes into account that the establishment of accessibility and usability is in the interest of all people - for approximately 10 percent of the total population an accessible environment is compellingly necessary, for approximately 30 to 40 percent it is necessary and for 100 percent it is comfortable (Bundesministerium für Wirtschaft und Technologie, 2004) - this demand becomes even more understandable.

The tourism industry has to meet the challenge of a continuous accessible design of the tourism service chain. The German study "Economic Impulses for an Accessible Tourism" includes the meaning of each individual component of the tourism service chain (Bundesministerium für Wirtschaft und Technologie, 2004): Accommodation was the most important element (82%), followed by transportation at the destination (76%), arrival and departure (74%) and trips (71%). The availability of information about the destination, which is part of the phase of information and decision, is of special importance for the impaired and thus for the selection of the destination they might travel to. This was classified by 71 percent of the interviewees as important. 40 percent explicitly stated that they were dissatisfied with the given situation. A 2006 study of the B&W Projekt Tourismusmarketing concludes that people with disabilities inform themselves on the Internet to a large extent (36.8%) (Bock & Wend, 2006). One can assume that these values will still be rising in the future if appropriate offers are supplied. This is due to the fact that the use of the Internet provides significant improvements to the quality of life of people with disabilities (Anderberg & Jönsson, 2005) and to the fact that the increased need for information concerning the entire tourism service chain could be covered with appropriate offers on the Internet.

3 Requirements for a Web 2.0 Tourism Information System for People with an Impairment

People with impairments will increasingly be exchanging their experiences on specialized travel platforms for accessible tourism in the future, similar to numerous travel platforms for people who are not disabled, such as for example Tripadvisor (http://www.tripadvisor.com). In this context, Web 2.0 enables dramatic service improvements. Owing to broadband and new Internet technologies, users can be active without any or only little IT-knowledge. They can publish their experiences online, discuss them with others or enrich their contents with videos and pictures. They can live their own creativity, present themselves to others, invite friends and get to know new friends.

In order to generate added value for the target group and the destination, a Web 2.0 Tourism Information System must provide current (and thus correct) as well as standardised information on as many parts of the tourism service chain as possible. A substantial goal of the platform is to support the provision of information in the phase of information and decision as well as to support the reflection and exchange of experiences in the phase of post-processing. Thus the provision of information is facilitated, transparency on the market increased, and lack in confidence diminished. Therefore the user is enabled to participate interactively on the platform by sharing own travel experiences in the form of travelogues, by contributing to forums, by evaluating and rating accommodations and by making recommendations. Furthermore it is important to obtain special knowledge about the accommodations and their environment in a standardised way in order to facilitate an objective evaluation. Taking the growing importance of the market for disabled people into account, the

collection of data should be made by the suppliers of accommodations. In case of false data, this would be uncovered by the community and punished with negative ratings.

Apart from the *availability* of information, the *accessibility* of existing information on the Internet represents another problem for disabled people. For a certain part of the potential users the so-called web accessibility is a crucial aspect. Web accessibility means that people with disabilities can perceive, understand, navigate, interact with and contribute to the Web (Web Access Initiative, 2005). These disabled people are in particular:

- The blind, the visually impaired and colour-blind people
- The deaf and the hearing impaired
- People with neuromuscular and skeletal impairments
- People suffering from epilepsy

From this list, different requirements for online platforms can be derived - depending on the impairment. Blind people make use of a so-called screen reader, which reads out loud the contents of a web page or solutions which convert these contents into Braille. It is substantial that the elements and contents of a website remain structured without layout, meaning that a consistent separation from contents and layout is made and HTML formatting is used sensibly. Elements such as tables, forms, pictures or other multimedia contents and interfaces must be provided with additional information. Pictures and videos primarily need alternative description texts, and tables need a summary of their content. With forms it is important to group the fields of a form into semantically connected sections. Additionally descriptions of the individual form fields and the fields themselves should be linked to each other. This also increases the comfort for people without impairment and thus produces synergies. In order to make a web page available for people having a colour deficit, the understanding of the web page must not depend on colours. Likewise, it is crucial for people with low vision that font size is adaptable to user needs. For the deaf and the hearing impaired it is important that sounds have alternative descriptions which help to understand their sense and content.

Another important group are people with neuromuscular or skeletal impairments, i.e. people who are not able to use a mouse. Alternatively, the latter use either the keyboard, special phonetic input systems or special pointing devices which can be controlled via mouth. Here the focus should be on so-called Access-Keys and logical tab orders so that the web page can also be operated without a mouse. For people suffering from epilepsy one has to take into consideration that fast animations or movements on the web page must be avoided since they could lead to epileptic seizures. These and further guidelines and recommendations are developed by the *Web Access Initiative* (WAI) in the *Web Content Accessibility Guidlines 1.0* (WCAG 1.0). The WCAG contains a user matrix with relevant aspects for different groups of users as well as scenarios on how people with impairments use the Web (Web Access

Initiative, 1999). Apart from this initiative the American Section 508 which describes minimum requirements to the information technology sets important impulses for the establishment of accessibility in this sector.

4 The No Barrier Travel Platform – The case of Austria

4.1 Accessibility-Features

The NoBaTravel-Platform is based on a Web 2.0 Framework and designed with accessibility standards in mind to create Web 2.0 Communities, Therefore it, to a very large degree, conforms to accessibility-standards by default. Related contents and controls on the website are grouped and can therefore easily be bypassed using a so-called "skip-navigation-control" (Bigham, et al, 2007). This control at the beginning of each website is only visible to screen reader and is being generated automatically depending on the content-groups of each website. Thus, on every page, recurrent elements like the navigation can be skipped easily and people can get to the desired contents directly. The whole platform uses *cascading style sheets* (CSS) and proper HTML instead of tables or frames to control layout and presentation. Thus the website is still structured, read- and usable for blind or visual impaired people who use alternative browsers such as screen readers, speech output browsers, braille browsers and text browsers. All font-sizes are provided in relative units, so that people with visual impairments can easily adjust the font-size according to their needs. Foreground and background-colour combinations provide sufficient contrast when viewed by people having colour deficits. Alternatively those people can apply an own style sheet, which meets their needs in a better way. For every dynamic element that depends on Javascript- or Flash-technology, a fallback is provided, so that the site is usable without restrictions even if these technologies are not supported by the user-device. Form controls are explicitly associated with labels that describe their meaning in order to ease their usage. For every non-text element as photos and graphics there are text equivalents provided and users of the platform are encouraged to also provide these information, when they upload own photos within the travelogues. In order to make the platform usable for people suffering from epilepsy the platform avoids elements and animations that cause the screen to flicker. HTML-elements are used according to their specification (i.e. H1, H2, ... for headlines, List elements as UL, LI, ... for navigation controls) in order to convey the document structure. In order to provide access to people with neuromuscular and skeletal impairments, which cannot use a pointing-device, the platform implements so-called Access-Keys. These enable direct access to important contents of the platform, regardless on which site of the platform the user actually is. In example people can press ALT+0 to get back to the welcome page, ALT+1 to get to the help page or ALT+7 do get to the search page. This assignment to the Access-Keys is well established over the last years. In addition there exists a logical tab order through the links, forms, controls or contents of the site to ensure that the platform is still usable with a keyboard only.

All pages of the platform are validated to formal grammars like XHTML and CSS. Additionally it was evaluated with respect to WCAG 1.0 and manually debugged with assistive technology. Unfortunately the WCAG 1.0 only provide checkpoints for accessibility in common and cannot judge the severity of barriers according to the kind of impairment (Brajnik & Lomuscio, 2007). Therefore the platform was tested by users with visual, neuromuscular and skeletal impairments. In conclusion the platform produced no violations of the checkpoints and therefore it *conforms* to Priority 3 of the WCAG 1.0 (Triple-A). The human judgement confirmed in addition that the platform is also *accessible*.

4.2 Welcome Page

The welcome page of the NoBaTravel-platform offers an overview of the most important features, as well as direct access to the search for accessible accommodations in Austria. The user may use the interactive map on the left or the dropdown on the right to choose state, type of accommodation and the type of disability that applies most to their needs in order to receive a list of all accommodations that correspond to the request (see Fig. 2). At the bottom of the welcome page one can find the latest travelogues, the best rated accommodations as well as a tag cloud which contains topics and keywords (so-called *tags*) used by travellers to characterise their travelogues. Frequently used tags appear in bigger size than those that are used rarely. Thus the tag cloud provides the user with a convenient way to quickly receive the most relevant topics on the platform and to directly navigate to the issue of interest with one click. In addition, the platform offers subscriptions to RSS-Feeds (*Real Simply Syndication*) for travelogues in order to keep people informed about the latest travelogues even if they do not visit the platform.

Fig. 2. Welcome Page NoBaTravel.at (1).

By (free) registration, every user gets access to their profile, which offers access to basic data and own contents (i.e. travelogues). Furthermore the user can post own threads in the forums and create their own travelogues to share their travel experiences. If a user specifies himself as a supplier, he is automatically authorized to

enter (accessible) information about his accommodation into the system via a simple online-backend on the platform.

4.3 Accommodations

Information on accommodations is crucial with regard to the decision for or against a tourist destination. On this account its important for the online platform to acquire and provide this information in a standardised and transparent manner. Beside address, description and room amenities the platform focuses on accessibility and usability, which is covered by more than 120 criteria in 13 categories.

Based on the given data, the system calculates a rating by means of a weighted rating-scheme in order to provide an objective assessment of accessibility of the accommodation. The weighting can easily be adjusted anytime by the maintainer of the platform, depending on the kind of impairment. Further evaluation takes place directly via the users themselves on basis of their subjective experiences in an accommodation. Hence criteria which are not objectively detectable can be included into the total evaluation and incomplete information or distortions that may appear due to the criteria selection or weighting can be corrected.

Fig. 3. Accessibility of accommodations - Overview.

While the accommodation overview provides only the most substantial rating information as well as a photo and a short description (see Fig. 3), the detailed view for each accommodation shows address data as well as an overview of all relevant room amenities and accessibility characteristics. Each accommodation has an own forum to enable discussions about it. Likewise, photos and travelogues in short form are indicated. They refer to the selected place or its periphery.

4.4 Travelogues

The Travelogue module enables the user to write their travel experiences in a simple and spontaneous way online and supplement them with photos, all of which is made available to other users (see Fig. 4).

Fig. 4. Travelogues

As a rule, user reports are more trustworthy than official information from suppliers. This makes it easier to select an accommodation or destination. Moreover users can find interesting advice in these reports (i.e. accessibility of sights at the destination). The creation of a travelogue consists of two steps. In the first step fundamental data of the journey is queried and stored in a structured way. Each travelogue needs a meaningful title, at least one destination as well as the optional travel date and/or the travel period. In order to simplify the input of an Austrian destination, the system will automatically show a selection of suitable places when the user types in a character. This is made possible by the complete collection of all Austrian places in the database of the platform.

When entering a destination, the system automatically recognises whether accessible accommodations for the periphery of the destination have already been stored in the database of the platform. The accommodations from which one can choose are indicated. If there are no accessible accommodations available, the desired accommodation can be entered by the user directly. Beyond that the user can specify whether the travelogue is to be published with access for everyone or only for themselves. This selection can be changed later at any time. Likewise, the users can select the way in which they appear as authors of the travelogues – with their real name, their nickname or their email address. In an intermediate step, the user inputs are verified and the chosen destinations are indicated on an interactive map of Austria based on Google Maps. In the second step the users can write (as he can do with Microsoft Word) their reports online and enrich the travelogue with photos of the journey. Beyond that they are encouraged to select suitable tags (keywords) which characterise the travelogue best in order to appear in the tag cloud mentioned above.

5 Conclusion and future work

This contribution points out that people with restrictions in mobility constitute a considerable demand for the tourism industry, which is still underdeveloped. The

demand for accessible offers in the tourism sector will rise in the future, not least due to demographic trends. Thus it is an important challenge for the tourism industry.

The introduction of the platform nobatravel.at enables people with an impairment to gather relevant, trustworthy and current information on the accessible offers of the destination Austria. Moreover it allows them to share their experiences, exchange ideas, ask questions and solve their problems directly within the community. Thus the platform supports the phase of information and decision with regard to their trip and contributes substantially to its improvement. Beyond that the platform supports the phase of the post-processing, in which intuitive and simply arranged tools are offered in order to publish own travel experiences in the form of travelogues. Thus nobatravel.at is the first Austrian platform that not only contains accessible accommodations in a standardised and rated way, but also involves the target audience itself and thus offers a higher service quality on the basis of more objective information. For destinations and suppliers of tourism-related products and services the platform offers the possibility of positioning themselves in this highly interesting market segment and of gathering knowledge about the target audience.

Further work will deal with the extension of the platform. For example, it would be conceivable to store the accessibility of sights in a structured way and improve the social network among the users of the platform. Additionally efforts will be made to develop and/or adapt methods in order to analyse the social network of the users more thoroughly and thus gain new knowledge about the target audience of people with an impairment.

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Some Critical Remarks on Dynamic Packaging from the Perspective of SMEs and Small Tourism Destinations

Mark Markus[a] and
Markus Lassnig[a]

[a] Salzburg Research Forschungsgesellschaft, Austria
{mark.markus, markus.lassnig}@salzburgresearch.at

Abstract

This paper builds on findings from the ERDF-funded study on Dynamic Packaging 2006 and from e-Business W@tch 2006, a study commissioned on behalf of the European Commission – and complements these results with more recent data and analysis. Its basic intention is to critically analyse the notion of Dynamic Packaging (DP) from the perspective of SMEs and small tourism destinations. From their perspective, most DP promises do not withstand a critical investigation. DP benefits do exist, but in order to exploit these potentials, enormous organisational and technological challenges must be taken.

Keywords: Dynamic Packaging Implementation, Potentials and Challenges.

1 Introduction

Dynamic packaging (DP) depicts probably the most sophisticated and challenging e-business format in the tourism industry in terms of technological requirements (connectivity / interoperability of heterogeneous data) and organisational demands (management of enormous numbers of external suppliers). It has been heavily discussed in the tourism sector as a new "Wundermittel" ("miracle cure", Fettner, 2006) or "the killer application for the leisure travel industry" (Rose, 2004), offering both the supply and demand side of the tourism value chain substantial advantages. According to the European Travel Commission "the winners of the future will be those destinations and suppliers that develop user-friendly websites allowing for direct bookings and dynamic packaging." (as cited in Poon, 2005, p. 50)

A comprehensive literature review reveals DP as a technology-based instrument for tackling the problem of over-capacities (Fischer, 2005); as an instrument enabling customisation of travel components, at the same time enabling service providers to avoid direct price competition by using hidden discounts (CSI Media, 2006; Travel Mole, 2005); and as a tool that disburdens the individualisation of cost-competitive travel packages, spearing multiple registrations and payments.

There is, however, a great imbalance between DP promises and serious investigations assessing these claims critically. In fact, apart from Markus (2007) and the e-Business W@tch report for "ICT and e-Business in the Tourism Industry" (2006), a comprehensive web survey revealed only two books that provide an extensive

coverage of the topic: Rose (2004) primarily concentrates on technological aspects and Stengel (2004) on DP implications for the tourism value chain. The majority of information sources accounts for announcements, short journal and paper articles or short case studies, presentations and company-based information material which often lack a systematic approach and an all-embracing analysis. Hence, there is as yet no empirical evidence providing sufficient support for any of these claims. The lack of analysis is especially evident from the perspective of small tourism regions and SMEs. Even if DP solutions have been implemented almost exclusively by industry giants so far, questions on DP potentials, challenges and implementation steps from the perspective of small destinations have been increasingly imposed. (Baltes, 2002, p. 26) These questions build the recurrent theme throughout this article. The tourism destination model used for analytical purposes is the province of Salzburg.

After reading this paper, relevant industry players should be able to assess (i) the potentials and challenges, (ii) organisational and technological requirements, and (iii) implementation phases of this sophisticated e-business format. Following a short definition, a snapshot on DP state-of-the-art focusing on technologies, providers and markets will be provided. A special emphasis will be placed on the potential and implementation analysis. In the concluding remarks the question will be answered, whether and under what conditions Dynamic Packaging is "hot or not".

1.1 What is Dynamic Packaging?

Dynamic packaging (DP) is the travel industry jargon for a user centred, cheaper and more flexible way of assembling and booking a personalised holiday, using the web and associated applications of technology. The phrase is rarely seen in the public literature on a travel web site. Instead marketers have adopted more straightforward descriptions of the technology: "Book Together and Save", "Build Your Own", or "Flight + Hotel", etc. From the end customer / consumer view, DP is an online real-time service which mimics the experience of visiting a travel agent and negotiating a deal customised to consumer wishes. From the travel service provider view, DP automatically combines offerings from more than one data source on demand and according to customer preferences.

Not every form of online packaging deserves the ambitious predicate "dynamic": "Many in the travel industry think that just because there is only one payment transaction for all vacation components that it is a dynamically packaged reservation. This is not the case." (Trisept Solutions, 2006) In contrast to ordinary packaging solutions (bundled in advance, partially pre-packaged, but not dynamically interrelated travel arrangements), the notion of dynamic packaging essentially builds on so called "separate inventory management systems" (Trisept Solutions, 2006), i.e. the technological (and organisational) ability of a Dynamic Packaging system to bundle multiple travel components in real-time on basis of *distributed travel resources*. Among many similar DP definitions (Fitzgerald, 2004; Rogl, 2003), the one from Kabbaj (2003) is rather concise and highlights this important element: "DP

means dynamically (i.e., in real-time) putting together – and pricing – a package of several major travel components, e.g., air flight legs, hotel nights, car rental days, etc., from heterogeneous suppliers and heterogeneous information sources or back-end reservation services, even as those provide frequently changing availability or prices".

1.2 Methodological Steps

The results presented in this paper were collected via multiple methodological steps conducted in the framework of two research projects: e-Business W@tch and TEC-Dynapro (e-Business W@tch / European Commission 2006 and Markus 2007). Each of these steps illuminates the notion of DP from different angles which lead to a multifaceted synthesis of the issue. The steps are summarised in the following figure.

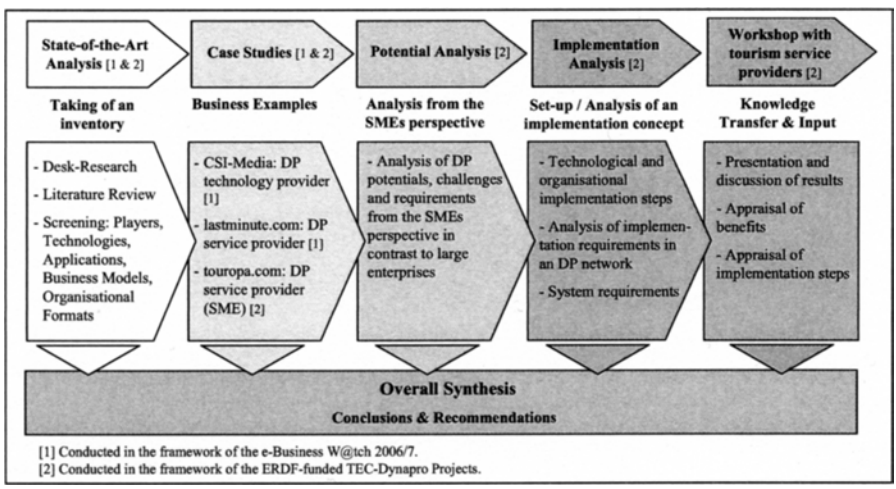

Fig. 1. Methodological elements

2 Some Basic Facts on Dynamic Packaging

2.1 Numerous XML Technology Providers, no Semantic Web Yet

The growing number of DP technology providers and users suggests that the adoption of DP is increasing. Meanwhile, there are several companies in Europe offering ready-to-use DP technologies/suites, such as: CSI-Media (UK), GoCuo (UK), Innovasoft AG (DE), Multicom (UK), OpenJawTechnologies (IR). The dominance of companies from the United Kingdom does not surprise given the fact that almost 80% of all DP sales in Europe are effected in Great Britain (see section 2.3 on the DP market for more details) (e-Business W@tch / European Commission, 2006, p. 112).

The examination of DP technologies reveals XML as the leading technology for the aggregation and integration of heterogeneous data. DP has been identified as a likely

area of an early industry-wide strategic impact for semantic web technologies and some R&D activities can be identified in this field, (Cardoso, 2006). However, no such solutions can be found on the market as yet. According to Kabbaj, DP solutions based on semantic web technologies can be expected to be deployed approximately by 2010 (Kabbaj, 2003).

2.2 Services and Providers: Tourism Industry Giants Prevail

The number of online travel portals offering DP services is continuously growing, which additionally underlines the importance of DP. Some prominent DP service providers are: ebookers.de (DE) eDreams (IT), Expedia (UK), Flexible Trips (UK), Lastminute (UK), and Thomas Cook (UK) (e-Business W@tch / European Commission, 2006, p. 113).

DP travel services focus on the composition of basic travel components (hotel + flight + transfer), whereas a more detailed (or in-depth) pre-trip holiday customisation, consisting of, for example, a particular hotel room (with a specific view), a window seat in an airplane or certain sports activities, still requires the professional and manual "hand" of traditional tour operators or travel agencies. Therefore, the primary focus of DP services is not so much the comprehensive personalisation of services but price-efficiency in combination with flexibility and convenience for customers, emphasising savings of self-packaged arrangements: "Tailor-made and save!" (Expedia.co.uk). Although "the value of the tour operator's 'hand holding' for customers is falling fast" (McDonald, 2005), access to computer reservation (CRS) and global distribution systems (GDS) still provides operators and traditional agencies with more specific and destination-related information. However, given the rapid development of web-based automated travel services, it can be assumed, that in the medium and long term this information and personalisation advantage will gradually diminished, as more detailed and cost effective services are provided by means of ICT, especially via internet.

Furthermore, analysis reveals that DP was predominantly implemented by large tour operators and online travel agencies that operate an enormous network (1,000+) of service providers (accommodation, flight, transport, transfer, and events). These providers are able to seamlessly aggregate and process large quantities of heterogeneous data, as well as to offer real-time transaction capabilities and legal guarantees. Obviously, technology does not pose an insuperable obstacle for the adoption of DP, at least not for large companies that dominate current DP markets. For many small providers of tourist services that do not share interoperable computing systems, the adoption of DP might pose a significant technological (and organisational) challenge, as Travel Tech Consulting (2006) puts it: "The travel industry has always been plagued by disparate, closed systems and networks that do not communicate and share information. This lack of connectivity leads to 'one-off' integration solutions that simply upload and download information between systems in a batch mode".

2.3 Market: Evolution, Not Revolution

Currently, there are no statistics on DP market volumes that provide information on the share of DP within the overall (online) travel market. If different data sets are combined, an indication of the DP market can be calculated.

According to Marcussen 2007, the overall travel market in Europe reached the amount of 247 billion Euro by 2006. Thereof, the share of 15.5 % or 38.3 billion Euro account for the online travel market. According to Euromonitor 2006 (Wong, 2006), in Western Europe the DP market reached *2.4 billion Euro* in 2006, which is, if a relation to Marcussen is established, *6.3 % of the online* and *1.0 % of the overall travel market.* If the Euromonitor data on DP markets in Western Europe from 2005 (1.9 billion Euro, Travel Mole, 2006) and 2006 are compared, some DP market growth rates can be identified. Again, it must be noticed that the share of DP in the overall and online travel market remains almost unchanged: In 2005, 6.5 % of the overall and 0.8 % of the online travel market accounted for DP. This market data can be taken as an indication that DP will not revolutionise the travel market, e.g. by substituting pre-packaged deals and traditional travel agencies – although frequently claimed by many authors (Kabbaj, 2003, p. 11). Rather, these data clearly expose DP as an evolutionary element of travel markets that will complement and change but not entirely replace their existing channels and forms. Again, it can be assumed that DP will increase the competition on the market and make the situation for traditional packagers and travel agencies even more difficult than it already is.

DP markets in Europe feature strong tendencies of concentration. According to Euromonitor 2005 (Travel Mole, 2006), approximately *90 %* of DP sales are concentrated in only three European countries: United Kingdom 76 %, Germany 11 %, France 3 % and other countries 10 %. Therefore, the UK seems especially predestined for DP, because most international UK travellers needs a travel package consisting of flight and accommodation (plus eventually car or transfer) services, which are two basic building blocks of a dynamically assembled package. At the same time, United Kingdom, Germany and France are the largest online travel markets in Europe. (Marcussen, 2007)

3 Implementation and Analysis of Potential

In this section, some critical issues will be discussed that destination management organisations and tourism regions should think about when considering the implementation of a DP solution. These issues relate to obstacles in the technical implementation, measures, potential benefits and challenges.

3.1 Putting DP Technology in Place

The set-up of a DP solution is probably one of the most demanding technological undertakings in the tourism and leisure industries. In order to manage an enormous

number of external suppliers, a DP system must be able to solve connectivity and interoperability problems of a large quantity of heterogeneous data descending from various service providers. In small tourism destinations this technological preconditions are hard or even impossible to achieve. In spite of rapid technological progress, Kabbaj's rather sceptical opinion on the implementation of DP technology thus remains accurate (even if written back in 2003), especially from the perspective of SMEs and small tourism regions:" One of the (many) interesting questions is what it would take – given the current state of the technology in place – for a vacation provider to build its own DP system? The answer is that – with even a lot of money and resource – it is almost impossible. And this even if it has a call center available 24/24, 7/7, a web-based facility updated in real time, complex algorithms and an in-house discount rules and inference system. It will have to offer this dynamic packaging across multiple: brands / business units, market / countries / currencies, distribution channels, inventory contracts / external sources / databases, thousands of suppliers... while being efficient enough to do so profitably!" (Kabbaj, 2003, p. 10)

However, the implementation of a DP solution is a problem that can be solved (see for a gradual technological implementation model developed by Guntram Geser in Markus, 2007, p. 117) as there are many experienced DP technology providers, some of them (e.g. CSI media) taking even care about interoperability issues (DP "feeds") between DP provider and single sub-constructors. But there are also examples of self-developed solutions: touropa.com, for instance, is a small German online tour operator that successfully went online in 2005 with a self-developed DP system after approximately 18 months of technological development. (see the case study in Markus, 2007, p. 71) But even if technology issues can be solved, the essential questions on DP benefits and profitability must be considered.

3.2 Analysis of the Potential from the Guests' Perspective

Are DP services of interest for potential customers of a tourism region? Firstly the tourists of the region of Salzburg are predominately self-organised groups of travellers that arrive mostly from neighbouring countries in their own cars. Many of the visitors are regular guests, that negotiate their accommodation arrangements rather with accommodation providers (and eventually receive some extra provisions) rather than booking online via a DP portal. Three basic, cost-intensive DP components that enable biggest financial benefits for guests and service providers – transport, transfer and accommodation – are thus irrelevant for their purposes. Secondly, the question as to whether there are any other relevant travel components (e.g. tours, cultural and sports events, sports courses), of which a travel package could be built, must be assessed as critical due to rather low saving potentials. Customers must realise real (financial) benefits in order to be prepared for buying travel services in advance, which can be purchased any time locally – and for which they don't even know whether and how often they will want to use them. A potential shortage of services (e.g. special dinners, musical tickets, events, rooms) also might motivate guests to buy services in advance. Finally, results from an AOL study show that "consumers are

still prepared to shop around to get the best deals" (Sommerville, 2005), i.e. they may not be prepared to buy all or more travel services in the framework of one DP portal. Anyhow, when considering the benefits of DP from the perspective of guests, Orman makes an important point: "In essence, dynamic packaging promises operators the opportunity of generating business with minimal manpower input. On the surface there is nothing wrong with this, however in the process of incorporating dynamic packaging into their online marketing strategies, many operators are seduced into the trap of thinking of customers as automated buying machines, instead of people." (2006)

3.3 Analysis of the Potential from the Perspective of Tourism Service Providers

From the perspective of service providers, DP is often referred to as an online marketing and sales channel that enables dynamical price adjustments to a rapidly changing market demand, thus helping to optimise the utilisation of (over)capacities. This objective is not only depending on the behaviour of tourists and the (international) visibility of the DP-portal, but is connected with many other critical issues. In the region of Salzburg, for instance, the problem of over-capacities and thus the biggest DP potential seems to be *relevant in low season only*. Accordingly, while in low season there would be a bundle of booking options in the framework of a DP portal, only few and sometimes no booking options would be available in high season (e.g. Christmas Holidays). Hence, in high season DP might even prove as counterproductive. Secondly, in this context, the (lack of) motivation of service providers to participate in DP offerings of e.g. small tourism regions must be discussed. By many accommodation providers selling tourism services online has been seen as a *loss of management upon their own capacities*, i.e. control about which guest comes when and for how long. Furthermore, in order to harmonise services, some standardisation of content and form of services would be essential – for instance, in Salzburg, a standardisation of elements of ski courses and contents proved to be an insuperable obstacle for the realisation of a DP platform – which again might be seen as a *loss of competitive advantage* which is necessarily linked to the content of services. At the same time, the participation of all regional service providers is crucial for the success of a regional DP platform. (Schambach, 2005) Hence, the participation of tourism content providers in a DP portal is associated with some disadvantages. In addition, no instantaneous (substantial) financial benefits can be expected on short notice.

3.4 Analysis of the Potential from the Perspective of Small Tourism Destinations

Perhaps the biggest beneficiaries of a DP solution might be the regions themselves. In the framework of a regional DP portal a whole arsenal of regional tourism services might be integrated, extended (e.g. by non-regional transport services) and prepared for packaging and booking. Marketing and customers' benefits are thus clear. Additionally, the portal, clearly a chance to enhance the cooperative culture within a region, can also be used as an innovative tool for market research. In this respect,

Tina Finch from EzRez DP technology provider writes: "Imagine not only having data on a guest's stay at the hotel, but on his entire travel pattern – the airline and car rental company he likes, and even the activities he prefers. This is a way to understand your customer far better than in the past" (as cited in Chipkin, 2005). However, great organisational and technological (and even legal, see for more detail Vogel, 2005) efforts must be taken to be able to exploit these potentials, particularly to convince a critical mass of service providers to take part in a DP endeavour. There is a considerable long-term conflict potential, too, given that business rules and price reductions cannot be solved once in a time, but require permanent communication and negotiation with service providers. Finally, a DP portal operator (private or public) must be designated, which is not an easy task, given that the economic profitability is hard to achieve on basis of a relatively modest quantity of service providers in the context of a small tourism region. As Michael Anderson, EMEA director of new channels point out: "Building a dynamic packaging platform and sourcing inventory requires a considerable degree of investment spread over thin margins." (as cited in Travel Mole, 2005) Hence, a realistic management of expectations is of utmost importance when the implementation of a DP portal in the context of a small tourism destination is considered.

3.5 Analysis and Assessment of DP Implementation Steps

In the following figure, four phases of implementation are envisaged from the perspective of a tourism destination that intends to implement a DP solution. In addition, for each phase a time-span has been estimated and the level of challenges (low, moderate, high and very high) assessed and described in brief.

Based primarily on case studies' results (e-Business W@tch / European Commission, 2006; Markus, 2007), one can estimate that the implementation of a DP solution might take up to approximately 2 ½ years (from 01/2008 to 08/2010). Thereby, the most important steps of implementation include e-business set-up, technology selection, technology implementation and operational phase.

The biggest barriers can be identified in the *e-business set-up* phase, because here the organisational, financial and legal basis of the portal must be established. Furthermore, it must be ensured than enough content providers take part in the portal, which is essentially the question of DP financial and other benefits as well as of co-operational models in the tourism destination. Remarkably, it can be assumed that day-to-day DP operations are linked to even higher (organisational, business and co-operational) challenges than the selection and implementation of the system. Yet, while there is certainty that DP systems can be successfully implemented, there are no verified examples showing that DP can be implemented and operated successfully in terms of e-business activity in the context of a small tourism destination.

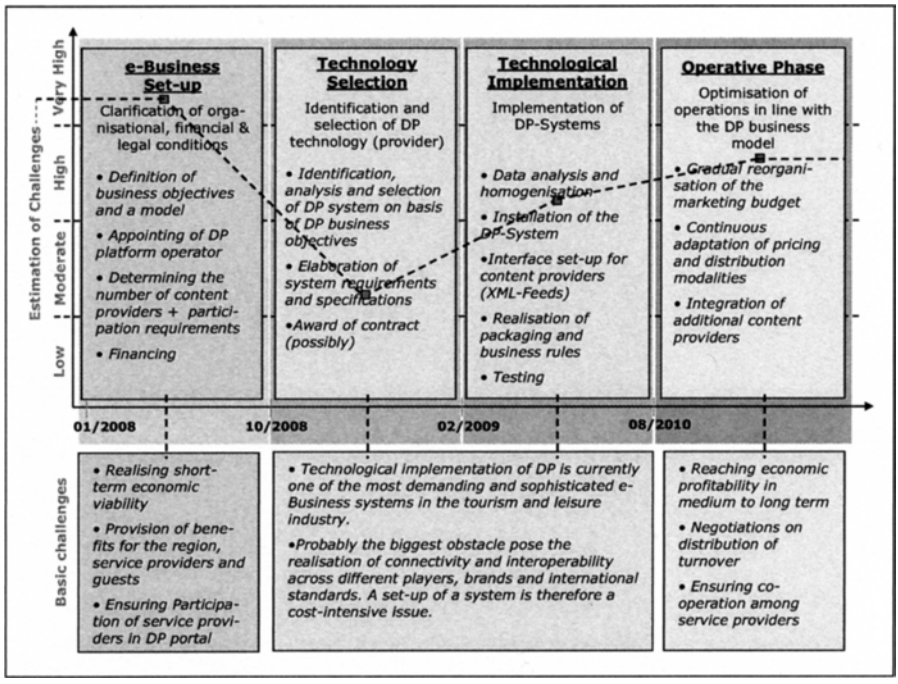

Fig. 2. Phases of DP implementation

4 "Dynamic Packaging: Hot or not"?

Even if scientifically not yet proven, from the perspective of giants in the tourism industry, it is probably legitimate to look at DP as one of the key technologies and decisive e-business innovations. DP empowers customers to package and book travel components in real-time by means of web-based configurators. Furthermore, there are a number of indications that DP indeed can tackle the problem of over-capacities and generate higher margins.

From the perspective of SMEs and small tourism destinations, however, most of DP promises do not withstand a critical investigation. There are not many arguments supporting the idea of a successful implementation of a DP solution within a small tourism destination. Hence, from this particular perspective, DP still turns out to be "hype" more than a serious and sustained e-business solution. DP benefits do exist, but in order to exploit these potentials enormous organisational and technological challenges must be taken. From the perspective of small tourism regions, DP thus proves to be neither "hot", nor "not" (Sommerville, 2006), i.e. neither an essential

prerequisite ensuring a prospering future of small tourism destinations, nor an innovative e-business format that can be neglected.

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Dynamic Packaging using a Cluster-based Demographic Filtering Approach

Andreas Jagersberger,
Klemens Waldhör

Krems Research
Forschungsgesellschaft mbH, Austria
{andreas.jagersberger, klemens.waldhoer}@kremsresearch.at

Abstract

Dynamic packaging and product bundling are key topics in current tourism research and also heavily discussed within the travel industry. This paper describes a new approach to how a user model and a combination of collaborative and demographic filtering can be used to recommend product bundles in dynamic packaging. The user model differentiates between a short term component and a long term component. The short term component contains information about the user's current session while the long term component saves data which holds beyond a session. Furthermore it is shown how stored data is used to recommend a combination of tourist services. This not only takes evaluations of other users into account, but uses demographic properties of the user as well.

Keywords: travel recommendation; user model; collaborative filtering; content based filtering; demographic filtering.

1 Introduction

The number of electronically available tourist offers increases constantly. Nearly all kinds of tourist services (in this document, the more general term "objects" is occasionally used instead of "services") can be searched for and booked on the Internet. In many cases the services are often only available on different (booking) platforms. Even if the services can be found by the booking systems combining and packaging individual services is rarely offered. And if available, it is restricted to a combination of transportation and accommodation. This is caused by the complex searching and booking procedure once several tourist offers are involved. Furthermore the user has to compare different packages and prices, and does not have any information about the quality of the selected services or how the price structure has been determined from the individual services.

The anet project "Dynamic Packaging" deals with the implementation of a new type of dynamic packaging software which is heavily based on a user model and should allow better and finer grained recommendations. The main goals are the integration of service packages initiated by customers and the personalization of the offered packages. Further goals include:

- A mechanism is designed to support the packaging of tourist services by customers (guests). From the customer's point of view the quality of the package not only depends on the combination of the selected services but on customer's preferences as well. A model representing the user and his preferences for holiday activities forms the basis for providing customer specific recommendations. The model saves these data in a user profile. Further factors retrieved from the current user context such as date, weather etc. are also taken into account. The user model is part of the booking system and in the current version only available in the host booking system.
- A recommendation system offers tourist services depending on the user profile. The user can add services or replace services with other services in his package.
- The user is supported by an integrated evaluation function, which allows him to check the quality of the selected services based on the evaluation of other users. Furthermore he can evaluate these services once he has consumed them. He benefits from the other users' experiences and can share his own experiences.
- The tourist offers themselves are represented in an abstract form. This ensures that real life offers can easily be integrated into the system, e.g. by providing Web services.

2 Dynamic packaging process

2.1 Dynamic packaging process

Figure 1 presents the dynamic packaging process and how it is realised in the prototype. Before being able to search for product bundles, a user has to be created and his characteristics collected. These characteristics are saved in a database and subsequently referenced as a user model. After registration of the user characteristics, the user can search and combine different tourist services i.e. accommodations, different means of transport and other services like sport opportunities, places of interest etc. Based on a pre-processed match of relevant tourist offers, the user gets recommendations using *cluster based demographic filtering*. They then have the option to choose the cheapest package or to choose objects recommended by other users. The chosen and consumed package are saved and should be evaluated after the trip so that other users can take advantage of the user's recommendations.

2.2 User model

The development of this new type of recommender system supports the preparation of individual service packages. In order to create recommendations a user model is developed which selects different services depending on the user's profile (Montaner, 2003).

Besides user specific information such as general interests or psychological aspects (e.g. hedonist, dreamer, fearful (Reeh, 2005)), the user model also saves information about the travel behaviour of the user. User characteristics change more or less

depending on life situation. As a result, it is necessary to have a long term and a short term component in the user model. Data that never or rarely changes, such as date of birth, martial status or psychological aspects, is saved in the long term component. In addition, a short term component saves data specific to a particular journey (also referenced as "travel specific data"). They are not stored together with the user model but are saved separately for each journey. Data for this short term component can not be changed since it is specific to a particular journey and is thus fixed.

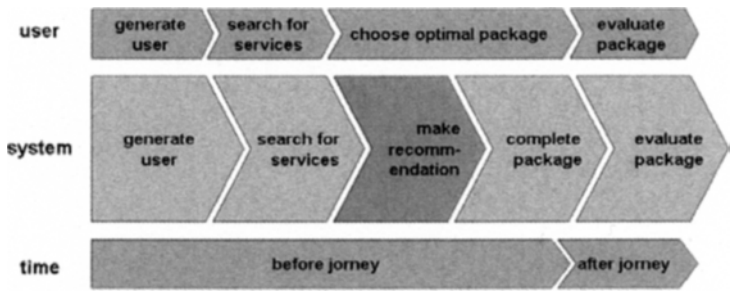

Fig. 1. Dynamic Packaging architecture

3 Collaborative filtering and content based filtering

The term recommendation here refers to selecting and offering objects which a user might be interested in or find worth visiting. Object proposals are determined by applying specific algorithms depending on the type of recommendation used. Two basic approaches are well known:

- *Collaborative filtering*: The main idea of collaborative filtering is the evaluation of an object by many users. If many users classify an object as "good", one can assume that other users will experience it as "good" too.
- *Content based filtering*: Content based filtering uses the description of objects in order to find a recommendation. Object recommendations are created based on similar positive evaluated objects.

Comparing both approaches, the same problem is evident but from different perspectives. Content based filtering focuses on similarities of objects while collaborative filtering concentrates on similarities of users. Although the same algorithms can be used for the computation of the recommended objects, results will differ depending on the filtering methods.

Both approaches use the concept of *correlation* to determine the *similarity* of two objects. This is very similar to the concept of correlation in statistics. A high positive correlation value refers to very similar objects while a negative value characterises very different object. A value near 0 indicates no relationship between the objects.

A *collaborative filtering system* can not always be used. If only a few data (objects) are available this approach should not be used as it requires a large database to result in valid recommendations. One cannot assume that all objects (e.g. journeys) have been evaluated by users. Objects which are only offered for a short time period like art performances can not be evaluated meaningfully if the number of evaluations is small. Therefore content based filtering should be used (Büttner, 2007).

Besides collaborative filtering and content based filtering there are many other methods to calculate relationships between users and objects. One method is the usage of *user related demographic data.* This method is called *demographic filtering* and can be used in combination with collaborative filtering or content based filtering to find better recommendations (Montaner, 2003). A detailed research of available Open-Source-Software returns many collaborative filtering and content based filtering systems but no software library could be found which supports demographic filtering. Thus it was decided to implement a new software solution for the prototype.

4 Calculating the similarity between objects und users

The *cosine correlation* is used in the dynamic packaging prototype as the basic similarity measure. This correlation method creates reliable results in a short (computational) time compared to more complex statistical methods (Vozalis, 2004).

Formula (1) shows the *Cosine Correlation* which is used to determine the similarities between objects.

$$cfs(a,i) = \cos(\vec{u}_a, \vec{u}_i) = \frac{\vec{u}_a \cdot \vec{u}_i}{\|\vec{u}_a\|_2 * \|\vec{u}_i\|_2} \tag{1}$$

The users are represented as vectors whereas the values of attributes represent the assessed objects. In the following discussion *active user* u_a refers to the user who searches for object recommendations – the one who wants to get travel advices. u_i refers to users who have evaluated objects. The similarity is calculated using the cosine of the active user u_a and an arbitrary other user u_i from the database. The range of the correlation is always between -1 and +1. The similarity can be interpreted as an angle between both vectors. A perfect positive correlation of both vectors is given when the calculated value is 1. If the calculated value is -1 the correlation of two users is perfectly negative. If the value is near 0 no correlation exists between both vectors (see Rummel, 1976).

5 Cluster based demographic filtering

Based on a *collaborative filtering similarity* (**cfs**), *n* neighbours u_i of the active user u_a are computed. n – the number of neighbours - is an integer between 1 and the number of all users in the database. The correct choice of n is very important: if the value is too small recommendations have low quality, a very high value results in a low system performance. Those n users u_i are chosen from cfs which have the highest similarity with the active user u_a. There exists many algorithms and heuristics to determine an adequate n (see Roumani et al., 2006). However, the dynamic packaging prototype only uses a static n of 100 users. This approximate choice of n is sufficient for first tests.

In a further step the values of the long term component are retrieved for each neighbour user u_i. In addition each journey of the neighbour user u_i is retrieved from the short term component. Both components are used for the computation of the *demographic filtering similarity* (**dfs**) between the active user and the neighbour users u_i. The final recommendation is not only influenced by the cfs but now also by the dfs. Figure 2 explains the *cluster based demographic filtering similarity* (**cbdfs**).

The result of this filtering is a list of objects which are sorted decreasingly depending on the value of the cbdfs.

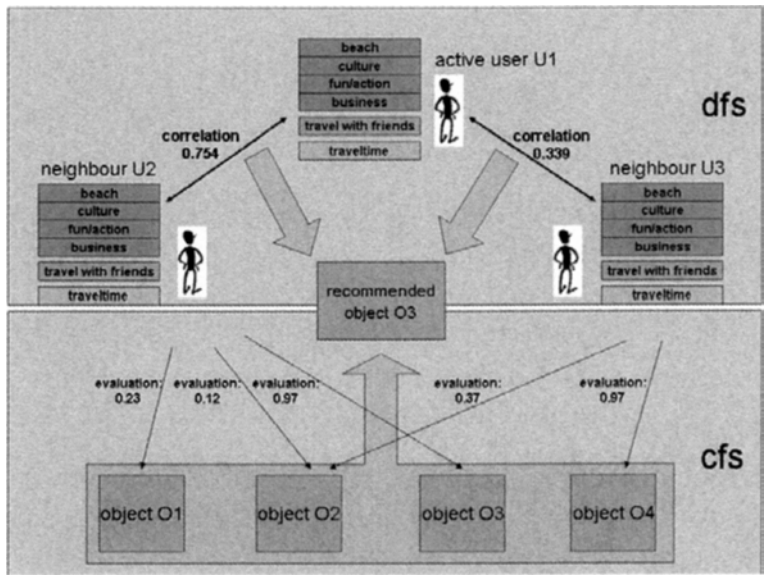

Fig. 2. Cluster based demographic filtering

Taste (Owen, 2005) is an Open Source collaborative filtering and content based filtering engine for Java. Taste is developed based on the Apache V2 license and is ideally suited for research purposes. Taste is used for the development of the recommendation system.

5.1 Motivation of clustering the user model

A collaborative filtering system uses similar users to get recommendations. However, this similarity results from evaluated objects. This method does not take into account the influence of the motivation of the journey or the traveller's interests, psychological aspects or emotions. Thus cluster based demographic filtering is used. The chosen clusters are based on two models for travel motivation (see Reeh, 2005 and Hahn, 1993) and have different influence on the demographic user similarity. To express this difference each cluster can be weighted by an arbitrary value. The assumed increase of recommendation accuracy has not been tested so far and needs to be analyzed in further research.

5.2 Classification of Clusters

Three different types of cluster are defined:

- *Cluster single (Cs)*: The cluster contains one value which is an arbitrary number between 0 and 1 (e.g. quality)
- *Cluster boolean (Cb)*: The cluster contains one value either 1 or 0. This value corresponds to a boolean value (e.g. married / not married).
- *Cluster multi (Cm)*: Several values will be aggregated up in a cluster, where each single value is an arbitrary number between 0 and 1 (e.g. interests).

If one chooses the weighting factor in such a way that it sums up to 1 the value of correlation will always result in between 0 and 1. This can be interpreted as percentage value. A correlation of 0.95 between user U1 and user U2 means that U1 and U2 have a similarity of 95 %.

Table 1 shows the user characteristics and associated clusters chosen for the short and long term component. The numbers in the second column are the weighting factors for each cluster.

Table 1. Classification in cluster

Cluster	Weight	Type	Component
Cluster Interests	0.380	Cm	Long term
Cluster Traveltime	0.025	Cs	
Cluster Male/Female	0.025	Cs	
Cluster Children	0.050	Cs	
Cluster Travwith	0.095	Cb	Short term
Cluster Travdata	0.350	Cm	
Cluster Qualtiy	0.025	Cs	
Cluster Board	0.025	Cs	
Cluster Travlength	0.025	Cs	

The weighting factors can only be determined using experimental settings. For the development of the dynamic packaging prototype an approximate calibration is sufficient which have been taken from expert discussions.

5.3 Computation of the user demographic correlation

In the following discussion, a description is given as to how the user demographic similarity is computed by the demographic filtering algorithm.

Formula (2) calculates a part of the user similarity for the *Cluster Boolean* (*Cb*), a cluster type for features which are either true or false. If the supplied attributes are equal a value of 1 is returned otherwise 0 is returned.

$$dfs\_bool(a_{Cb}, i_{Cb}) := \begin{cases} 1 & a_{Cb} = i_{Cb} \\ 0 & a_{Cb} \neq i_{Cb} \end{cases} \tag{2}$$

Formula (3) calculates a similarity value for two real numbers between 0 and 1. The result is again a value between 0 and 1. The higher the value the more similar are both user's demographic values. This cluster is used where a feature can be represented by real value.

$$dfs\_\sin gle(a_{Cs}, i_{Cs}) := \begin{cases} \dfrac{a_{Cs}}{i_{Cs}} & i_{Cs} > a_{Cs}, i_{Cs} \neq 0 \\ \dfrac{i_{Cs}}{a_{Cs}} & i_{Cs} \leq a_{Cs}, a_{Cs} \neq 0 \end{cases} \tag{3}$$

Formula (4) is based on the Cosine Correlation (1) from the cfs and is used for clusters which consist of several features.

$$dfs\_multi(a_{Cm}, i_{Cm}) = \cos(\vec{u}_{aCm}, \vec{u}_{iCm}) = \frac{\vec{u}_{aCm} \cdot \vec{u}_{iCm}}{\|\vec{u}_{aCm}\|_2 * \|\vec{u}_{iCm}\|_2} \quad (4)$$

The difference in usage results from the values used: Collaborative filtering uses the evaluations of the objects while demographic filtering uses the values of the cluster multi for the computation. Table 2 presents user characteristics of the Clusters multi for "interests" and "travdata".

The Dynamic Packaging prototype uses values in the range of [0, 1] for both vectors "Interests" and "Travdata". Those values are supplied by the user, e.g. in the phase when the user is created in the system. A value near one indicates high affinity with the given characteristics. To ensure a correct computation the values of the vectors are transformed so that the mean of these values is 0. The dfs computations are executed with these data and transferred back into the original range [0, 1] expressing the user similarities as a percentage value.

Table 2. User characteristics of Cluster multi

Cluster	Weight	Type	User characteristics
Cluster Interests	0.38	Cm	sport wellness esoteric culture architecture/design history culinary sightseeing
Cluster Travdata	0.35	Cm	health beach/vacation at the seaside cultural journey fun/action business

Formula (5) shows the dfs which is based on the formulae *dfs_single*, *dfs_bool* and *dfs_multi*. Cluster weightings are multiplied with the results of dfs_bool, dfs_multi and dfs_single.

$$dfs(a,i) := \sum_{Cs} Cs * dfs\_\sin gle(a_{Cs}, i_{Cs}) + \sum_{Cb} Cb * dfs\_bool(a_{Cb}, i_{Cb}) + \sum_{Cm} Cm * dfs\_multi(a_{Cm}, i_{Cm}) \quad (5)$$

5.4 Combining cfs and dfs

In the final step cfs has to be associated with dfs. Formula (6) calculates the cluster based demographic filtering similarity cbdfs. The values of collaborative filtering and demographic filtering have the same weights. Although they are computed from different types, Vozalis et al. (2004) explained that using the same weights gives the best recommendation results.

$$cbdfs(a,i) = \frac{cfs(a,i) + dfs(a,i)}{2} \quad (6)$$

6 Example of cluster based demographic filtering

An example will demonstrate the algorithm. We assume three users U1, U2 and U3 where U1 is the active user (searching for a recommendation), while U2 und U3 have been selected as neighbours from the collaborative filtering computations. The similarity of the three users U1, U2 and U3 is determined using the formulae (2) till (5). The values of the attributes can be found in Table 3 and uses only a restricted subset of clusters defined in Table 1.

Table 3. Specific user's characteristics of three users

Cluster	Type	Weight	User characteristics	U1 (active user)	U2	U3
travdata	Cm	0.333	Beach/vacation at the seaside	0.1	0.2	0.9
			cultural journey	0.7	0.5	0.2
			Fun/Action	0.5	0.8	0.7
			Business	0.8	0.5	0.5
travel with friend	Cb	0.333	travel with friend	1	1	0
traveltime	Cs	0.333	traveltime	0.333	0.666	0.666

The results of computing dfs_single, dfs_multi and dfs_boolean is shown in Table 4.

Table 4. Example dfs computations

	dfs_multi/Cm	dfs_bool/Cb	dfs_single/Cs	dfs
U1U2	0.763	1	0.5	0.754
U1U3	0.019	0	1	0.339

The calculation of the final dfs is now is shown in Table 5 with two different weighting schemes. Scheme 1 assumes equal weighting of all three components while scheme 2 heavily weights the factor traveltime.

From this calculation it can be seen that user U1 and user U2 have more similar preferences than user U1 and user U3 given scheme 1. If on the other hand "traveltime" plays a dominant role, the preferences revert.

Table 5. Final example dfs computations

Cluster	Weight 1	U1U2	U1U3	Weight 2	U1U2	U1U3
travdata	0.333	0.254	0.019	0.100	0.076	0.002
travel with friend	0.333	0.333	0.000	0.100	0.100	0.000
traveltime	0.333	0.167	1.000	0.800	0.400	0.800
Final dfs		0.754	0.339		0.576	0.802

The cfs should be given as follows in Table 6 and we apply formula (6) for the overall recommendation.

Table 6. Final example dfs computations

Travel Option	U2 cfs	U3 cfs	cdbfs U2 W1	cdbfs U3 W1	cdbfs U2 W2	cdbfs U3 W2
Maldives	0.300	0.800	0.527	0.570	0.438	*0.801***
Majorca	0.500	0.300	0.627	0.320	0.538	0.551
Vienna	0.754	0.339	*0.777**	0.420	0.688	0.651

As can be seen, depending on the weightings used, either Vienna would be recommended if equal weighting is used (*) while the Maldives would be recommended if "traveltime" plays an important role (**).

7 Conclusions

The user model and demographic filtering combined with collaborative filtering technique presented in this paper forms the basis for the adaptation of a tourist recommender system. It has been described how stored user characteristics influence the outcome of object recommendations. By applying the developed formulae, clustering and weighting of user characteristics is supported that has a strong influence to the resulting recommendations. Furthermore, it has been shown how an existing recommendation system can be extended to realise these requirements. The method presented is a powerful, yet efficient method for generating tourist recommendations and can be used in any dynamic packaging system requiring a recommendation feature. Besides this, both the user model and the approach used can be applied also to any system with tourist content (e.g. tourism information systems or tourism booking systems). The techniques developed for the dynamic packaging process were implemented in the anet project Dynamic Packaging. Their great advantage compared to other recommendation systems is a more fine grained recommendation of tourist services. The inclusion of the user model for tourism results in higher customer satisfaction as well as higher customer loyalty. By applying a cluster based demographic filtering approach, search and product bundling time are accelerated.

Vozalis et al. (2003) presented a similar concept, with the exception that they do not use clusters and instead use a vector based approach for user profile. They compute the correlation between the vectors using the cosine transformation in order to determine the user specific correlation, and use a different formula for computing the final correlation value (Vozalis et al., 2004). By introducing control variables, the value of the correlation can be influenced. Using special settings of those control variables, formula (6) can be derived.

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Tourist Activated Networks: Implications for Dynamic Packaging Systems in Tourism

Florian Zach[a], Ulrike Gretzel[b], and
Daniel R. Fesenmaier[a]

[a] National Laboratory for Tourism and eCommerce
School of Tourism and Hospitality Management
Temple University, USA
{fzach, drfez}@temple.edu

[b] Laboratory for Intelligent Systems in Tourism
Recreation, Park & Tourism Sciences
Texas A&M University, USA
ugretzel@tamu.edu

Abstract

This paper discusses tourist activated networks as a concept to inform technological applications supporting dynamic bundling and en-route recommendations. Empirical data was collected from travellers who visited a regional destination in the US and then analyzed with respect to its network structure. The results indicate that the tourist activated network for the destination is rather sparse and that there are clearly differences in core and peripheral nodes. The findings illustrate the structure of a tourist activated network and provide implications for technology design and tourism marketing.

Keywords: tourist activated networks, network analysis, dynamic packaging, on-the-move traveller, destination management organizations.

1 Introduction

Tourists' experiences within a destination are the result of the interaction of the traveller with the service infrastructure and destination environment. Previous studies have identified travel decisions as complex processes with final choices being interrelated (Dellaert, Ettema, & Lindh, 1998). As such, the tourist consumption system, as proposed by Woodside and Dubelaar (2002), describes a complex and dynamic pattern of tourists' activities which exist within the context of attractions and accommodations, the transportation network as well as other tourists. It is argued that understanding tourists' travel path through this system is essential to developing a coherent destination management strategy. Furthermore, it is argued that information technology (IT), particularly mobile technology and the increasing availability of free wireless Internet, enables tourists to easily retrieve and share information throughout the travel experience. Mobile technology, therefore, allows destination marketing organizations (DMOs) to support dynamic bundling of tourist services to enhance visitors' experiences while *en route*.

This paper reports on a study that examined the movement of tourists through a destination. The underlying network is identified and its structure (i.e., core, periphery, and places immediately adjacent to the core) is discussed. The results of this analysis are then interpreted within the context of mobile computing and the development of systems that can be used to integrate offerings of local firms in support of on-the-move travellers.

2 Tourism Destination Systems – A Network Perspective

Fesenmaier and his colleagues (Kim and Fesenmaier, 1990; Lue, Crompton and Fesenmaier, 1993; Jeng and Fesenmaier, 1998; Hwang and Fesenmaier, 2003; Hwang, Gretzel, and Fesenmaier, 2006) have argued that travel can be conceptualized as a series of experiences that occur in specific patterns depending upon the spatial organization of the attractions and the nature of the travel party (i.e., needs, motivations, etc.). It was found in these studies that travel is largely multi-destination / multi-activity whereby a trip represents a bundle of activities / attractions/places that meet the specific needs (i.e., add value to the experience) of the traveller. In addition, this research indicates that the bundling of activities / destinations/attractions enables travellers to manage the perceived risk/cost of the trip.

More recently, Woodside and Dubelaar (2002) developed a conceptualized understanding of tourism systems arguing that tourists' actions can describe the relationship between places / activities / experiences. Further, Hwang et al. (2006) and Shih (2006) argued that travel patterns can be understood as networks. Indeed, Hwang et al. (2006) and Shih (2006) conducted studies to assess the structural properties of travel within and between different destinations. Specifically, Hwang et al. (2006) examined multi-destination travel in the United States and Shih (2006) focused on travel in Taiwan. In both studies the authors found that travel patterns exhibit specific network properties and that these structures provide substantial insight into the relationship between a traveller and the system that supports travel experiences.

Ritchie and his colleagues argue that tourism destination management organizations represent several components of the tourism system that, together, contribute to create a "seamless" experience for the tourist (Ritchie & Crouch, 2003). This research, along with emerging literature in collaborative destination marketing, suggests that strongly networked tourism organizations are very effective in co-creating tourism products and services (e.g. Palmer and Bejou, 1995) and in participating in a variety of Internet-based marketing activities (Wang and Xiang, 2007). Indeed, Gretzel, Fesenmaier, Formica and O'Leary (2006) and Zach, Xiang, Gretzel and Fesenmaier (2007) concluded that it is essential for destination management organizations to use IT in order to enhance cooperation between organizations, businesses and governmental institutions so that value-added, innovative tourism products can be created.

3 IT and on-the move Tourist Information Search

The increasing importance of IT has changed the way tourism organizations manage and operate (Poon, 1993). Indeed, the Internet has become the most important channel with which tourism organizations can deliver information to existing and potential visitors (Gretzel and Fesenmaier, 2005; Wang & Fesenmaier, 2006). Specifically, the Internet has become the primary medium which tourists use to search for information in the pre-consumption stage and to share and re-experience their trip in the post-consumption stage (Gretzel et al., 2006). Gretzel et al. (2006), however, argue that whereas the Internet in the pre- and post-consumption phase is accessed mostly through the home computer, mobile technologies enable tourists to connect with friends and make short-term decisions while travelling *en route* (consumption stage). Indeed, a recent study by the Pew Foundation (2006) found that 14.0% of cell phone users access the Internet through their cell phone, while another 16.0% would do so if their phone would support it. This development together with the increasing availability of free wireless Internet enables tourism organizations to provide information for tourists *en route*.

Brown and Chalmers (2003) conducted an ethnographic study to understand how tourists experience places and to provide suggestions for the development of IT that supports the tourist experience at a destination. Other scholars have examined traveller behaviour with the goal of developing specific systems; for example, Schmidt-Belz, Laamanen, Poslad and Zipf (2003) discussed the behavioural foundations for the development of CRUMPET; Schwinger et al (2005), Malaka and Zipf (2000), and Kramer, Modsching, ten Hagen and Gretzel (2006) focused on strategies for, and the impact of, mobile tourist guides; and, Modsching, ten Hagen and Gretzel (2007) examined the use of GPS to track visitors while travelling to/through a city.

Through their choices, tourists create dynamic relationships between organizations providing tourism related products. These relations can be conceptualized as "tourist activated networks" where tourists "activate" the relationships by choosing a combination of attractions, services, etc. Following from Hwang et al. (2006), Becken and Gnoth (2004) and Cardoso et al. (2007), it is argued that the notion of tourist activated networks provides for a powerful and practical relational metaphor that is well understood by tourism organizations in building innovative partnerships to support the dynamic construction of bundles of products (i.e., experiences) based upon travel behaviour. Mobile IT enables DMOs to learn about tourists' bundling of experiences and to simultaneously support tourists in dynamically building their *en route* experience. It is clear that IT can be used to effectively meet the needs of visitors to a destination in a number of ways. Yet, dynamic packaging seems to be currently restricted to pre-trip stages. Examples of dynamic packaging provided by online travel agencies are discussed by Cardodo and Lange (2007). This paper argues that a better understanding of tourist activated networks at destinations is needed to spur innovations in dynamic packaging for *en route* decision-making.

4 Research Method

Based upon the travel behaviour, mobile computing and destination management literatures, it is posited that the network structure of travel through an area can be used to develop systems that support the dynamic bundling of tourist products. Thus, the goal of this study was to identify the network structure of travel within Northern Indiana (USA) with the aim to make recommendations toward the development of IT systems that may be used to support traveller experiences in the area. The research framework is described in the following paragraphs.

4.1 Sampling and Data Collection

Visitors were intercepted at one of nine visitor centres (VCs) located throughout the area (see Figure 1) in the fall of 2005 and the summer of 2006. Those who agreed to participate in the research were sent a follow-up survey a month after their trip. In total, 2177 visitors were contacted. Of those who received a survey (bad addresses excluded), 49% (1009 respondents) completed the survey. As part of the survey, respondents were asked to describe in detail their trip to the region.

4.2 Measures and Data Analysis

The questionnaire invited respondents to list up to seven places they visited before and after (for a total of fourteen places visited) they stopped at the visitor centre. This information on the spatial movement of tourists was used to develop a symmetric matrix representing the spatial network of all the places visited by the tourists. SPSS 15 and UCINet 6.0 were used to analyze this dataset. It is important to note that the results are conditioned by the fact that all respondents stopped at the visitor centre sometime during their trip to/through the area.

Fig. 1. Map of Northern Indiana

5 Research Results

Descriptive statistics were first calculated to describe the visitation behaviour of tourists to the region. Next, characteristics of the places visited by tourists in Northern Indiana were assessed. Last, network analysis was employed to identify the network structure of visitor travel through the area.

5.1 Tourists' visitation behaviour

It was found that the Northern Indiana visitors identified 320 different places at which they stopped including museums, hotels, restaurants, parks and shopping areas. As can be seen in Figure 2, the number of places visited sharply declines whereby essentially every tourist visited at least one place beyond the visitor centre; two thirds

visited two additional places and one third of the travellers visited 4 other places; only 7.6 percent of the tourists visited 7 places additional to the visitor centre.

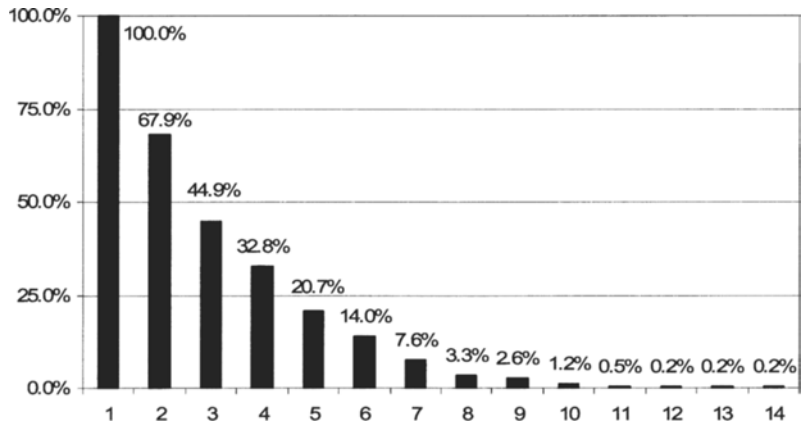

Fig. 2. Number of places visited additional to the visitor center by tourists in Northern Indiana

5.2 Northern Indiana tourist places

The most popular places visited are listed in Table 1. Also shown in the table is the ranking of the popularity of places visited at the beginning and at the end of the visit to Northern Indiana. It can be seen that the first four most visited places are the top four at the start and the end of visits to the area (though in a different order). Several places that ranked high as start or end places for travel through Northern Indiana were not among the top ten most visited places. Some of the top ten visited places such as Nappanee, on the other hand, are not ranked among the top ten start or end places,

indicating that the visitors bundled these places as "drive through" destinations while visiting other places in the area.

Table 2 shows the "long tail" effect of the places visited. As can be seen, nearly two thirds of the places have been visited only once, representing only 13.7% of all visitations in Northern Indiana. This contrasts sharply with those places visited 8 times and more in that they account for less than 10.0% of the places visited, but generate more than two thirds of all the visitations. This finding is consistent with Zipf's power law whereby a small number of core places is responsible for most of the visitation (Barabási & Albert, 1999).

Figure 3 presents the overall network of the 320 places visited in Northern Indiana. The figure shows that the visitor centre (VC) is in the middle of the network (again, it is important to note that this finding is an artefact of the sampling methodology) and that there are a small number of core attractions that are highly connected with other places in the network. Last, the outer rim of the network identifies those places that have been visited only once.

Table 1. Top visited places in Northern Indiana

Top places in Northern Indiana	Visitation ranking	Top 10 start place ranking	Top 10 end place ranking
VC	1	1	1
Shipshewana	2	3	2
Notre Dame	3	4	3
Indiana Dunes	4	2	4
Nappanee	5	n/a	n/a
Elkhart	6	6	n/a
Light house mall	7	n/a	5
Amish Acres	8	5	10
Shipshewana Flea Market	9	8	n/a
Goshen	10	n/a	n/a
Amish Country	12	n/a	7
Restaurant	14	n/a	6
Studebaker Museum	15	9	n/a
Gas station	16	7	8
RV Museum	19	n/a	9
Pokagon State Park	24	10	n/a

Table 2. Visitation pattern

Total number of times a place was mentioned	Percent of Places	Percent of Total Visitation
Mentioned once	65.9	13.7
- " - twice	11.8	4.9
- " - 3 times	5.2	3.2
- " - 4 times	2.3	1.9
- " - 5 times	1.7	1.9
- " - 6 times	2.0	2.5
- " - 7 times	1.2	1.6
- " - 8 times and more often	9.9	70.3
Total	100.0	100.0

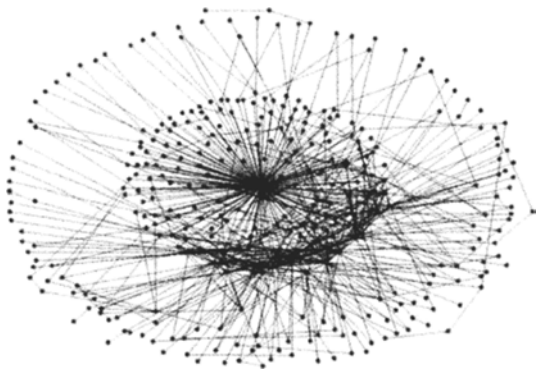

Fig. 3. The overall network of places visited in Northern Indiana

5.3 Characteristics of the tourist network in Northern Indiana

A core/periphery analysis of the network data was conducted to identify the core places of the Northern Indiana tourism network. A continuous approach was applied and resulted in eight core places (see Table 3). As proposed by Borgatti and Everett (1999) coreness measures can be accepted as a good measure of fit indicating that the place can clearly be distinguished from the other places. A measure of fit of 0.74 for the Northern Indiana tourism network can be considered as good.

As indicated previously, the VC was visited by every visitor to Northern Indiana. The other core places, however, were visited by a maximum of 23.8 % of the visitors. It can be seen in Table 3 that the top three core places to the network have been a start or an end place for a trip for about 25% of the visitors. Also shown is the mean number of places visited by tourists that visited one of the core places. Interestingly,

Nappanee had the highest number of places and simultaneously has a low percent rating of being a start (8.8%) or an end point (11.8%) as compared to the other core places.

Table 3. Core place pattern

Core places in Northern Indiana	Coreness	Percent of visits to core place	Percent of Core Place visits as trip start	Percent of Core Place visits as trip end	Mean number of places visited by tourists to Core Place
VC	0.648	100.0	42.2	28.0	4.0
Shipshewana	0.348	23.8	21.0	27.0	5.0
Notre Dame	0.289	14.7	30.6	27.4	4.6
Indiana Dunes	0.251	14.0	35.6	25.4	4.9
Elkhart	0.204	7.6	25.0	9.4	5.8
Light house mall	0.188	7.6	12.5	34.4	4.6
Nappanee	0.174	8.1	8.8	11.8	6.6
Amish Country	0.165	5.9	16.0	32.0	5.0

Fig. 4. Core network with adjunct places

The core network and places adjunct to them are graphically represented in Figure 4. As can be seen, there are strong relationships between the eight core places. However, there is no direct linkage between all of the core places. That is, it can be seen that many of the core places are the only connection points for many of the pendants surrounding the core network. The Light house mall, for example, is connected only with Indiana Dunes and the VC. This indicates that the density of the network is

extremely low; indeed, the overall network of 320 places includes just 1.0% of all possible linkages within the network. This shows visitors' boundless choice in bundling any of the experiences visitors seek to encounter when *en route*.

6 Conclusions and Implications

The results of this study indicate that travel through Northern Indiana is highly structured in that it is served through a small number of key attractions/communities; these core places function as important hubs routing travellers throughout the destination. It was also found that the visitors to the area "bundled" together a number of different experiences as they navigated through the area. Furthermore, none of the core places (except the VC) are attractions for tourists only. Last, a large majority of the places were mentioned only once or twice, implying a high diversity in tourist activated networks for the destination.

It is argued here that the network structure provides a strong and practical basis for dynamically bundling products that create value for tourists and the destination. Incorporating knowledge about visitors' combination of *en route* experiences enables DMOs to develop knowledge-based recommender systems with tailored choices for subsequent experiences (Schmeing, Cardoso and Fernandes, 2006). In the case of Northern Indiana, recommendation systems might suggest smaller, less known places along the route that the travellers are currently following. Or, given the fact that a visitor has started out at a core attraction, the system might suggest a unique itinerary comprised of a series of attractions, restaurants and rest areas which are seemingly unrelated but follow a more interesting path through the area. Following the notion of tourist activated networks, tourist firms "activated" through the recommendation system can be informed to include the new bundles in their products/services offered.

It is, however, important to recognize that information on tourists' travel paths alone is not sufficient for truly personalized recommendations. Thus, further research should focus on the integration of spatial movements with personality and preference based recommendation systems in order to better enhance the tourist experience while enabling tourism firms to develop innovative partnerships. In addition, studies are needed to examine the extent to which tourist firms can actually use IT to better support the development of dynamic bundling systems as well as other barriers to the development of dynamic packaging systems.

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Information Elements on DMO-Websites: Alternative Approaches for Measuring Perceived Utility

Karin Teichmann
Andreas H. Zins
Institute for Tourism and Leisure Studies
Vienna University of Economics and Business Administration, Austria
(karin.teichmann, andreas.zins)@wu-wien.ac.at

Abstract

Information utility has become a major issue in consumer research since providing useful and relevant information is a key factor for the success of destination marketing organisations (DMO). This study compared six different approaches for measuring perceived utility (importance) of information elements on city tourism (CTO) organization websites: group discussion, rating, partial ranking, choice-based conjoint analysis (CBC), adaptive conjoint analysis (ACA) and maximum difference method (MaxDiff). Results showed that simple, compositional methods achieved a more consistent weight pattern compared to the conjoint approaches. The degree of complexity and level of abstraction seem to be responsible for the biases occurring in these techniques. On the other hand, the quality and content of CTO web sites vary to a large extent. Despite different weighting schemes for eight different content areas, by and large, the best and worst web sites remain the same.

Keywords: rating, ranking, ACA, CBC, MaxDiff, CTO web sites, destination

1 Introduction

Understanding how people acquire and use information has been a major concern in consumer behaviour literature. Since information search represents a stage in the decision process where consumers are sensitive to external influences, marketers devote a lot of effort to communicate their services (Schmidt & Spreng, 1996).

Research on the Internet as an information source has mainly focused on issues of credibility or trust and on issues concerning the interface such as ease of use and design (Fogg et al., 2001; Schlosser, White & Lloyd, 2006). Hence, most studies examine the functional role of the Internet as an information source. Much less research has been conducted in the field of exploring how useful the content of a web site actually is and how important different content characteristics are. As people increasingly use the Internet for destination information, destination marketing organisations need to understand how to maximize the utility of information elements on their web sites. A valid instrument measuring utility is therefore essential in order to allocate marketing resources appropriately. Thus, this study aims primarily to examine which elements of a destination website are useful for the planning process of vacations to a city destination.

Different instruments can be considered in order to measure utilities. However, little is known about how and to what extent these instruments cause differences in measuring utility. Especially from a practical view, the degree to which measurement instruments vary is interesting in order to decide for the most accurate, reliable and efficient. Therefore, this study additionally aims at comparing alternative ways of measuring the utility of information elements on/of a DMO-website. The instruments are also evaluated in terms of practicability for self-administered questionnaires.

2 Theoretical Foundations

Many studies outlined the importance of the Internet as information source for vacation planning. The Internet as a search medium offers not only comfort and low cost but also interactivity between persons and units such as business entities. Thus, the Internet "[...] can subsume many different physical sources of information, including mass media, person-to-person word-of-mouth communication, expert reports and opinions, and store-based product displays" (Peterson & Merino, 2003 p. 112).

Official destination web sites provide information for potential visitors and serve the function of promoting and marketing the country, state/province or city. Choi, Letho et al. (2007) emphasise the role of DMO web sites to communicate destination image. The more features the web site incorporates the more it can meet the needs of consumers at different information consumption stages. For instance, at the pre-decision stage, information about accommodation, flights, weather, maps and attractions are the most important elements searched. After the decision has been made, more specific DMO web sites are consulted (Choi, Lehto & Oleary, 2007).

Sutcliffe (2002) proposes a model of web site evaluation based on three stages: initial attractiveness, exploration and navigation, and transaction. Attractiveness of the web site is the key factor for further browsing and refers to aesthetic design as well as content. Five content aspects contribute to overall usability assessment: consistent visual style, visibility of identity and brand, matching arousal to user's mood and motivation, stimulating users' interest by secondary motivation, and selecting content to suit users' requirements (Sutcliffe, 2002). User satisfaction is another issue that contributes to the evaluation of a web interface (Zhang, von Dran, Small & Barcellos, 1999).

Besides the general use of the Internet as information source, issues of perceived utility and usefulness of information provided via Internet have emerged in information search literature (Snepenger, Meged, Snelling & Worrall, 1990). Research has focused on how useful different features of tourism web sites are for travel planning. Kaplanidou and Vogt (2006) identify navigation, content and accessibility as major determinants of a DMO's perceived usefulness. Navigational characteristics refer to a web site's well-defined set-up whereas the content represents a combination of written and visual elements of travel information. How easily

accessible a web site is refers to the third hypothesized determinant of Kaplanidou and Vogt's perceived usefulness construct. However, results only support that content significantly determines the extent of a destination web site's usefulness in planning a trip. No significant relationship could be found for navigation or accessibility.

In their qualitative meta-analysis about success factors for destination marketing web sites Park and Gretzel (2007) screened more than 150 papers published between January 1997 and September 2006. After having identified more than 700 different concepts they present a unified framework defining the following nine commonly used success factors: 1. information quality; 2. ease of use; 3. responsiveness; 4. security/piracy; 5. visual appearance; 6. trust; 7. interactivity; 8. personalization; and 9. fulfilment. Interestingly, information quality tops the list of tourism publications as most often used criterion followed by ease of use and security/privacy. The fulfilment factor representing order processing, billing accuracy, online booking process and confirmation can be most often found outside the tourism literature; however information quality has the second rank in close distance.

Common to most studies is the operationalization of perceived utility as one-item, ad hoc question about how useful consumers perceive information about the travel product as a whole or about product components (Nishimura, Waryszak & King, 2006; Fesenmaier & Vogt, 1992). Clearly, this measurement rather focuses on a general perception of usefulness and does not consider the degree of distinctiveness or different elements of the information provided. This is, however, a vital issue as DMO web sites significantly differ in their richness of information provided as well as information value.

Literature on utility measurement distinguishes compositional methods and decompositional techniques (Holbrook, 1981). The compositional approach aims at assessing utilities for single attributes and adding these single utilities in order to get the total utility of a product. For decompositional techniques, holistic evaluations of complex, multiattribute stimuli are used in order to get utilities for single attributes. Bonifield, Jeng and Fesenmaier (1997) compared three different approaches to assessing the relative importance of different motivations for travel. They concluded that conventional methods such as Likert-type scales or constant-sum scales yield more consistent results compared to a conjoint measurement. For the current study no consistent recommendations for a particular measurement technique could be derived from previous findings. The information service of a DMO website can be varied, complex or quite simple and restrictive in content. Whereas the decompositional approaches favour a more holistic measurement of utility and importance values, the compositional methods are much easier to handle, yet favouring the inflation of stated preferences.

3 Methodology

The study is divided into two parts: a content analysis and a self-administered survey. The content analysis of 59 official city tourism organisation (CTO) websites identified frequently used content elements. The cities were chosen from all continents and represent the major spots of city tourism in the world (see Table 1). This analysis resulted in a list of 48 different content criteria allocated to nine different categories: complexity of the web site, sights and activities, offers relating to distinct target groups, accommodation, (public) transportation, additional information, news, contact facilities and language. Complexity represents a summary count on how many categories and criteria did provide any information at all. For languages only the number of different language versions in addition to English was recorded. Under the category sights and activities available information was observed for the following criteria: sights, cultural offers, night life, shopping, wellness, sport, history, congress, events and restaurants/bars. Similarly, information for the following target groups and segments were investigated on each web site: children, senior citizens, singles, families, organized groups, business travellers, gay & lesbian, eco-tourists and handicapped. For accommodation, the following content elements were differentiated: booking facilities for hotels, external links to hotels and hotel chains, and a hotel guide. Transportation and mobility aspects are covered by information on public transportation, city maps, arrival by car, arrival by train, and external links to train, airline, car rental and taxi companies. Access to press releases, FAQs, a travellers' forum, hints and general geographic and climate information on the city were classified under additional information. News information was observed through the availability of a new ticker, a news section, weather information and currency exchange rates. Finally, contact facilities were recorded by different channels: telephone, fax, email, postal address, a service hotline, the addresses of information offices; and by the contact details about the CTO team members.

Table 1. Alphabetical list of 59 official CTO web sites inspected

Amsterdam	Cape Town	Jakarta	Montreal	Perth	Sydney
Athens	Chicago	Jerusalem	Moscow	Prague	Tokyo
Auckland	Dallas	Copenhagen	Munich	Queenstown	Toronto
Bangkok	Delhi	Las Vegas	New Orleans	Rio de Janeiro	Vancouver
Barcelona	Denver	Lisbon	New York	Rom	Venice
Beijing	Dublin	London	Nice	San Francisco	Vienna
Berlin	Hanoi	Los Angeles	Oman	St. Petersburg	Warsaw
Budapest	Hong Kong	Madrid	Orlando	Shanghai	Wellington
Buenos Aires	Honolulu	Melbourne	Oslo	Singapore	Zurich
Cairo	Istanbul	Miami	Paris	Stockholm	

In general, a simple dichotomous value (0=not available, 1=available) was sufficient for recording the absence or presence of this piece of information. A value of "2" was assigned for interactive solutions in the sub-categories of public transportation, city map, arrival by car or train, event calendar, and restaurant guide. Overall, the quality of the information was assessed at category level.

The web site of Singapore was used as a best practice reference and served a basis for comparison. Where no differentiation was meaningful a value of "2" was assigned: categories complexity, news, contact and language. For the remaining five categories (sights and activities, offers relating to distinct target groups, accommodation, (public) transportation and additional information) a good quality impression was awarded by a value of "3", a rather bad impression yielded a value of "1". Finally, the scores within each category were rescaled by setting the maximum value to 1. As an intermediary result of this first step of content inspection the ratios of nine content categories are available for 59 CTO web sites. These data can be used as input material for any scoring model which considers external variables such as goals or utility functions from managers or travellers.

In order to compare utilities derived from different measurement instruments, direct as well as indirect methods were included in the survey using a web based questionnaire (see Figure 1): rating, partial ranking, choice-based conjoint analysis (CBC), adaptive conjoint analysis (ACA) and maximum difference method (MaxDiff; Cohen & Neira, 2003).

A self-administered survey was used for the second part of the present study to assess the utility function of travellers with respect to various content elements. For this quantitative approach, a convenience sample of 126 travel interested people from Austria evaluated the content categories previously identified by the content analysis. To create reasonably high processing involvement, instructions advised the subjects to "consider yourself a person who has just booked a trip to a city you have never been before".

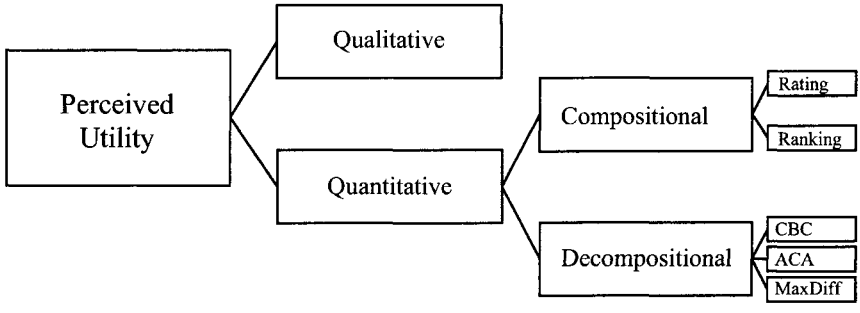

Fig. 1. Measurement approaches in this study

During an initial step devised to familiarize with the given criteria (except for complexity) and their corresponding qualities, screenshots of different CTO web sites were presented and described verbally. Only these verbal descriptions were used in the consecutive tasks to avoid the recall and evaluation of a particular CTO web site. For each category a rather unpretentious parameter value was opposed to a more sophisticated one. The option "not available at all" was unrealistic for all categories for each of the inspected cities. Hence, this characteristic could not be used.

To provide some external point of reference a more qualitative approach to determine relative importance values for each of the nine content criteria was followed. Five graduate students (3 female, 2 male) assessed the constructs after a tutorial lecture. The students assigned 100 points to the criteria they perceived the most important when planning a city vacation. The remaining criteria were evaluated relative to the most important construct and the subjects subsequently reported the rationale for their decision in a group discussion. In order to specify importance weights, first, the means for each construct were calculated and, in a second step, divided by the sum of the means of all constructs (see Table 2).

The questionnaire with the other five methods was pre-tested. This pre-test showed that the choice-based conjoint analysis needed to be excluded from the questionnaire. Respondents raised too many concerns about delivering consistent ratings about the presented web site variants. In the survey, respondents were asked to rank the top five attributes by their importance first and, in a second step, to rate all attributes on a 4-point scale from "very important" to "unimportant". The conjoint analysis aims at examining preferences in a series of product profiles by measuring trade-offs between different levels of profiles (Bonifield, Jeng & Fesenmaier, 1996). For the adaptive conjoint analysis (ACA: Green, Krieger, Agarwal & Johnson, 1991), each content category was represented by two levels. Respondents, first, had to indicate how preferable the categories of a web site are on a 7-point scale to arrive at initial estimates for the paired comparison section. During the next phase of the ACA preferences were estimated by comparing pairs of web site profiles. In the last phase, respondents received three web site descriptions which they had to rate on a scale from 0 ("do not agree at all") to 100 ("totally agree") in order to calibrate and validate respondents' utility scores. The last part of the survey comprised the MaxDiff method. Respondents had to select the most important category as well as the least important out of a set of five features. This process was repeated eight times for each respondent. The data gathered from the MaxDiff section of the questionnaire were subject to multinomial logit analyses to assess the individual utilities for each of the content category.

4 Results

Table 2 shows importance values for each category and measurement instrument. The qualitative approach (second column) reveals that the category "sights and activities" (19%) is the most useful element perceived on a CTO web site followed by

information about accommodation (14%). The values for the ranking method are calculated by their top five occurrences in relation to all records. As the table depicts, "language", "transportation & mobility" and "sights & activities" are elements with high perceived utility. The means for the rating method (1="very important" to 4="unimportant") show similar results except for "language" which ranks in the middle field of important information elements. Apart from this deviation, the ranks follow the same pattern like the partial ranking method.

The first decompositional method applying an adaptive version of a partial profile conjoint analysis reveals completely different results. The score for language versions shows the least importance whereas the remaining seven criteria do not differ significantly. Information on attractions and activities ranks on top similar to the ranking of the group decision process. The second decompositional method (MaxDiff) highlights completely different importance values: language versions are outstanding with three times the importance weight of sights & activities or transport & mobility. Information on accommodation is ranked much lower compared to the other methods.

Leaving any technical arguments in favour or against one of the measurement techniques aside, the derived weighting schemes can be applied to complete the scoring model for 59 CTO web sites initiated by the content analysis. The situation assuming equal weights for all criteria (first column) of Table 3 and 4 can be compared with the weighted results. For the sake of simplicity and overview only the top and bottom ten cities are listed in Table 3 and 4.

Table 2. Importance weights for content categories

Category *N = 126*	*Group decision*	*Ranking (Top 5)*	*Rating*	*ACA*	*MaxDiff*
Complexity of the web site	0.10	n.a.	n.s.	n.s.	n.s.
Languages of the web site	0.10	0.20	2.25	7.1	46.9
(Public) Transportation	0.13	0.19	1.53	13.0	13.9
Sights & activities	0.19	0.17	1.73	14.4	14.4
Accommodation	0.14	0.14	1.97	12.8	6.8
Additional information	0.11	0.10	2.08	13.5	2.7
Offers for special interest groups	0.09	0.09	2.43	13.7	3.5
News	0.08	0.08	2.67	12.9	6.3
Contact facilities	0.06	0.03	2.70	12.7	5.4
Sum	1.00	1.00		100%	100%

Note: Rating scale 1 "very important, 4 "unimportant".

The variation of city names on the ranks reflects the sensitivity of the scoring model with respect to different importance weights. The overall discriminative power is ascertained by the fact that on a normalized scale from 0 to 100 each method covers a range between 13 and 76. Definitely, Singapore achieves consistently the first rank with scores above 70. No other city passes this threshold. Overall, the top list reveals a very stable picture with Singapore, Vienna, Vancouver, Berlin and Melbourne. Even the somehow deviating ACA weights result in quite similar values and ranks compared to the other methods. The MaxDiff method seems to incorporate some biases. Amsterdam and Prague can be found among its top ten which do not show up on the other lists.

Table 3. Top 10 list of CTO web sites depending on weighting scheme

Unweighted	*Group decision*	*Ranking (Top 5)*	*Rating*	*ACA*	*MaxDiff*
Singapore	Singapore	Singapore	Singapore	Singapore	Singapore
Vienna	Vancouver	Vienna	Vienna	Vancouver	Vienna
Vancouver	Vienna	Vancouver	Vancouver	Vienna	*Amsterdam*
Berlin	Berlin	Berlin	Berlin	Berlin	*Paris*
Oslo	Melbourne	Melbourne	Melbourne	Melbourne	Berlin
Melbourne	Oslo	Munich	Oslo	Oslo	Hong Kong
Hong Kong	Dublin	Dublin	Perth	Perth	Vancouver
Munich	Munich	New York	New York	New York	Prague
New York	Perth	Oslo	Munich	Hong Kong	Munich
Perth	*Wellington*	Perth	*Cape Town*	Dublin	Melbourne

Table 4. Bottom 10 list of CTO web sites depending on weighting scheme

Unweighted	*Group decision*	*Ranking (Top 5)*	*Rating*	*ACA*	*MaxDiff*
Athens	*Tokyo*	Oman	Orlando	Orlando	*Beijing*
Oman	Cairo	Athens	Oman	Oman	Athens
Moscow	Moscow	Queenstown	Queenstown	Chicago	Chicago
Orlando	Warsaw	Warsaw	Warsaw	Warsaw	Moscow
Warsaw	Athens	Buenos Aires	Chicago	Hanoi	Buenos Aires
Cairo	Orlando	Hanoi	Cairo	Queenstown	*Honolulu*
Shanghai	Shanghai	Cairo	Shanghai	Cairo	Oman
Chicago	Buenos Aires	Moscow	Buenos Aires	Shanghai	Cairo
Hanoi	Chicago	Chicago	Hanoi	Moscow	Shanghai
Buenos Aires	Hanoi	Shanghai	Moscow	Buenos Aires	Hanoi

An analogous stable rank list can be found at the bottom of the 59 cities (see Table 4). Hanoi, Buenos Aires, Chicago, Cairo, Shanghai and Moscow seem to end the list in terms of usefulness of their offered CTO web sites. Again, the MaxDiff weighting brings two cities in the list of bottom ten (Beijing, Honolulu) which has no equivalent within the results of the other approaches.

5 Discussion and Implications

This study aimed at comparing five different approaches for measuring perceived utility of CTO web site elements: rating, partial ranking, choice-based conjoint analysis (CBC), adaptive conjoint analysis (ACA) and maximum difference method (MaxDiff). The visualisation of experimentally configured web sites using short verbal descriptions was too complex and fuzzy for the respondents to give consistent ratings. Therefore, the CBC approach was eliminated after the pre-test. For analytical purposes, the naïve approach assuming equal weights for the identified content criteria was considered to complement the remaining four techniques.

The importance values generated by a convenience sample of respondents interested in city travelling reflect a situation where the traveller has already decided to visit the particular destination. Therefore, the perspective of persuasiveness of a CTO web site was intentionally not investigated. With reference to the aggregate results the different methods reveal some convergence overall, yet differ in many details.

The issue of language versions merits special attention. For any individual traveller it would suffice to find a web site in one language: in one's mother tongue. This is the reason why the evaluation of options in this respect is not so straight. When considering this aspect independently, the methods (rating, partial ranking, MaxDiff) supported the respondents in discriminating between the two quality levels "country language only" vs. "country language + at least English". The differences between both importance values are extremely high. The ACA method using compound ratings for pairs of web site profiles does not reflect the language relevance in the same way. It can be argued that the basic assumption of compensatory relationships between the used criteria is violated, especially for the language issue. It seems plausible to assume that the best web site in terms of usability and content does not create utility to somebody who does not understand the language used in the web site.

Large differences between two quality options – see language example above – of a characteristic can be interpreted as a measure of importance. This is the default approach used in deriving weights in conjoint analyses. However, if two options are perceived relatively equal but equally important or useful, such a difference score loses ground. This happened e.g. with evaluating information on transportation & mobility applying the rating technique. This example shows that it is not irrelevant to consider the particular levels when evaluating the importance of this characteristic. Therefore, it is recommended to take the variety of realistic options and variants into

account and to incorporate them into studies about importance and relevance of features.

Partial profile methods such as ACA and MaxDiff have the potential to view products from a holistic perspective and to enforce making trade-offs. However, information services like a CTO web site have already such a high degree of complexity that the precise representation – be it graphically or verbally – cannot be easily achieved at the abstract level. Results from the conjoint methods seem to be more skewed and biased compared to the other techniques (see similar conclusion in Bonifield, Jeng & Fesenmaier, 1996). On the other hand, it is not trivial how to transform ratings and ranking results for different options or levels of a characteristic into a uniform importance score for this particular characteristic.

This study provides important managerial implications. Practitioners can evaluate their web sites on the basis of using the least costly technique since the results suggest three content areas that achieve high importance ratings with all measurement methods: information on sights & activities including cultural offers, attractions, restaurants and nightlife. Almost equally important is the question of how to get around in the destination. City maps and information about the public transportation system and other mobility infrastructure are most relevant. Accommodation guides, links and reservation facilities rank on third place but are still very important in general. Additional information covering press releases, user forums and detailed geographic information show a consistent middle rank. News, contact facilities and information for special interest groups are much less relevant. Altogether, these results on average importance values for content elements can act as guidelines for the design and content management strategy for a CTO web site. Those information areas providing the highest utility for travellers preparing a trip to this destination should be arranged and maintained with utmost prudence. Content areas with a much lower attention and importance weight should not be overemphasized in terms of effort and web space. Despite the differences inherent in the measurement approaches for deriving importance values the application of these weighting schemes within a complete scoring model yielded basically convergent results for best/worst CTO web sites. This sign of robustness is essential if interested web site designers and content managers try to learn from good or best practice examples.

This research could be extended in various directions: Firstly, where applicable, the internal consistency of the different measurement techniques could be investigated at the disaggregated level. Secondly, the existing scoring model for 59 CTO web sites could be inspected in more detail for each content category. Importance scores can also be gathered and analyzed for different groups: different types of travellers with different travel styles and/or from different representatives of the supply side.

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Implementation of a Destination Management System Interface in Tourist Information Centres and its Impact

François Bédard[a]
Marie Claire Louillet[b]
Alix Verner[a]
Marie-Claude Joly[a]

[a]École des sciences de la gestion, Université du Québec à Montréal
bedard.francois@uqam.ca
[b] Institut d'hôtellerie et du tourisme du Québec

Abstract

The aim of this paper is to understand the conditions for a successful implementation by the tourism ministry of a North American tourist destination of a destination management system (DMS) interface in local tourism information centres (TICs) located in its territory, and to comprehend the context, objectives, and impact of such an initiative. The Bédard model for adaptation to information technology (IT) in the service sector was used as the theoretical framework in this research. Two main data collection sources were employed: face-to-face interviews with the Ministry's project leader and phone interviews with the TIC coordinators participating in the DMS interface implementation. Main findings show that TICs located in major urban centres are using DMSs to make reservations, while TICs located in more rural areas prefer to maintain direct contact with hotels. Working relationship, training, financial support and technical support were identified as main factors in adopting the interface.

Keywords: destination management system; DMS interface; tourist information centre; SME adaptation to technology.

1. Introduction

Tourist information centres (TICs) are found in most destinations around the world. In general, they are small-sized, community-based organizations. Several operate only during the high tourism season. The financial structure is not the same in all locations: some are financed by member fees, others by local, regional, or national authorities, and still others by a combination of these sources. Each TIC has the mission to attract tourists within the geographical limits of their particular territory to generate maximum revenues for its members. The information the TICs provide to visitors is generally limited to the products, services, and attractions located within the territory's borders. Taking available financial resources into account, the use of Information and Communication Technology (ICT) by TICs is relatively limited (UNWTO, 2004). Called to work with TICs located in their destination, on a country-, province-, or state-wide scale, Destination Management Organisations (DMOs) are primarily oriented to visitors while TICs are mainly oriented toward serving tourists with information provided by their members. As such, it is in the DMOs' best interest see to it that TICs are able to adequately inform their visitors on the

products, services, and attractions not only in their town or immediate region but also throughout the entire destination, and to make a reservation when necessary. From there, DMOs must be equipped with a strategy for convincing TICs to alter their behaviour, thus creating cooperation between the two. Deploying DMS interfaces in TICs could be a winning strategy for a DMO in possession of such a system. Frew and O'Connor (1999; 1998) recommend assessing the implementation success and the impact performance. The aim of this paper is to understand the conditions for a successful implementation in TICs of a DMS interface operated by a tourism ministry, and to comprehend the context, objectives, and impact of such an initiative. Included in this paper are the factors that led the TICs to adopt an inter-organizational IS such as the DMS, the DMS measures of success, as well as its impacts on the TICs. The paper is comprised of the following sections: introduction, theoretical background, methodology, results, conclusions, and future work.

2. Theoretical background

There are several conceptualizations of management systems used by destinations (Buhalis, 2003; Buhalis & Spada, 2000; Chen & Sheldon, 1997; O'Connor, 1999). Each definition translates into a different view of the system: an information system, a distribution channel, a strategic management system, or an inter-organizational information system (IOIS). Chen and Sheldon (1997) define DMS as an IOIS that groups tourist product and service suppliers and, on the one hand, offers consumers and intermediaries easy access to complete information (maintained, up-to-date, and relevant to the tourist destination's facilities), and, on the other hand, the ability to make a reservation. This definition was selected for the purpose of this paper as it defines a DMS as the IT infrastructure of the DMO and as an enabling mechanism to support a working relation between DMOs and TICs.

Bédard's "Adapting to New Technologies in Services" model served as a framework to study the implementation of the IT infrastructure in an inter-organizational context (see Table 1). The model, represented by a pyramid, encompasses most of the dimensions pertinent to the DMS interface implementation. One of the three fundamental aspects of adapting new technologies in services – training, adoption, or use – is identified at each extremity of the pyramid. The term "training" is used here in a broad sense and encompasses the activities of sensitization, observation, and diffusion of knowledge related to new technologies. Another important facet of the pyramid deals with the adoption of technologies. Several questions arise in this regard: How much of the business budget should be consecrated to acquiring new technologies? Which technologies truly respond to the needs of the company? Which suppliers offer the best quality / price ratio for products and technological solutions? What are the advantages of being part of a network that supplies technological solutions? The use aspect refers to how businesses use new technologies. Two main types of use corresponding to specific technologies can

be distinguished: technologies related to the business' internal operations (e.g., management, control) and those related to marketing activities (distribution, promotion, advertising, building customer loyalty). Finally, the pyramid is inserted into a frame where the sides are identified by four words – partnership, merger, alliance, and consortium – each expressing a form of association. This frame exemplifies the present trend where businesses from the same industry band together to better tackle the challenges of the new economy.

The study of IS success antecedents helps to further understand the factors that lead to the adoption or the successful implementation of an IS such as a DMS. Larsen (2003) identified the following five categories: (1) constructs related to technologies, such as support and artefact quality; (2) concepts related to IS expertise, such as the organization's maturity in IS; (3) organizational dimensions, such as structure, environmental complexity, and inter-organizational relationships; (4) communication about tasks; (5) individual and job-related dimensions.

DeLone and McLean (2003; 1992) define IS success as a multidimensional concept. Their model's six categories include IS adoption factors and factors that are consequences of IS use: (1) system quality measures technical success; (2) information quality measures semantic success; (3) the quality of the service provided; (4) use, (5) user satisfaction, (6) individual and organizational impacts measure effectiveness success.

Given the definition of a DMS as an IOIS (Chen & Sheldon, 1997), the IOIS success framework also offers relevant adoption factors that relate to the external frame in Bédard's model (2001) such as: (1) collaboration, (2) organizational factors, and (3) technologies (Kumar & Crook, 1999). Collaboration factors combine economic, strategic, and social elements (such as value sharing and trust) and conflict management. Organizational factors group dimensions related to the organization (size and resources), the individual (involvement, task importance, and time), and leadership style. Lastly, technological factors include security, standardization, system integration, and level of IS competence.

Certain dimensions in the organizational context are common to most ISs, such as training, upper management involvement, implementation planning, estimation, and impact evaluation (Bergeron & Raymond, 1992). The availability of significant financial resources and technological skills are key success factors for an organization initiating the IOIS (Iacovu et al., 1995; Zhu et al., 2004). Concerning the technological context, the organization's skills and its technology readiness are measured by the intensity of its technological use in general (Zhu et al., 2004) and the degree of integration of the new IOIS with other ISs already present in the organization (Bergeron and Raymond, 1992; Iacovu et al. 1995; Zhu et al. 2004). The diversity of commercial interface functionalities (Zhu et al., 2004) and the diversity of commercial partners are also positive factors in the adoption of IOISs (Bergeron & Raymond, 1992; Iacovu et al., 1995).

Table 1. Conceptual Framework

DIMENSIONS	VARIABLES
Adoption	- **IS quality**: Ease of use, functionality, reliability, flexibility, data quality, transportability, integration, and importance. System response time (DeLone and McLean, 2003); IT quality (Larsen, 2003); diversity of interface functionalities (Zhu et al., 2004). - **Information quality**: Contents that can be personalized and are precise, complete, relevant, coherent, easy to understand, and secure (DeLone and McLean, 2003). - **Service quality**: Stems from the SERVQUAL marketing tool and measures the tangible aspect, reliability, reaction speed, and empathy exhibited to the user (DeLone and McLean, 2003). - **Individual and job related factors**: communication about task (Larsen, 2003). - **Organizational factors**: expertise in IS; organizational structure and complexity (Larsen, 2003); level of IS competence (Kumar and Crook, 1999); technology readiness, and financial resources (Iacovu et al., 1995; Zhu et al., 2004).
Training	- Communication about tasks, individual and job related dimensions (Larsen, 2003) - Upper management involvement (Bergeron and Raymond, 1992)
Use User satisfaction	- Typically voluntary behaviour or based on manager judgment; precedes benefits but does not create them; measured in terms of frequency, navigation time, number of accesses, mode of use, and dependence (DeLone and McLean, 2003). - Perceptual measure of user opinion for the duration of use (DeLone and McLean, 2003)
Net benefits	- **Individual benefits**: efficiency or better performance on the level of task, work and decision-making, work environment quality (DeLone and McLean, 2003) - **Organizational benefits**: strategic benefits, efficiency, control, cost reduction, including research costs, market breadth, and additional sales (DeLone and McLean, 2003)
Partnership, merger, alliance, consortium	- **Adoption factors of IOIS**: Collaboration, value sharing, trust; organization size and resources system integration (Kumar and Crook, 1999; Zhu et al., 2004); diversity of commercial partners (Bergeron and Raymond, 1992); partner power, dependence, coercive measures, recommendations, incentives, normative pressure (Chwelos et al., 2001; Iacovu et al., 1995; Teo et al., 2003); mimicry or isomorphism (Barringer and Harrison, 2000; Teo, et al, 2003); trust and commitment (Lee and Lim, 2005); government influence, incentives or regulations, increased security, credibility (Zhu et al., 2004). - **Inter-organizational or societal benefits**: partnership (DeLone and McLean, 2003)

Source: Adapted from Bédard's Adapting to New Technologies in Services model (2001)

Finally, regarding the participation in IOISs, (1) resource dependence (Teo, Wei & Benbasat, 2003), (2) cooperation, (3) partner's power (Ramamurthy,

Premkumar, and Crum, 1999), and (4) inter-organizational trust influence the adoption and success of IOISs. The sponsor organization implements the IOIS that meets its particular needs (Cavaye & Cragg, 1995), whereas the participating organization (the TICs in this case) adopts IOISs at the request of its partners (Bergeron & Raymond, 1992; Iacovu et al., 1995; Teo et al., 2003). The initiating partner exercises its influence by making recommendations, offering a compensation system, or using coercive or threatening measures (Chwelos et al., 2001; Iacovu et al., 1995). Governments have a great influence on IOIS adoption and its success stems from either incentives or regulations, which can increase the security and credibility of electronic transactions (Zhu et al., 2004).

3. Methodology

In the spring of 2007, in-person interviews were conducted with the Ministry's project leader (DMO). The aim of the DMO interview was to reveal the ministry's objectives for carrying out this initiative and the different steps that led to implementing the DMS interface in the TICs. Semi-structured phone interviews were conducted in the summer of 2007 with the TIC coordinators participating in the DMS interface implementation. Qualitative interviewing explores the shared meanings that TICs coordinators and the DMO project leader develop and provides valuable information concerning the operation of the TICs (Langley, 1999; Rubin & Rubin, 1995)

The interview framework was developed based on the conceptual structure presented in Table 1. The discussion framework and a description of the survey's goal were emailed by the Ministry's project leader to the supervisors of the 88 TICs using the interface. It closed with an invitation to interested supervisors to schedule a telephone interview date with a member of the research team. Discussions were held with 16 responding TIC supervisors. Among these, one supervisor coordinated three establishments and two others coordinated two establishments each. Consequently, the survey amassed information on 20 of the 88 participating TICs. This number proves satisfactory because the information collection showed that the empirical saturation point for acquiring new knowledge (Bertaux, 1981) was attained within the first 14 discussions.

In fall 2007, to improve their reliability, the interview results were triangulated with the information that the DMO collected during its annual meeting with the TICs.

4. Results

Findings of the interview with the Ministry's project leader

The Ministry decided to implement an interface, specially created for the TICs on its territory and based on its DMS, in order to (i) improve the quality of the

service provided by the TICs by giving them access to highly developed technological tools, and (ii) strengthen the working relationship between the Ministry and the TICs. The interface allows each participating TIC to respond to information requests on the entire destination and not only on its particular area. It also allows TICs to provide a free reservation service (single nights and packages) and to collect data to better understand their clientele. The interface is made up of the following components:

- Information functionalities: information search by text, category, region, etc.
- Reservations functionalities: allows to reserve in specific establishments
- Packages functionalities: package reservations, choice by region, types of packages (adventure-ecotourism, casino, family, etc.), date, etc.
- Bargains functionalities: presentation and reservation possibility for monthly promotions (i.e., a discount of at least 20% on regular rates)
- Survey on tourism clientele: gathers information on the clientele (postal code, destination, etc.)
- Survey reports: allows to consult surveys
- Interactive mapping: allows to build itineraries for clients

The project's eligibility criteria were determined by the Ministry in consultation with representative associations in the field. The following criteria were retained for the TICs: be officially recognized by the Ministry, have access to high-speed Internet, be willing to offer reservations and information on the entire geographical area covered by the Ministry. Priority was given to two of the most frequented centres in each of the 20 tourist regions of the territory. Then, participants were chosen with regard, in part, to the strategic importance of their location in the area as well as to the number of visitors served.

The Ministry presented the project to the tourism industry during its annual meeting with the TICs. Meetings were then held with those in charge at interested TICs to show them the interface, confirm their interest in the project, learn the internal functioning of their centre, and validate the physical locations of the future workstations. The following services were offered to TICs participating in the project: informational and transactional content from the Ministry's visitor network, search and reservation engines, interactive mapping, a tool to gather data on clients, reports stemming from survey data, a workstation for customer service clerks, printed training tools such as training manuals for supervisors and employees, training sessions for supervisors, and, finally, a help and support service available seven days a week. The emphasis was placed on training TIC supervisors, who would, in turn, train their employees in the proper use of the interface. Twelve training days were held in different regions of the territory. Some 75 TIC supervisors participated in these sessions. The materials distributed during these sessions included computer-assisted training (CAT) information, one user manual for the supervisor and one for the tourist information clerk, a user's folder (training plan, exercises, etc.), as well as promotional stationery and other items (summer scarves, mouse pads, etc.).

Furthermore, the Ministry set up a coaching service for supervisors who took part in the training sessions. This personalized follow-up with each supervisor took place on-site at each of the TIC offices. The coaching included a review of the training received, the study of specific practices at the TIC, familiarization with the reservation functionality using the interface, the use of sales techniques to provide a personalized experience to each tourist, and information on access routes to the major urban centres.

Interface implementation began in 2005 with a pilot project in which six TICs participated. In 2006, 43 TICs from 16 of the 20 tourist regions of the destination had used the interface. In the summer of 2007, the period during which this article was written, 88 TICs were using it. The goal of a network of 100 TICs using the interface should be achieved in 2008.

Findings from the interviews with TICs participating in the project

Among the TICs interviewed, 13% implemented the DMS interface in 2005, 31% in 2006, and 56% in 2007. Differences in opinion regarding the decision to implement the interface are not correlated based on the size or location of the TIC, nor on the year of interface implementation.

Acquisition /Adoption

A large majority of respondents declared that their decision was strongly influenced by the trust they have in the tourism ministry as well as by the free workstation and the free technical support provided by the Ministry. TICs located in urban centres adopted the DMS interface because it provided online access to an up-to-date inventory of hotel rooms.

Training

Almost all of the supervisors regarded the training received within the framework of the project as perfectly adequate. Supervisors considered the manual explaining how the interface works as the most useful tool in their training. Telephone support, the interface user manual for tourism information clerks, and the user folder were ranked ex aequo in second place. The large majority of respondents found the email support as well as the coaching visit useful. No major changes were suggested regarding these training activities and tools; any comments concerning them centered on technical specifics or the logistics related to the length of the training or the availability of the proffered support. Of all activities, only the online training was considered to be of little or no use; in fact, the large majority of respondents declared themselves indifferent to or unsatisfied with this activity. At the time the survey was conducted, half of the respondents had already had the opportunity to use the online training activity. Their opinions were equally divided into two groups: one half found it very useful, while the other half found it not at all useful. Lastly, more than half of the respondents affirmed having had sufficient time to adequately train their staff, while a third of them felt that they lacked the time required for this task.

IT uses

A large majority of respondents declared that their decision to use the DMS interface was strongly influenced by the quality of the contents in the information files on tourist products and services. Other factors also affected the decision to use the interface, but in smaller measure. These include: telephone support, system response time, transaction security, system flexibility, information availability, improved internal operations, and the quality of information supplied in response to tourist requests.

The results on interface use are presented based on the use of the nine functions or applications: information, bargains, reservations, mapping, survey data, report module, survey modification management module, user creation/modification management module, and currency converter tool.

- Information

This function is frequently or very frequently used by nearly one-third of the TICs to search for information on areas other than their own. A great majority of people who use the application report being satisfied or very satisfied for the following reasons: ease of use, the system's speed and accessibility, the research criteria, relevance of the results, up-to-date information in the files, and the presentation of the results. Relatively speaking, TICs located in a major urban centre use this function more than others. However, they also critique this function. Suggested improvements concern user-friendliness of the interface, accessibility and system speed, search criteria and result relevance, and finally, file updating. In regard to researching information on their own area, the majority of TICs rarely or never use the information DMS database, preferring to use their printed tourist guides. Respondents claim to have a good knowledge of the local offering and believe that their own database is more complete than the interface's information tab, especially concerning hotels, tourist attractions and circuits, and their town or region's transportation options. Moreover, several respondents indicated that they prefer using other search engines such as Google, which was often cited as an example.

- Bargains

This function is rarely or never used in the vast majority of TICs. Two main reasons have been discerned to explain why the function is not used: (1) It is easier to receive a discount on lodgings by communicating directly with hotel keepers by phone, and (2) often, a bargain presented to the visitor by the information clerk in the morning was no longer available when he or she returned to the TIC to make the reservation in the late afternoon/evening.

- Reservations

First of all, regarding reservations in TIC areas, a large majority of respondents rarely or never use this function. Nearly half of the respondents, mostly from regions located outside of major urban areas, indicated that they wish to

maintain direct contact with hotel keepers in their region, who, in turn, prefer telephone reservations and, as many in their area, are not equipped to reserve online. The situation for TICs located in major urban centres is somewhat different. These centres frequently or very frequently use the reservations function since they have a greater number of hotel rooms available for booking online. Secondly, concerning reservations in other areas, a vast majority of TICs rarely or never use the reservations function. The main obstacle limiting the use of this function is the lack of client demand and the lack of time to make such reservations. The kinds of TICs that frequently or very frequently use this function are those that serve fishing and hunting outfitters and those located at major intersections between two final destinations. In general, the TICs that use the reservations function report being satisfied or very satisfied. The two problems reported by the few unsatisfied respondents concern mainly the lack of choice in search criteria used to make a reservation and, to a lesser degree, the limited price ranges for hotel reservations. On the whole, although respondents perceive the reservations function as an interesting characteristic of the interface, they prefer telephone reservations, which they regard as easier and more customer-friendly.

- Mapping tool

One third of TICs use this tool frequently or very frequently, the second third moderately, and the final third rarely or never. Differences in opinion on this point do not correlate with the size or location of the TIC. The vast majority of those using this tool are satisfied or very satisfied with it. The few unsatisfied respondents believe that the maps are imprecise or out of date. Others prefer using the Google Maps tool.

- Survey data and report module

Survey data allows TICs to discern clientele type by gathering postal codes or by assessing client profiles. The report module compiles and presents the gathered data. More than half the TICs very frequently use these tools and are satisfied or very satisfied with them. Others rarely or never use them because they have their own system in place or because they plan on using them in a later season.

- Survey modification management module and user creation/modification management module

Almost all TICs use these tools. Users feel that these tools facilitate the internal management of the centre. The most appreciated features in the first module are the ease of making modifications and the system's speed. The most appreciated features in the second module are ease of use, adequate security level, system speed, and reliability.

- Currency converter tool

Although considered a very practical tool, the currency converter is almost never used in TICs because the demand for such a tool is virtually non-existent.

Impacts

After one year or more of using the DMS interface, the TICs have developed a working relationship with the Ministry. The TICs, consulted on an annual basis regarding their level of satisfaction with the interface developed for them, suggested improvements for (1) the local accuracy of the mapping tool, and (2) the survey module showing statistics on the reservations made by the TICs.

The importance of this working relationship was mentioned in the interviews and also emphasized during the annual TIC-Ministry meeting. Since then, the TICs have met several times with the resource person responsible for the technical support within the DMO. This relationship will lead to an even better collaboration in the future between TICs and DMO.

5. Conclusion

This study has led to the understanding of the impact of the implementation of a destination management system (DMS) interface in TICs located within a tourism ministry's territory in a North American destination. The presentation of the context and objectives of this initiative rests on a literature review dealing primarily with the criteria of DMS success and the factors influencing participation in inter-organizational systems. These theories serve as a frame of reference for understanding the technological environment in which the Ministry made its decision to move ahead with its initiative and the follow-up strategy for the implementation. The impact of the interface implementation was evaluated through telephone interviews with TIC supervisors. The theoretical framework and results presentation were constructed based on the three fundamental components to consider when adapting technologies to services, namely, training, adoption, and use (Bédard, 2001).

Bergeron and Raymond (1992) identified training as one of the organizational dimensions common to most information systems. Discussion results clearly showed that the training program implemented by the Ministry as part of the DMS interface implementation constituted a key factor in the success of its adoption. Zhu et al. (2004) stressed that governments hold great influence over the adoption and success of inter-organizational information systems by bestowing incentives or regulations, which may increase electronic transaction security and credibility. Along the same lines, Chwelos et al. (2001) and Iacovu et al. (1995) pointed out that the initiating partner in such systems exercises its influence by making recommendations or offering a compensation system. Discussion on the research findings show that these factors played a role in the case of the interface deployment.

The research, corroborated by findings from Kothari and Fesenmaier (2007), leads to the conclusion that TICs focus on the basic functionality of the informational content of the destination's lodging and attractions. The DMO in this article is willing to associate the TICs in its territory and to change their

manner of doing business on-line. It represents one step towards the successful development and implementation of DMSs (Collins & Buhalis, 2003).

For future research, it would be interesting to pursue the study of this experiment over a period of three to five years to describe and explain changes observed throughout the period. Future work should also test the degree and scope of replication of these inductive findings in order to improve the data generalization to other TICs and destinations.

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Evolving Destination Systems: VisitScotland.com

Roberto Daniele[a]
Andrew J. Frew[b]

[a] Oxford Brookes University
Business School - Department of Hospitality, Leisure and Tourism
rdaniele@brookes.ac.uk

[b] Queen Margaret University
School of Business & Enterprise
afrew@qmu.ac.uk

Abstract

This paper explores through a case study approach the progress in the development VisitScotland.com, Scotland's national destination portal. A brief history of Destination Management System (DMS) developments in Scotland is provided to contextualise current activities and the work examines current developments with particular regard to VisitScotland.com's business model, issues surrounding its Public-Private Partnership configuration and an analysis of key performance indicators. Findings show that whilst there are still substantial obstacles to be overcome particularly with regards to engagement and long term financial viability, VisitScotland.com seems to have set in place the appropriate business model and technology infrastructure to become an effective DMS for Scotland

Keywords: Destination management systems; SMTEs, Electronic Distribution; Public Private Partnerships.

1 Background

As a destination Scotland has had a long and at times challenging history with respect to Destination Management System (DMS) developments starting from the implementation and subsequent failure of Hi-Line, in 1984. Whilst Scotland is in no way unique in this situation (the list of DMS failures worldwide is indeed extensive – see, for example, Archdale, 1993; Sussman and Baker, 1996) a series of factors which will be examined in this paper seem to make the implementation of DMS in Scotland particularly problematic.

Whilst some of the earlier DMS developments in Scotland have been well documented in the literature (Frew & O'Connor, 1999 and 2000; Sussman & Baker, 1996; Pringle, 1995) more recent developments have not been analysed is such detail. In particular there have been few studies examining the role of Public Private Partnerships (PPP) for the development of DMS.

2 Aims

The aims of this paper thus are twofold: firstly, to provide a succinct review of DMS developments to date with particular regards to a) the relationship between SMTEs and DMS, b) the role of the private and public sectors in the development of DMS and c) determinants of DMS success/failure. Secondly, the paper aims to identify, through an inductive case study approach, key issues/themes relating to more recent developments in Scottish DMS, namely VisitScotland.com.

3 Methodology

Given the exploratory nature of this project, a case study approach was adopted. Data collected comprised face-to-face interviews with key executives including the CEO, and all company directors. In addition secondary data was collected through analysis of company annual reports, internal company documents, newspaper and trade articles, and several industry websites. Complete interview transcripts and the above mentioned data were imported into nVivo7 for analysis. Such Computer Assisted Qualitative Data Analysis Software (CAQDAS) is well suited to the facilitation of a qualitative approach to research (Lewins and Silver, 2005). Thematic coding of the data generated 6 key clusters: a) ownership and organisational structure, b) business model, c) technology infrastructure and website functionality, d) key performance indicators, e) PPP issues and f) industry engagement.

4 Definitions and Key Issues

4.1 DMS definitions

Over the years lack of agreed terminology has prompted several authors to develop their own DMS definitions (Vlitos-Rowe, 1992; Buhalis 1994; Pringle, 1995; Sussman and Baker, 1996). More recently, however, Horan and Frew (2007: 63) have derived a comprehensive definition derived from a Delphi survey of academic/industry experts:

"Destination Management Systems are systems that consolidate and distribute a comprehensive range of tourism products through a variety of channels and platforms, generally catering for a specific region, and supporting the activities of a destination management organisation within that region. DMS attempt to utilise a customer centric approach in order to manage and market the destination as a holistic entity, typically providing strong destination related information, real-time reservations, destination management tools and paying particular attention to supporting small and independent tourism suppliers"

4.2 Role of the Public and Private Sectors

Despite DMS *raison d'être* being focused on the support of SMTEs which usually comprise the vast majority of tourism businesses at a destination, several authors (Buhalis & Main, 1998; Beaver, 1995) have highlighted longstanding difficulties in achieving SMTE representation in DMS, including the reluctance of small firms to use ICT, their lack of training, poor strategic management and marketing skills and the short term operational focus of managers.

Lack of basic ICT infrastructure such as Property Management Systems (PMS) has further translated in substantial connectivity problems for DMS operators which often have to revert to costly and time consuming manual procedures to finalise a booking or to update/maintain inventory on behalf of the accommodation provider. SMTEs reluctance to allocate and or maintain adequate and up-to-date room inventory to the system have also negatively impacted on the performance of DMS often presenting a distorted and incomplete picture of accommodation availability at the destination. SMTEs reluctance to pay commission has also been a constant chronic problem. These factors, combined with the relative low value of transactions exchanged in the system, have made it very difficult to achieve viable business models and revenue streams which would guarantee a DMS survival.

To address some of these issues, Mistilis and Daniele (2004) suggest that, in the last decade, there has been a strong trend towards the formation of partnerships between private sector companies and public sector organisations in respect of the development and operation of DMS. Catalysts of these developments are the increasing trend for "small government" driven by the pressure on availability of public funds on one side and the recognition that the private sector can bring to the table considerable levels of technological expertise, investment power, is generally seen as more responsive to market needs and capable of bringing a more entrepreneurial approach to the running of such systems. However the role of public and private sector involvement in DMS development and operations has also been a problematic area, mainly because of the often contrasting priorities or drivers of development with the public sector focusing predominantly on the need to promote the destination (through the provision of motivational information) and the focus of the private sector on transactions and bookings which are the elements which bring revenue to the system.

Whilst most of the research to date seems to favour private sector involvement in such developments (Tedeschini, 1991; Buhalis & Spada, 2000; Mistilis & Daniele, 2004) DMS running in a private public sector partnership situation have been accused of anticompetitive behaviour by various industry sectors. In addition, various business models for private public sector partnership have been adopted by different organisations making it difficult to provide direct comparisons or "one size fits all" solutions.

4.3 Determinants of Success

Not surprisingly given the issues highlighted above, the history of DMS developments comprises many failures: Archdale *et al* (quoted in Sussman and Baker, 1996:103) suggest that:

> *"The overall pattern of systems development in the field has been diverse, geographically disparate and generally reactive. This has lead to a confused pattern of business objectives, a marked absence of technical, commercial or data definition standards, a plethora of often conflicting developments within individual countries and little evidence of inter-NTO co-operation or even formal discussion of the issues."*

As a result a substantial stream of DMS literature examining key success/failure determinants has emerged: Frew and O'Connor (1999) for example, identified success factors under the four key headings of database issues (comprehensive, quality controlled, cost effective) distribution issues (availability of booking function, web front end) management issues (IPR, project management structure, resource provision and private sector migration strategy) and operational issues (does DMS have PMS interface, can suppliers automatically upgrade inventory, training programme for operators) whilst Buhalis and Spada (2000) took a stakeholder perspective looking at the criteria of success from the point of view of six key stakeholders: consumers/visitors, tour operators, travel agents, tourism suppliers, public sector and investors.

More recently Wang and Russo (2007) have conceptualised the functions of a DMS around the four dimensions of the ICTR model (Virtual Information Space, Virtual Communication Space, Virtual Transaction Space and the Virtual Relationship Space) suggesting that DMS need to proactively address and cover each of such spaces but that they are currently still in preliminary stages of development with only the information dimension sufficiently developed but with weaknesses in applications related to transactions and relationship building.

The advent of the Internet has provided DMS with a further dimension of opportunities and threats: on the one hand it has solved some of the technological and costs issues involved in developing and linking networks of SMEs. On the other, it has presented operators with the opportunity to develop their own web presence independently from DMS. The ability of consumers to access product information directly from the suppliers or from the highly successful new travel eMediaries such as lastminute.com and Expedia as well as smaller national or regional accommodation booking agencies (Daniele & Frew: 2004; Mistilis & Daniele 2004) has created some potential alternatives to DMS systems, bringing into question not only the role of DMS but also that of national or regional tourist offices at least as far as their marketing role is concerned. For all their shortcomings however, to date, DMS still remain the only systems in the tourism supply chain geared at promoting specific

destinations as coordinated networks of tourism suppliers with a depth and breath of product that private operators seem unable or unwilling to match.

5 History of DMS in Scotland

The first DMS development in Scotland was Hi-Line, a system set up in 1984 by a combination of stakeholders including the then Highlands and Islands Development Board (now Highland and Island Enterprise) and the area tourist organisations in Scotland. (Frew & O'Connor, 1999; Vlitos-Rowe, 1992). Hi-Line was developed as the private sector fulfilling mechanism of the marketing efforts of the public sector. After a promising beginning, the company run into both financial and technical problems and failed in 1992. Between 1993 and 1996, a new system "IDMS" (Intelligent Destination Management Systems) was proposed by the STB and the Edinburgh & Lothian Tourist Board with the view that this would develop into a national system. The value of this project lay in the fact that, for the first time, the strategic implications of the Internet as a distribution channel and the need to move away form proprietary systems towards an Open Systems infrastructure were conceptually incorporated in the planning for a DMS.

Whilst the concept never really took off., it provided the conceptual framework for Project Ossian, Scotland's first comprehensive Destination Management System aimed to provide a user friendly, Scotland-wide computer system with information on tourism products and services, and the ability to plan, book and pay online (Frew, 1998). In 1997 a team started work on the development but by 1999 financial problems started to appear and it was soon clear that the project could not be delivered by the public sector alone. Following a major review, more close involvement of the private sector was sought via the development of a Public Private Sector Partnership (PPP). A project board was established in May 2000 to lead and manage the project and after a lengthy and often criticised development process the final PPP structure emerged in the form of a company (eTourism Ltd) trading as VisitScotland.com .

5.1 VisitScotland.com: Ownership and Organisational and Structure

The original ownership structure of VisitScotland.com saw a considerable portion of the partnership in the hands of the private sector. Key stakeholders in the project were:

- Schlumberger a leading oilfield and computer services provider (computer division of was acquired in 2004 by Dutch company ATOS Origin who automatically took over its 60% interest in eTourism Ltd). A key role of Schlumberger Sema was to provide project management and the technology infrastructure for VisitScotland.com. The technology infrastructure component was then subcontracted to TouchVision for the development of the main

database and booking engine and to Media Surface for the development of a content management system (VisitScotland, 2002).

- PartnershipsUK (PUK) is a Public Private Partnership whose mission is: " *to support and accelerate the delivery of infrastructure renewal, high quality public services and the efficient use of public assets through better and stronger partnerships between the public and private sectors"(PartnershipsUK, 2007).* Its role in the partnership was to provide investment, commercial expertise and provide best practice input in joint venture management (VisitScotland, 2002).

- VisitScotland's and participating Area Tourist Boards' (ATB) role was to provide content and promotion for the website. A key role was envisaged in particular for the ATBs who were running local Tourist Information Centres responsible for the maintenance and upload of local data and to be the point of interface with the local trade (VisitScotland, 2002). Finally the role of VisitScotland was seen as providing industry leadership and engagement, be in charge of the DMS marketing (by providing links to VisitScotland.com in all of their advertising material) and generally safeguarding public sector interest (VisitScotland, 2002).

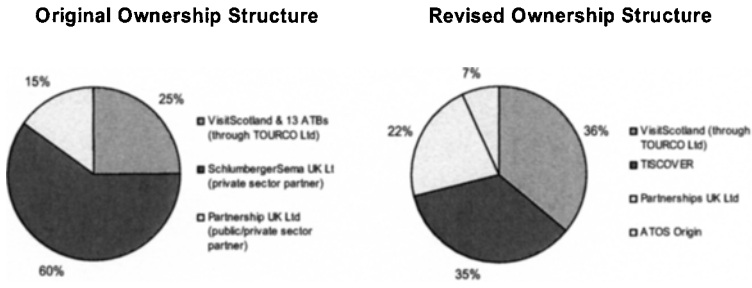

Fig. 1. Ownership Structure eTourism Ltd

Between 2003 and 2004, it became increasingly clear that the existing technology platform was being outgrown and a new technology infrastructure was needed to cope with both the forecast demand and to deliver the new functionality required by the business plan such as XML interfaces for hotels etc. Following an in-depth consultancy and assessment of the technology marketplace in general and the international DMS supplier marketplace in particular, VisitScotland.com decided to adopt Tiscover a DMS developed by the Tyrol Tourist Board in 1991 with the aim of providing tourist information and market intelligence to local suppliers (Frew and O'Connor:1999). Tiscover is now a leading DMS supplier with installations in Austria, Germany, Switzerland, Great Britain, Italy and South Africa and covering a portfolio of over 2000 regions and 20.000 accommodation units, which generated 1.3 million bookings and inquiries in 2006. At the same time VisitScotland (the national tourism board) took over shares owned by the ATBs which were dissolved in 2005

and the new technology supplier, Tiscover became a private partner shareholder. Figure 1 illustrates the changing ownership.

5.2 Business Model

VisitScotland.com's business model is essentially based on the 'agency' model whereby Visitscotland.com acts as an intermediary between suppliers of tourism product (at this stage mainly accommodation suppliers and to a lesser degree packages) and consumers wishing to travel to Scotland. VisitScotland.com charges suppliers a commission which varies between 8% to 10%. Consumers booking via the contact centre rather than the website also incur a £3 booking fee. Business which do not wish to be booked via VisitScotland.com can still have complete details of their business listed in the directory for a flat annual fee.

Ancillary services offered by VisitScotland.com include "Web-in-a-box" an e-commerce platform which allows suppliers (serviced accommodation only at this stage) to a) set up their own website using standard templates and information extracted from their entry in the VisitScotland.com website and b) to manage and maintain their inventory on their own and VisitScotland's website. Charges for Web-in-a-box are £10 per room per year plus 0.5% of the value of the transaction if the booking is taken from the supplier's website, or 8% of the value of the transaction if the booking is taken via any of the VisitScotland.com related websites. For accommodation providers that run a Property Management System, VistScotland.com also offers an XML interface to allow automatic live and dynamic updating of hotel prices, room availability and special offers. VisitScotland.com also provides a series of fee-based services to VisitScotland, including fulfilment of brochure requests, provision of contact centre services and CRM related data. A further revenue stream is generated by advertising opportunities on the VisitScotland.com website.

Fundamental to VisitScotland.com's business model is the synergy achieved with VisitScotland with regards to its promotional activities, content generation and industry recruitment: in effect VisitScotland.com does not have a marketing department or budget and, besides search engine marketing/optimization activities, it relies on the approximately £30 million per year commercial and marketing activities of VisitScotland to attract visitors to their website. Likewise much of the destination information and motivational content for the website is provided by VisitScotland. Finally Business Relationship Managers in the 14 VisitScotland Network Offices assist VisitScotland.com in recruiting new businesses to the DMS. The synergies derived by this collaboration make the business model proposition viable and feasible for both the private and public sector partners.

5.3 Technology infrastructure and website functionality

The core technology driving the VisitScotland.com website is Tiscover's booking engine. Linked to this core software are a collection of best of breed software

applications including SAGE for the accounting and financial components, Mediasurface's Content Management System and Secure Trading for credit card transactions.

The VisitScotland.com site provides extensive motivational information through approximately 30 websites including the main portal, regional websites (e.g. www.visithighlands.com) and activity based websites (such as www.cycling.visitscotland.com). However, one of the major problems in relation to VistScotland.com website's functionality relates to their accommodation booking function which is limited by lack of a critical mass of operators providing live availability to the system: Visitscotland.com estimates show that out of 9,000 operators listed in the database only 1,000 or so are considered as "active" (i.e. providing and maintaining live inventory on a regular basis). This can at times result in a poor visitor experience in terms of lack of bookable product.

The website also seems to have fallen behind in other aspects of website functionality: there are no consumer ratings for accommodation and other tourism services providers (an increasingly common and popular feature in many travel related websites), mapping functionality is very poor and there is a distinct lack of extras such as trip planners, podcasts, videos, etc which are now the norm in best of breed destination websites (see for example the New Zealand or Ireland official sites at www.newzealand.com or www.discoverireland.com).

5.4 Key Performance Indicators

VisitScotland.com commercial performance has seen significant accumulated losses as of 2006. There are four key areas contributing to losses so far:

- Relatively low yield per transaction: because of the nature of the tourism product sold (mainly guest houses and B&Bs) and the relatively low commission structure (8% to 10% against a private sector standard of 15% to 25%) VisitScotland.com produces a relatively low yield per transaction which varies between £18 (bookings via contact centre) to as low as £8.05 (bookings via TIC);

- Below average performance of the website channel: whilst the number of visitors to the VisitScotland.com website has grown from 1.7 million in 2002 to 5.6 million in 2006, its look-to-book ratio has remained relatively stable at a very low 0.3% against an industry range of 4% to 8%. Whilst it is difficult to pinpoint all the variables contributing to this underperformance, paucity of live inventory appears to be one of the major causes of poor conversion;

- Relatively high operational/administration costs mainly due to high head count in the contact centre (over 50% of staff), and lack of ideal levels of automation in key business processes: for example despite the availability of an extranet and web-in-a-box which should allow for accommodation

providers to manage their inventory online, much of the inventory is still handled manually by VisitScotland.com staff which have to "chase up" operators via phone to obtain inventory availability.

- Finally the high level of accumulated debt is now generating considerable interest charges.

Figure 2. below, highlights the relatively poor performance of the website channel compared to the two key revenue generating channels (VisitScotland.com's contact centre and VisitScotland's network of Tourism Information Centres). Contact centre in particular has been performing strongly and boasts a conversion rate of almost 15%. However this is also the most costly distribution channel thus rising yield issues.

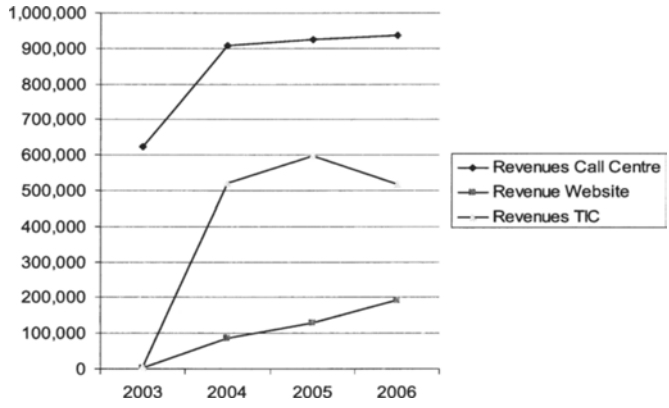

Fig. 2. Revenues (£) by Distribution Channel

Despite the not so impressive indicators there are several pointers to a more promising future. Firstly, following the appointment of a new CEO in 2004, a strengthened management team was put in place with a complementary mix of expertise in both the hospitality/tourism fields and ICT. Likewise the existing composition of the Board of Directors has been augmented by the appointment of a highly regarded independent chairman with extensive credentials in the field. VisitScotland.com has now an improved technology infrastructure which will allow it to cope with any future growth in both visits and transactions. In addition, following the adoption of the Tiscover platform it has been possible to offer new products and services in the marketplace: depending on their take up levels, these should provide additional revenues for the company. Finally, there have been constant and continuing improvements in key metrics: over the last 3 years unique visitors to the site and turnover have been increasing steadily whilst at the same time operating costs have been contained and in many cases reduced.

5.5 PPP Issues and Industry Engagement

Central to VisitScotland.com's challenges are the often combined issues of tensions around the Public Private Partnership initiative and the well-documented lack of strategic orientation of many SMTEs and the consequent need for a strong educational/engagement programme.

Like other PPP developments in the DMS field, VisitScotland.com has been subject to some level of criticism by industry operators (fuelled by often ill-informed reporting on the project by the national press). One regional industry association in particular has been very vocal in their complaints against the current set up and are calling for the return of VisitScotland.com to the public sector based on the following stated concerns:

- The national DMS is not generating new business for Scotland but simply displacing and re-directing existing demand to its own website; in addition its emphasis should be selling Scotland as a destination rather than selling accommodation. A DMS should facilitate rather than obstruct direct contact between suppliers and customers thus avoiding commission charges which increase the providers' cost base.

- By listing VisitScotland.com URL as the only fulfilment portal in all their advertising, VisitScotland is effectively subsidising a particular firm at the expense of other Scottish booking agents and/or incoming tour operators. The suggestion is that multiple private booking systems competing with each other would be more effective and there is no justification for the current monopolistic arrangement;

Whilst some of these points are not new and may even have some elements of validity, it is important to consider that the trend towards public-private partnerships in tourism is not only well established but growing, particularly in more developed countries (WTO, 2007). The PPP model seems particularly suited for running DMS with booking functionality: the vast majority of reservation enabled DMS projects which were developed exclusively by the private or public sector have failed (e.g. Swissline, Ossian, BRAVO and so on). Most of the successful DMS with booking functionality are run on a PPP basis (e.g. Gulliver InfoRes Ireland and Bonjour Quebec).

Consumers are increasingly booking their travel online and wishing to do so also on DMO websites (one of the major complaints that the award winning Australia.com website receives is related the lack of booking functionality). From a marketing point of view, it is essential that industry adapts to the needs of the consumer: failure to do so would compromise Scotland's visibility on international markets and its perception as an innovative and customer focused destination.

At the same time, with the exclusion of a minority of innovators, SMTEs have not kept pace with the rate of technological development in recent years: with inventory management and booking engine solutions such as Web-in-a-Box becoming more user friendly and affordable thanks to intense competition between system providers, and high Internet penetration it is very difficult to explain the low level of adoption of eBusiness practices amongst SMTEs as highlighted in two recent reports (Scottish Enterprise, 2006 and QMU, 2005)

5.6 Conclusions

The last two decades of DMS developments have seen a growing gap between the pace of technological development in the field and the ability of SMTEs to keep up and to strategically take advantage of such developments. The ability of DMS to present a highly integrated and networked destination to potential visitors is highly dependent on two key factors, namely; a synergistic relationship between the Private and Public sector to achieve a viable and mutually beneficial business model for DMS development; and the adoption of these systems by SMTE as key stakeholders in the destination value chain.

Regrettably the history of DMS developments has more often than not seen significant financial investment (often unnecessarily) in the technological aspects of the project at the expense of SMTEs' education, training and engagement programs which, together with consumers, will ultimately determine the success or failure of such systems. Therefore crucial to VisitScotland.com's viability and prosperity will be its ability to educate and address the industry's limited engagement with, and support for, an experiment that has been unfolding in Scotland for the last 20 years: the creation of a truly connected destination. Further research is therefore needed to analyse appropriate business models for Public Private Sector partnership which are able to incorporate elements of industry training and engagement whilst at the same time minimising potential conflict of interest issues as highlighted in section 4.2 of this paper.

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Consumers' Preferred Criteria for Hotel Online Booking

Astrid Dickinger[a],
Josef Mazanec[b]

[a] Department of New Media Technology
MODUL University Vienna, Austria
Astrid.Dickinger@modul.ac.at

[b] Institute for Tourism and Leisure Studies
Vienna University of Economics and Business Administration
Josef.Mazanec@wu-wien.ac.at

Abstract

Online bookings of hotels have increased drastically in recent years. Studies in tourism and hospitality have investigated the relevance of hotel attributes influencing choice but not yet explore them in an online booking setting. This paper presents findings about consumers' stated preferences for decision criteria from an adaptive conjoint study among 346 respondents. The results show that recommendations of friends and online reviews are the most important factors that influence online hotel booking. Partitioning the importance values of the decision criteria reveals group-specific differences indicating the presence of market segments.

Keywords: hotel attributes, adaptive conjoint analysis, partitioning, vector quantization.

1 Introduction

The importance of the Internet as information medium particularly in tourism has been identified and discussed by numerous researchers (Gursoy & McLeary, 2004). However, it has long been stated that the Internet, as yet, is not used to its full extent as a platform for bookings and recommendations (Klein, Köhne & Öörni, 2004). Nevertheless, current figures show that the purchases made online are multiplying. An increase in online travel sales of 22% to EUR 46.8 billion is predicted during 2007 (Marcussen, 2007). The major part of online tourism sales, 56%, is generated by air travel, hotels account for 16%, package tours 16%, rail 8% and rental cars 4% (Marcussen, 2007). Online hotel booking, the second most important product in online tourism revenue is the focus of this research. Hotels make use of the internet to not only offer services to customers but to simultaneously provide a platform for customers to give feedback on their stay in a specific hotel. As a result in addition to the well known star ratings hotels get their individual quality ratings from former guests. Previous research shows that word-of-mouth is a major driver for hotel purchase decisions (Dubé & Renaghan, 2000a). Online reviews and online user generated content is considered a tool for word-of- mouth on the Internet. Others found that for every second customer the star category is a basis for taking purchase decisions (Callan, 1998). These findings must be interpreted cautiously as various authors found that there are significant differences regarding those drivers in different market segments (Lewis, 1984; Wind, Green, Shifflet & Scarborough, 1989; Mehta & Vera, 1990). Research on online booking shows that the complexity of the travel product hinders end user adoption of online booking systems (Klein, Köhne & Öörni,

2004). Most studies have focused on the attributes of the booking system such as usability, system quality, service quality, usefulness, customer loyalty, and information quality to assess factors influencing online booking behavior (Law & Leung, 2002; Law & Leung, 2000; Law & Chan, 2004). Usability problems of hotel websites have a negative effect on online bookings and revisit intentions while increased depth of information and customer interaction have positive effects (Essawy, 2006). In this research hotel attributes - not system attributes - are investigated.

The aim of this study is to identify the critical factors that influence online booking through an adaptive conjoint study. The decision criteria included are pictures of the hotel and hotel room, recommendations of a friend, review of the hotel, star rating, location, and price.

The paper contributes to both research and practice in several ways: (i) the relevant attributes for online bookings are identified; (ii) the results indicate that there are group-specific differences regarding the importance of these attributes, hence strategies for communicating with these customer segments have to be developed accordingly; (iii) from a research perspective the study shows how customer heterogeneity might be handled; (iv) industry players get recommendation on how to present themselves in an online booking portal. They learn whether or not to include pictures and reviews and which elements to emphasize.

2 Literature Review

A number of researchers have examined attributes of hotels and their importance in customers' selection processes. A famous example is provided by Wind, Green, Shifflet & Scarborough (1989). These authors demonstrate how to employ hybrid conjoint analysis to develop "Courtyard by Marriott". They included product attribute evaluations and combined them with actual needs of customer segments leading to a successful introduction to the market and, above that, elaborated a method that allowed Marriott to design additional successful lodging concepts. Their study included almost 200 facets in the seven attribute groups external factors, rooms, food-related services, lounge facilities, services, facilities for leisure-time activities, and security factors (Wind, Green, Shifflet & Scarborough, 1989). Hu & Hiemstra (1996) also used hybrid conjoint analysis but focused on meeting planners and their choice process. Among other popular methods to identify relevant attributes are multidimensional scaling, multiple discriminant analysis (McCleary, Weaver & Hutchinson, 1993; Lieux, Weaver & McCleary, 1994), regression analysis (Lewis, 1985; Richard & Sundaram, 1994), and comparison of means for gaining segment-specific differences (Mehta & Vera, 1990; McCleary, Weaver & Lan, 1994; Callan, 1998; Dubé & Renaghan; 2000a). A detailed overview of important attribute categories and the respective studies are itemized in the following table.

Table 1. Review of relevant hotel attributes

Authors and focus of the study	Methods	Number of levels	Categories of attributes
Lewis, R. (1984) Business and leisure travelers.	Factor analysis, analysis of variance	66	Service quality, overall feeling, security, upscale services, food & beverage, image, price/quality, aesthetics/décor/ambient, amenities, beverage quality, room/bath condition, health facilities, reputation, quiet, room attributes, price and value, reservations and front desk, location.
Lewis, R. (1985). Business and leisure travelers.	Regression analysis	17	As above.
Wind, Green, Shifflet & Scarborough (1989) Potential travelers.	Hybrid conjoint, Multidimensional scaling, multiple discriminant analysis, ELASTICON (for pricing).	Close to 200	External factors, rooms, food-related services, lounge facilities, services, facilities for leisure-time activities, security factors
Mehta, S. & Vera, A. (1990). Individual travelers.	Comparison of means	26	Security, room/bathroom/overall furniture & decor, service in restaurants/bars/telephone/ overall/check in, reputation/image, business center facilities, class appeal of hotel, low price food and beverages, cleanliness, variety of restaurants/bars, location, music and entertainment.
McCleary, K., Weaver, P. & Hutchinson, J. (1993). Business travelers.	Multiple discriminant analysis	56	Basic product, business services, frequent traveler programs, banquet/meeting facilities, advertising/public relations, location, non-smoking rooms.
McCleary, K., Weaver, P. & Lan, L. (1994). Business women.	MANOVA	53	Business services and facilities, security facilities, basic facilities, personal services, free extras, convenient eating facilities, airline or hotel reward program, special room features, airport or meeting hotel, price, advertising/parking, fitness facilities.
Richard, M.D. & Sundaram, D.S. (1994). Leisure travelers.	Regression, factor analysis	29	Reception, accommodation, departure, food building, bathroom.
Lieux, E. M., Weaver, P.A. & McCleary, K. (1994). Senior tourists.	Multiple discriminant analysis	8	Budget, economy, luxury budget, midprice, upscale, luxury, bed and breakfast or country inn, family owned independent.
Hu, C. & Hiemstra, S. J. (1996). Meeting	Hybrid conjoint analysis	22	Price range, functional properties of meeting rooms, conference planning procedure, guest

Authors and focus of the study	Methods	Number of levels	Categories of attributes
planners.			room comfort, food and beverage function, location.
Bell, R.A. & Morey, R.C. (1996). Corporate Managers.	Logit model	9	Guaranteed last-room availability, flexible cancellation, electronic interface, free local calls, free breakfast, convenient distance from workplace, free airport shuttle, exceptional business amenities, special rate.
Callan, R. (1998). Leisure and business travelers.	Grading scheme	166	Location and image, price, competence, access, security, additional services, tangibles, service provider's understanding of the customer.
Dubé & Renaghan (2000a). Leisure and business travelers.	Frequencies	1275 drivers	12; Location, Value for money, brand name and reputation physical property, guest-room design and amenities, meeting-room design and amenities, bathroom furniture and amenities, service functional, service interpersonal, food and beverage related services, quality standards, marketing, other.
Dubé & Renaghan (2000b). Intermediaries.	Frequencies	No indication	Convenient location, value for money, communication with intermediary, brand name and reputation deals and incentives, quality of services interpersonal & functional, guest rooms, facility design.

The most frequently mentioned attributes that influence choice in leisure and business traveler settings are: location, service, star rating, security, food and beverage, image, price, room and hotel attributes, facilities for leisure time activities.

The majority of conjoint studies about hotel attributes try to convey a full taxonomy of all attributes of a hotel, which is not the purpose of this study. Only attributes typically presented in an online booking setting will be included since the focus of the paper is on factors driving online booking. A review of several online booking platforms (www.expedia.de, www.booking.com, www.travelocity.com, www.venere.com, www.hotels.com, www.tiscover.com) reveals that the most commonly featured attributes are star rating, price, location/map, photographs of the rooms and the hotel, evaluations of previous visitors, information about the rooms, information about the hotel amenities and facilities, information on the surrounding area. Since online booking is investigated in this study it is important to include exactly the attributes relevant in that scenario. Therefore, many attributes that were included in hotel studies are of no particular relevance. The attributes included with levels in parentheses were price (50€, 70€, 90€), online evaluation (very good reviews, average reviews, bad reviews, no reviews), location (in the center, close to the center, off center), pictures of rooms (average pictures, very nice pictures, no pictures), pictures of the hotel (average pictures, very nice pictures, no pictures), star rating (three star,

four star, five star), and recommendation of a friend (a friend recommended it, a friend said it is average, a friend discouraged, no opinion of a friend).

3 Methodology

3.1 Measurement and Study Design

Respondents were recruited by means of an online survey, using convenience sampling. The link to the questionnaire was e-mailed to 1500 students and 100 employees of a company inviting them to participate. The first webpage outlined the aim of the study. First, respondents were asked about their Internet usage for information search and online booking as well as the category of hotel they usually book. Given these data, respondents that never used the Internet for information search or booking were excluded from the analyses. This filtering was important as the scenario the respondents were confronted with included the booking of a four-star hotel in Barcelona. Only respondents that normally stay in such a hotel and know about prices and services should be included in the study. Then, an adaptive conjoint design with a total of 22 paired comparisons followed. The software used is the adaptive conjoint tool version 6.0.6 from Sawtooth Software Inc (Sawtooth, 2007). The conjoint procedures represent an indirect method of measuring the tourists' perceived utility of a combination of hotel attributes. They do not force the respondents into an artificial task of evaluating hotel attributes separately and sequentially. Instead, one lets them assess complete hotel descriptions in a way they encounter in a real-world choice situation.

The conjoint design involved the seven attributes mentioned and a total of 23 levels which were incorporated in 22 paired comparisons. The instrument used for measuring preferential differences between pairs was a 9-point scale with anchors "strongly favor left" to "strongly favor right" and neutral in the middle.

3.2 Conjoint and Partitioning Analysis

Sawthoth's adaptive conjoint analyzer (ACA) extracts the part-worth utilities for the attribute levels. However, it does not yield importance values of the attributes. These importances are considered to be a 'natural' basis for building market segments defined in terms of the combination of weights they attach to the attributes of a choice alternative. So one has to reconstruct them. They are easily derived from the part-worth utilities u_{ijk} of level j of attribute i for respondent k. The importance of a hotel attribute i for respondent k is given by

$$a_{ik} = \frac{[\max(u_{i1k},\ldots,u_{in_ik}) - \min(u_{i1k},\ldots,u_{in_ik})]*100}{\sum_{\forall i,j}[\max(u_{i1k},\ldots,u_{in_ik}) - \min(u_{i1k},\ldots,u_{in_ik})]}$$

where n_i denotes the number of levels of attribute i. The computation assures that the importances of the hotel attributes are defined on a percentage scale and therefore fully comparable over respondents.

The ACA employs an up-to-date modeling and powerful parameter estimation method via a Hierarchical Bayes (HB) model with Markov-Chain-Monte-Carlo (MCMC) estimation. As demonstrated by Tüchler, Frühwirth-Schnatter & Otter (2004) the HB-MCMC methodology assists in effectively detecting respondent heterogeneity in a principled manner. By delivering individual sets of attribute importance values for each individual respondent the HB-MCMC model captures continuous heterogeneity. (A latent class model would be an example of how to control discrete heterogeneity within a sample of respondents.) The ACA assumes normally distributed part-worth utilities, but, owing to its underlying Bayesian estimation of individual parameter values, offers the analyst an ideal opportunity for determining importance-based customer segments.

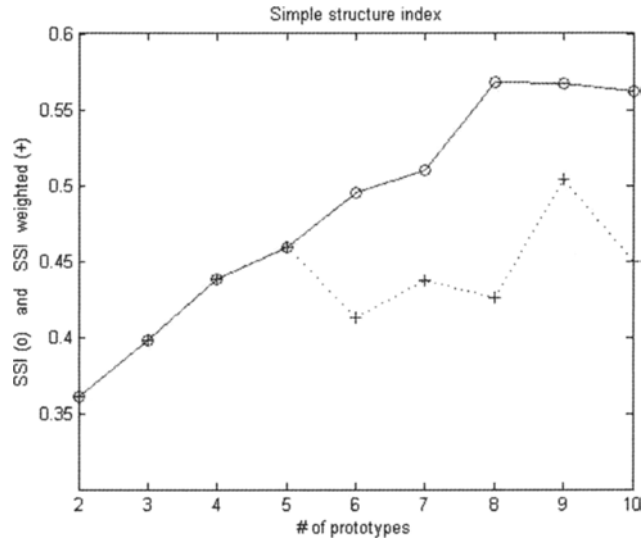

Fig. 1. (W)SSI for 2-10 classes

Vector quantization as outlined in Mazanec & Strasser (2000) was employed for partitioning the attribute importance data. Two decisions had to be made during the partitioning analysis: (i) the dot product of the (normalized) vectors of hotel attribute importances serves as similarity measure which is particularly robust against outliers. This means that the importance vectors are rescaled to unit length to become points lying on the surface of a 7-dimensional hypersphere. The similarity for a pair of hotel attribute importances then corresponds to the directional cosine between the two sets of importance values. (ii) the number of classes ('prototypes' in neural networks parlance; 'segments' or 'types' in psychometrics and marketing jargon) was determined by means of the Weighted Simple Structure Index introduced in Mazanec (2001) and evaluated in Dimitriadou, Dolnicar & Weingessel (2002). The WSSI assists in identifying interesting partitions i.e. solutions with strongly contrasting variable patterns. The SSI reflects the ease of interpretability owing to the amount of

contrast among the classes' mean weight vectors. Interpreting the partitioning solution is the easier the more hotel attributes exhibit marked differences between the customer segments. Managerial usability of the results, however, will be limited once the size of the classes becomes too small. Therefore, the weighted SSI penalizes contrasting values achieved for small segments. According to Figure 1 either 5 or 9 classes appear to be promising. As two classes dropped in size to about 2% in the 9-classes solutions the 5-classes result was chosen. Finally, an attempt of profiling the importance segments in terms of external (passive) variables was undertaken.

4 Results

4.1 Sample Composition

A total of 346 fully completed questionnaires were included in the analyses. Gender is distributed nearly evenly with 52% male and 48% female respondents. 15% of the interviewees graduated from University or College. Regarding the usage of the Internet as an information source for hotels 86% indicate to consult it always or often. Only the remaining 9% use this information source sometimes, 5% seldom. 43% always/often use it for booking, a third sometimes, 20% seldom and 8% never. 77% use online reviews of former guests in their information search which emphasizes including online reviews on a booking website. 65% indicate that they posted a hotel review themselves. Comparing this figure with the percentage for booking online it appears that after booking online many customers are invited to evaluate the hotel after their stay, a feature actually implemented by most booking platforms.

4.2 The Optimal Online Booking Scenario

Consider the aggregate results first. The average importance values in the entire sample range between 8% and 21%. The most important attribute of a hotel description is 'recommendation by a friend' followed by 'hotel review'. This is in line with previous research claiming that the hotel image with word-of-mouth as one of its propagators is most influential when it comes to hotel choice (Dubé & Renaghan 2000a). Pictures of the room, the only visible cue allowing some sort of prior inspection of the travel product before actually going there is the next important attribute. The room seems to be more important than the hotel as such. This is followed by price, location, and, finally, star category. Interestingly, star category, supposedly an attribute of highest relevance (Callan, 1998) turns out to be negligible in an online booking scenario. At least, this finding holds in the simultaneous presence of reviews and/or recommendation by friends.

Compiling the maximum part-worth-utilities the ideal online offer should include recommendations of a friend (generating an average part-worth of 2.29), favorable reviews (2.02), pleasant pictures of a hotel room (1.34), a price of €50 (1.33), a central location (.67), and a four-star rating (.28).

Now take account of the tourists' heterogeneity in terms of the importance of hotel attributes for online booking. The partitioning results recommend distinguishing five different types of consumer groups as depicted in Figure 2. Groups one to five

comprise 18%, 26%, 17%, 23%, and 16% of the sample. The numeric labels in the bar charts of Figure 2 read as follows: 1=price, 2=online review, 3=location, 4=pictures of rooms, 5=pictures of the hotel, 6=star category, 7=recommendation of a friend.

Table 1. Average importance

Hotel Attributes	Average Importances	Std. Deviation
Price	13.69	5.30
Hotel Review	19.41	4.46
Location	11.13	4.93
Pictures of room	13.86	3.42
Pictures of hotel	12.53	3.37
Star category	8.39	3.80
Recommendation of a friend	20.95	4.28

Type 1, Price indifferent. This segment shows lowest importance regarding the price of the hotel. The visual cues shown on the booking platforms such as pictures, evaluations and finally the star rating are of more importance. The recommendation of a friend is also relevant for this group. *Type 2, Recommendation seeker.* Type 2 exhibits the highest importance levels for online reviews and the recommendation of a friend. Pictures are somewhat important while location and star rating appear to be nearly irrelevant. *Type 3, Star rating indifferent traveler.* For these online bookers the star rating is not an important feature regarding the choice of a hotel. All other attributes show average levels of importance. *Type 4, Friends trustee.* In this group the recommendation of a friend is most important, followed by online review, price and location. Unimportant are the star rating and the pictures presented online. *Type 5, Price and recommendation.* For the fifth type price and recommendations, both from friends and online, are of highest importance. The other attributes are similar to type two with low importance of location and star rating and medium importance of the pictures shown online.

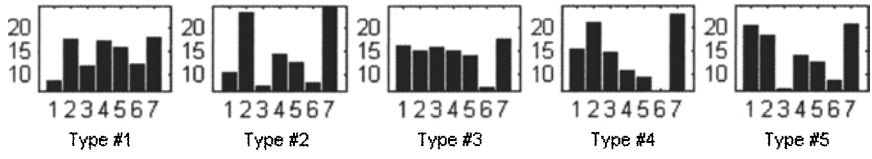

Fig. 2. Hotel attribute importances in per cent by tourist segment

Membership in the importance-based customer segments turns out to be independent from the respondents' gender, education, job position, and travel experience. However, the familiarity with city trips is associated with the importance classification. ANOVA results are significant ($p<.05$) and indicate that more

experienced travelers (Type 3) consider recommendations to be less important than inexperienced travelers (Types 2 and 4). Furthermore, there is a significant ($p<.05$) difference between the customer segments regarding the usage of online reviews. Types 2 and 4 use reviews as an information source before booking significantly more frequently. This conclusively corresponds with the high importance of recommendations for these customer groups. As to the amount of trust in the online reviewers Type 4 and 5 significantly ($p<.02$) more often think that reviewers are honest. There is also a difference regarding the perceived well-meaning and benevolence of reviewers. The results show that in the view of Type 1 and 3 tourists online reviewers appear to be less well-meaning ($p<.03$) and benevolent ($p<.04$) than for members of Types 5, 4, and 2.

5 Conclusion and Future Research

With a share of 70%, direct sales already account for the bulk of online sales (Marcussen, 2007). Therefore, it is imperative that hotels optimally present themselves and exactly provide the information required by their customers. A simple measure such as including pictorial elements significantly raises the average part-worth utility from -1.41 (no picture) to 1.34 (pleasant photo of a hotel room).

A change from a hotel description with no customer credentials to one with very good reviews provokes an average increase in the part-worth utilities from -.32 to 2.02. Within a particularly credential-sensitive segment such as Type 2 the increase is still more drastic pushing the part-worth from -.16 to 2.50. A change in the star rating, by comparison, only achieves an average increase from -.51 (three-star) to .28 (four-star) with even smaller effects for the customer Types 3, 4, and 5.

Under an online setting the traditional star rating apparently does no longer fulfill its purpose. When tourists are offered pictorial cues in conjunction with credentials (online and personal) they tend to disregard the star ratings. For two customer types (Type 2 and 4) representing approximately 50% of the market this effect is particularly pronounced. It also holds for market segments with an extremely weak (Type 1) or strong (Type 5) focus on price. Overall, an ideal online booking platform is expected to justify their quality claims pictorially and by referring to previous customers' experience rather than by pointing to their star rating.

Note that the results were gained by analyzing respondents' reported behavior. The major limitations to overcome in future studies about featuring hotel attributes online originate from this 'stated preferences' set-up. Observing the customers' unbiased reactions by unobtrusive measurement techniques may change the picture. Expressing a decent amount of distrust vis-à-vis the star rating systems may be indicative of the ideal self-image of a rational person. Also, the role of price is likely to become more significant if the online booking exercise entails an actual purchase.

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Analyzing a Hotel Website's Access Paths

Rosanna Leung
Rob Law

School of Hotel and Tourism Management
Hong Kong Polytechnic University, Hong Kong
{hmrosann, hmroblaw}@polyu.edu.hk

Abstract

Irrespective of content richness and user friendliness of a website, customers may not access the website if they cannot easily find their desired information. At present, the existing tourism and hospitality literature has a limited number of, if any, prior studies that examined users' accessed paths when browsing websites. This study analyzed the web server log of a Hong Kong five-star international chain hotel in the period May 2006 to Apr 2007. The log contained 597,269 visitors and 2,655,661 pages of view data. The main focus of this study was to analyze the information retrieved by visitors and their access paths. Empirical results showed that the majority of the visitors were local residents, and dining information was their primary interest. This implies that the visibility of a website in search engine was relatively low so that only local residents that know the hotel name can find the website. Moreover, this hotel information structure was not very well-organized as visitors took an average of 3.94 clicks to reach the page that contained their desired information.

Keywords: hotel websites; customer behaviour; log file analysis; access path

1 Introduction

The importance of website evaluations, in general and in particular on functions and design has been widely discussed in the existing academic literature (Au Yeung & Law, 2003; Liu & Arnett, 2000; Nielson, 2000). In a recent study, Chan & Law (2006) developed an automated website evaluation system that evaluates the layout and colour scheme performance of websites for hotels in Hong Kong. These prior studies, albeit were able to achieve certain degree of success, primarily incorporated users' perception into the evaluation process. It remains largely unknown to what extent the users have actually behaved in the real environment. Additionally, it is still unknown whether users can get what they want even though suggested criteria were strictly followed when hotel and tourism practitioners develop their websites. In order to understand web surfers' actual information search behaviour, an analysis of web server logs thus plays an important role. In general, web server logs capture all visitor information search activities, allowing visitors' behaviour to be analyzed. The number of previous attempts to understand web server logs, unfortunately, is very limited, if any, in the existing hospitality and tourism literature. To bridge such a gap, this study adopted a manual way to analyze the log file data of a hotel website to understand customers' web surfing behaviour and identify hidden weaknesses of the website layout.

2 Literature Review

One of the primary objectives of having a website is to have visitors to view as many pages as possible, and for a long period of time (Burton & Walther, 2001). To retain the visitors, Catledge and Pitkow (1995) offered some advice on design. For instance, important information should be located within two to three clicks from the home page and information should be grouped together so that users can interact within a small area on the website. Learning about precise user behaviour on websites is thus of significant interest to both academic researchers (Spiliopou-lou, 2000; Joshi *et al.*, 1999; Schegg *et al.*, 2005) and practitioners (Davenport, 1999; Kim-ball, 2000). The way users behave has long been of interest to tourism researchers. Since individual web visitors cannot be physically observed, studying their web surfing behaviours could be an alternative way to understand what they actually do. As such, web server logs, which record activities without disruption or intervention, should surely serve as a repository for users' action.

An entry in a web server log is created when a person interacts with a website and web server (Buchner & Mulvenna, 1998). Access paths, which reflect what users have done on a website, usually include data such as "the average length of a user's sessions, specific location duration (e.g., average time on a page), average download times, and how the user navigated through the site (e.g., entrance and exit points)" (Bertot *et al.*, 1997, p.376). Understand visitors' navigation behaviour can assist the design of more efficient and user-friendly websites, discover misleading, duplicate or overlapping content, and help to understand the links' effectiveness (Berkhin *et al.* 2001). Since path analysis provides a comprehensive visitors' web navigation pattern, Greenstain and Vasarhelyi (2002) advocate that understanding the access path well can make a company move towards success. This is due to the critical use of customer information to meet the challenges of increasing competition and to compete in the market place which is dictated by customer needs and preferences. Schegg *et al.* (2005) suggest that combining path analysis with user observation and user surveys would shed more light on how to convert these visitors from lookers to bookers.

3 Methodology

3.1 Company Background

Hotel Y is a five-star international chain hotel located in the city center of Hong Kong, a popular tourist destination in Asia. The hotel has more than 400 guest rooms with seven restaurant outlets. To meet the growth of Internet applications, Hotel Y has established its own website since mid-1990 and the newly refurbished version was launched in March 2006. The website is outsourced to a third-party design house that is responsible for hosting services and for updating all static information. Hotel staff update dynamic information update such as seasonal F&B and room promotion information. The hotel website offers four different language versions, including English, Japanese, Traditional Chinese, and Simplified Chinese, and is hosted on a

dedicated Microsoft Window Web Server. All visitors' activities are logged into web server log files.

3.2 Web Server Logs

This research utilized 12 months' (May 2006 to April 2007) web log files of Hotel Y for data analysis. All web logs were analyzed by a web log analysis software system that provided visitors' geographical data, page visit ranking details, click analyses, and visitor access path details. Furthermore, the system can generate detailed web statistics and exported to CSV files for further data analysis.

This study analyzed the log files in three areas: web page, files, and access paths. Web pages included all HTML and ASP browser related files. A file includes all non-web related documents such as PDF, DOC, and XLS. An access path shows the web visitor's surfing behaviour commencing from the entry page till the exit page.

In total, 365 web server log files with a total of 5.09GB data were analyzed. The web log is a Microsoft Internet Information Services Server log file (http://www.microsoft.com /technet/prodtechnol/WindowsServer2003/Library/IIS/676400bc-8969-4aa7-851a-9319490a9bbb.mspx?mfr=true [Accessed on May 10, 2007]). The total number of visitors and page view were 597,269 and 2,655,661 respectively, and the average number of page views per visitor is 4.45.

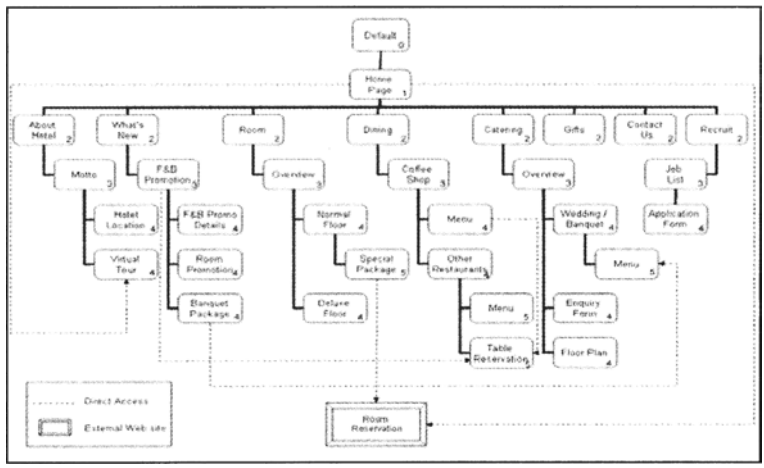

Fig. 1. A Simplified Hotel Y Site Map

3.3 Hotel Website Structure

The layout structure of Hotel Y's website is similar to other hotel websites. There are totally four language versions with each language version contains 51 web pages. The English version has additional 42 pages for staff recruitment. This provides a total of 246 available web pages on the website. If a visitor simply types in the domain name on web browser, the default page (default.aspx) will be redirected to the hotel home

page (Fig. 1). The upper part of the web page has a series of selection and the lower part of the web page is the content area. The content area of the home page was created by Flash where users can enjoy animation when selecting their information.

4 Findings and Discussions

4.1 Visitor Geographic Analysis

Table 1 outlines the ranking of web visitors' countries of residence. Apparently, the majority of visitors was from Hong Kong and the United States with 314,578 visitors (52.51%) and 118,077 visitors (19.71%) respectively. Mainland China (hereafter known as China) and Japan web visitors rank number three and four with 48,393 and 36,976 visitors (8.08% and 6.17%). In addition, hotel guest rooms' in-room broadband service and hotel internal network personal computers' default home page were on the hotel website. Extracting data from these IP addresses showed there were 8,004 visitors (2.13%) from these two servers.

Table 1. Ranking of Web Visitors' Country of Residence

Rank	Country	Visitors	%
1	Hong Kong SAR	314,578	52.51%
2	United States	118,077	19.71%
3	China	48,393	8.08%
4	Japan	36,976	6.17%
5	Taiwan	20,162	3.37%
6	Singapore	11,633	1.94%
7	United Kingdom	7,053	1.18%
8	Australia	5,148	0.86%
9	Canada	3,793	0.63%
10	Others	4,456	5.55%
	Grand Total	597,269	100.00%

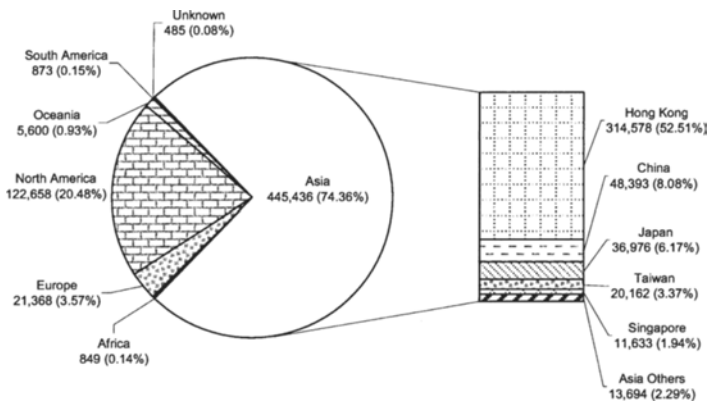

Fig. 2. Geographic Distribution of Hotel Website Visitors

It is interesting to note that Hotel Y is an international chain hotel, three-quarter of web visitors (445,436 visitors or 74.58%) were from Asia and one-fifth of visitors (122,658 visitors, 20.54%) were from North America; whereas only 29,175 visitors (4.88%) were from other continents (please refer to Fig. 2).

Using only Asian visitors as the calculation base, more than 70% of them were from Hong Kong, about 10% of visitors were from China, and more than 8% were from Japan.

4.2 Access Path Analysis

In total, there were more than 40,000 access path combinations. As revealed in Table 2, the most popular visiting path was purely from the default page to the home page with 34,580 hits (11.07%). One of the reasons for attaining such a result could be attributed to the fact the default home page for all in-room broadband service and hotel staff internal computers were defaulted to the hotel website. Once the web browser was started and the hotel web page appeared users simply left and visited their desired websites. Moreover, some web visitors may found that they could have reached the wrong hotel website, rendering their immediate departure.

Table 2. Top 20 Web Visitor Access Path Statistics

Ran	Hits	%	Path
1	34,580	11.07	/Default-->Home
2	6,748	2.16%	/Default-->Home-->Coffee Shop
3	3,634	1.16%	/Default-->Home-->Accommodation Overview
4	3,031	0.97%	/Default-->Home-->Contact Us
5	2,213	0.71%	/Default-->Home-->Recruitment Job List
6	2,060	0.66%	/Default-->Home-->Motto-->Location
7	1,899	0.61%	/Default-->Home-->/Default-->Home Page
8	1,869	0.60%	/Default-->Home-->Home (Traditional Chinese)--> Coffee
9	1,205	0.39%	/Default-->Home-->F&B Promotion Main
10	1,152	0.37%	/Default-->Home-->Motto
11	1,097	0.35%	/Default-->Home-->Virtual Tour-->Virtual Tour
12	1,083	0.35%	Home-->Home
13	863	0.28%	/Default-->Home-->Accommodation Overview-->Room
14	852	0.27%	F&B Promotion Detail-->F&B Promotion Detail
15	791	0.25%	/Default-->Home-->Recruitment Job List-->Application
16	757	0.24%	/Default-->Home?lang=en-us
17	757	0.24%	/Default-->Home-->Home
18	638	0.20%	/Default-->Home-->Accommodation Overview--> Normal
19	544	0.17%	/Default-->Home-->Home Page (Traditional Chinese)
20	455	0.15%	/Default-->Home-->Home (Traditional Chinese)--> Motto--
	66,228	21.20	

Total No. of Hits: 312,361

The second most favourable (or popular) access path was the access from home page and subsequently to coffee shop's information page. There were 6,748 hits following this path (2.16%) on the English version and 1,869 hits (0.60%) on Chinese version. This generated a combined total of 8,617 hits (2.76%). Since the majority of web visitors were from Hong Kong, the main service that these local residents were interested would be dining. In Hotel Y, the coffee shop provides Hong Kong residents with a buffet, their most preferred dining style. As such, many web visitors would like to browse for coffee shop information before they made actual reservations. The third and fourth favourable access paths were from home page to accommodation overview and hotel contact information with 3,634 and 3,031 hits respectively (1.16% and 0.97%). The hotel recruitment opportunity and application form pages ranked fifth and fifteen, which generated total 3,004 hits (0.96%). The English and Chinese versions of hotel location information ranked the sixth and twentieth with a total of 2,515 hits (0.81%).

Among the top 20 accessed paths, 19 of the entry paths originated from the home page and only the F&B promotion detail page was directly accessed as an entry page. Hotel Y regularly sent out monthly F&B promotion e-newsletters with URL link embedded so that recipients could directly access these pages. Apparently, most of the web information was searched directly from the hotel website but not referred by a search engine.

As far as the entry page record was concerned, more than 73% of the entries (185,889 hits) were from the "default" page which was then redirected to the home page. As well, a total of 81.5% entries were from all four languages' home pages (207,259 hits) and 6.25% of the entry hits was from the promotional page which included F&B promotions and room promotions (Table 3). Ranked the eighth was the robot exclusion file that was used when a search engine spider visited the website. However, only 860 hits per year indexing were recorded, which is quite low.

Table 3. Rankings of the Top 50 Entry Pages by Categories

Rank	Categories	Visits	%
1	Home Page (all four language)	207,259	81.50%
2	Promotional Page	15,895	6.25%
3	Virtual Tour	5,984	2.35%
4	F&B Dining	5,533	2.18%
5	Hotel Information	3,710	1.46%
6	Guest Room	2,745	1.08%
7	Recruitment	1,524	0.60%
8	/robots.txt (Robot exclusion file)	860	0.34%
9	Others	1,590	4.24%
		254,290	100.00%

4.3 Most Popular Web Pages and Files

As indicated in Table 4, the most popular two pages were the home page which generated 518,678 hits (32.04%). The F&B promotion page came next with 71,793 hits (4.43%). Following the website structure, if visitors would like to visit this page, they needed to click at least three times starting from the home page. However, from the monthly promotion e-newsletters that were sent to all the dining card members and office email footers, users can simply access this page directly by entering the special URL as indicated in the newsletter and emails. As a result, the recipients of these messages could directly reach these pages without searching around from the hotel website. Hence, the hit rate of the promotion page was the highest except the home page. The coffee shop page ranked fourth with 64,170 hits (3.96%). There could be two reasons for the coffee shop to get a high hit rate among restaurants. First, it was the most favourable restaurant in the hotel. Second, once visitors clicked "Dining" from the menu bar, they could immediately see the coffee shop information. Visitors could only visit other restaurants' information via the coffee shop page.

Table 4. Top 20 Popular Visited Web Pages

Rank	Page Hits	Hits %	Web Page Description	Clicks from home page
1	271,922	16.80%	Home Page	1
2	246,756	15.24%	Default.aspx*	1
3	71,793	4.43%	F&B Promotion Main page	3
4	64,170	3.96%	Coffee Shop	2
5	62,468	3.86%	Accommodation Overview page	2
6	55,245	3.41%	F&B Promotion Detail page	4
7	41,653	2.57%	Hotel Motto	2
8	35,777	2.21%	Room Promotion Main	3
9	33,382	2.06%	Home Page (Traditional Chinese)	2
10	26,405	1.63%	Coffee Shop (Traditional Chinese)	3
11	25,368	1.57%	Catering Main Page	2
12	22,768	1.41%	Hotel Virtual Tour	2
13	22,668	1.40%	Hotel Contact Detail	2
14	19,403	1.20%	Recruitment Application Form	3
15	18,786	1.16%	Cake Gift Voucher	2
16	17,547	1.08%	Hotel Room – Normal Floor	3
17	16,910	1.04%	Hotel Location	3
18	16,338	1.01%	Room Promotion Detail	4
19	16,072	0.99%	Recruitment - Job List	2
20	15,882	0.98%	Restaurant Reservation	3
	1,131,313	57.02%		

Total Page Hits: 1,618,907

** For Home page redirection*

According to Table 4, the cake gift voucher page seems to be a popular choice that ranked 15th with more than 18,000 hits. However, after the new website had been launched for a year, this page was still shown as "under construction". On the basis of

this result, it was likely that cake gift voucher was a highly expected item which the hotel could have lost many online business opportunities without the page ready.

In this study, the hotel motto page ranked seventh with 41,653 hits (2.57%). Seemingly, this page acts as a bridge for visitors to visit other hotel information pages like hotel fact sheets, location map, virtual tour, and access methodology (see Fig. 1). Among these different pages, hotel location map should be an important piece of information before visitors making any actual reservations. Therefore, it ranked the 17th with 16,910 hits (1.04%). However, once the visitors have reached the location page, they needed one more click to open the location map file which was created using PDF format. From the top 20 downloaded files (Table 5), the numbers of visitors who downloaded the English and Chinese versions of the hotel location map file ranked number one and 11th with 9,368 and 2,497 visitors respectively. Based on hit counts, location map ranked third and 18th with 20,793 and 3,931 hits respectively. Many new visitors needed the location information. As such, counting number of visitors for the hotel location page naturally ranked number one among the popular downloading activities.

Table 5. Top 20 Downloaded files Ranked by Number of Hits and Visitors

Downloaded File (PDF)	Hits Rank	No. of Hits	Visitors Rank	No. of Visitors	Clicks from home
Coffee Shop Menu	1	30,028	2	6,917	3
Chinese Restaurant Menu	2	22,811	6	3,273	5
Hotel Location Map	3	20,793	1	9,368	4
Chinese Wedding Package Flyer	4	17,088	3	5,457	4
Christmas Promotion Brochure	5	10,445	16	2,142	3
Coffee Shop Breakfast Menu	6	9,873	7	2,881	4
Restaurant Drink List	7	9,340	20	1,730	4
Fact Sheet	8	7,625	4	4,611	3
French Restaurant Menu	9	7,300	8	2,826	5
Japanese Restaurant Menu	10	6,868	10	2,707	5
Western Wedding Package	11	5,905	17	2,099	4
Ballroom Floor Plan	12	5,637	5	3,525	3
Fact Sheet (Japanese)	13	5,214	12	2,483	5
Fact Sheet (Traditional Chinese)	14	4,799	15	2,198	4
Japanese Restaurant Set Menu	15	4,320	19	1,802	4
Function Room Floor Plan	16	4,277	9	2,717	4
Snack Menu	17	4,138	14	2,262	4
Hotel Location Map (Traditional Chinese)	18	3,931	11	2,497	5
Ballroom Floor Plan (Chinese Style)	19	3,902	13	2,392	3
Function Room Floor Plan (Chinese Style)	20	3,253	18	1,909	4

Total number of hits: 1,144,744.

4.4 Using PDF files

According to Table 5, the ranking of coffee shop and Chinese restaurant menu ranked the top two by hits but rank second and sixth when calculated by number of visitors. Interestingly, restaurant information such as restaurant menu and seasonal promotion changes frequently such that many repeat web visitors returned and checked for the latest information. It, however, lacked the flexibility for Hotel Y to use different PDF files for showing web visitors the banquet room layout in different function styles. Instead, customers could only get a general idea of the function room size and layout. Customers might further request the sales person to draw the actual floor plan for their functions which might take several days before the sales person was able to get back to the customers. At present, various web applications are available that can display dynamic contents based on different variable values. Web visitors can input the number of guests and banquet style, and the system can then generate the exact floor plan layout to the customers.

Hotel Y's website contained plenty of dynamic information, which made it uneasy to update the website frequently using web design software. Such a situation was attributed to two factors. First, not many staff knew how to use web design software. Second, the high staff turnover rate created difficulties for software training. For these reasons, the hotel preferred to update the web contents using Word or Excel first, which were subsequently converted to PDF files for visitors to download. The main disadvantage of using PDF as the media was Acrobat Reader. Although Acrobat Reader is free, additional fonts pack is required for Asian fonts that some novice web surfers may not know how to download and install the fonts. Hence, they are unable to view the PDF files properly.

4.5 Number of Clicks to Retrieve the Desired Information

It is natural that the number of clicks to the desired pages can affect the website effectiveness and popularity. According to Table 4, the average number of clicks to the top 20 popular web pages was 1.84. This number showed the performance of Hotel Y's website was generally effective. However, more than 30% of the clicks were from the home page that would reduce the average clicks. As revealed in Table 5, the average number of clicks from the home page to download the desired files was 3.94, indicating a fairly lengthy process. Using hotel location map as an example, visitors needed four clicks to reach the location map page before a PDF file can be downloaded. For novice or impatient visitors, they might not be able to reach the map which was located four levels down from the home page. Moreover, for the users who needed non-English contents, they had to make one more click on language selection from the menu bar. In particular, when the F&B and room promotion pages were referred, which were the most attractive contents, visitors needed three to four clicks from the home page before they could get the information. This would certainly affect the website attractiveness, and ultimately the hotel business performance. Moreover, since the hotel had promotional e-newsletter with direct links to these promotional pages, the hit rate of these pages could remain high. In contrast, web visitors might

not be able to find the hotel information due to their lack of patience to go down to levels three and four.

4.6 Web Visitors' Behavior

By grouping the top 100 popular access paths by contents, ten different categories can be identified. Table 6 shows that more than 13% of the visitors accessed purely the home page and then quit. These users might find the website was not the one they were looking for. For instance, a visitor was looking for Hotel Y in Tokyo's website but reached Hotel Y in Hong Kong. Also, F&B related information ranked second with 16,909 hits (5.41%) and hotel information pages ranked third with 7,793 hits (2.49%). In contrast, only 347 and 61 hits looked for guest rooms with hotel location information or coffee shop information in one visit. Among the top 25% access paths, out of the 78,951 hits, 78,500 hits searched for single topic information, which outperformed those looked for multiple topics.

Table 6. Ranking by Categories for the 100 Most Popular Access paths

Rank	Category	Hits	%
1	Home Page Only	42,434	13.58%
2	Restaurant and Catering Pages	16,909	5.41%
3	Hotel Information Related Pages	7,793	2.49%
4	Guest Room Related Pages	6,846	2.19%
5	Hotel Recruitment Pages	3,315	1.06%
6	Virtual Tour	1,155	0.37%
7	Guest Room Page then Hotel Location	347	0.11%
8	Guest Room Page then Coffee Shop	61	0.02%
9	Gift Voucher	48	0.02%
10	Hotel Motto then F&B Promotion Page	43	0.01%
		78,951	25.26%

Total No. of Hits: 312,361

Among the top 50 popular types of downloaded files, more than 70% was F&B related (160,628 hits). However, when the number of visitors was concerned, only 57.24% of the visitors had downloaded the F&B information; whereas over 28% of the visitors had downloaded hotel information. This showed there were many repeat visitors who retrieved F&B information regularly because such information changes frequently. In contrast, for the visitors who had downloaded the hotel information, most of them were new visitors who were not familiar with Hotel Y.

Table 7. Ranking of the Top 50 Most Downloaded Files by Category

Rank	Category	Hits	%	Visitor	%
1	F&B	160,628	70.89%	51,032	57.24%
2	Hotel Information	50,543	22.31%	25,248	28.32%
3	Virtual Tour	13,332	5.88%	11,280	12.65%
4	Guest Room	2,094	0.92%	1,595	1.79%
		226,597	100.00%	89,155	100.00%

5 Limitations and Implications

Hotel Y has outsourced its online reservation service to a GDS. As such, it was not possible to analyze the performance of Internet bookings from the log file. Additionally, due to the limitation of the software, only the first 30 access paths were computed in this study, which makes it not possible to examine the complete information seeking paths. Moreover, there were more than 40,000 combinations of access paths, rendering its impossibility to manually categorize all the paths. Another limitation of this study is the dearth of further analysis for visitors' behaviour in a specific country.

In spite of the mentioned limitations, this research is expected to make a meaningful contribution to raise the awareness of the importance of hotel web log evaluations in order to understand online visitors' behaviour. To further elaborate this point, the arrangement of an information hierarchy could affect the information search efficiency of visitors. From the access path analysis, management can group the related information together in order to shorten the information search time. Also, by looking at the top visiting pages, hotel managers are able to understand which the most attractive (or popular) part is. Using Hotel Y as an example, if the hotel can launch the gift voucher sooner, they can increase the e-business opportunities. Thirdly, the entry page analysis can enable management to be aware of search engine visibility. Apparently, Hotel Y's website visibility in search engine is relatively low so that the top entry pages were mainly start from home page. Moreover, while there are many files in PDF format for visitors to download, the hotel management should consider the fonts used inside the document as well as the file size to avoid a long download time.

For software development professionals, they should consider further development on the software that can perform geographical analysis of web logs. With this additional feature, hotel management would be able to identify the behaviour of visitors from different regions.

6 Future Research

Findings of this research offer a general overview of web visitor behaviour on the basis of access paths and page hit. The empirical findings on path analysis, however, cannot identify visitors from individual countries. Therefore, this study is unable to distinguish the behavioural difference between local residents and overseas visitors. At present, most of the existing commercially available web log analysis software cannot perform such a kind of analysis. In view of this challenge, new software should be developed to analyze the relationship between access paths and origin for more comprehensive web log analysis. In addition, empirical findings in this study showed that the majority of visitors were local residents, indicating that the search engine indexing did not perform well. The ranking in search engines on general keywords such as "Hong Kong hotel" or "hotel in Hong Kong" does not seem to be high enough for visitors to locate the hotel website, and only those who know the

name of Hotel Y can find the website easily. As a result, a keyword analysis and search engine performance analysis would be valuable for future studies.

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A Study of Information Richness and Downloading Time for Hotel Websites in Hong Kong

ShanShan Qi[a], Rosanna Leung[a], Rob Law[a] and Dimitrios Buhalis[b]

[a] School of Hotel and Tourism Management
The Hong Kong Polytechnic University, Hong Kong
{shan.qi, hmrosann, hmroblaw}@polyu.edu.hk

[b] School of Services Management,
Bournemouth University, United Kingdom
dbuhalis@bournemouth.ac.uk

Abstract

It is generally agreed that a hotel website is created for attracting business. Adding visual materials such as images and multimedia files can enrich the website's content and enable a visitor to better understand the hotel. However, the more visual materials that are put on the website, the longer the download time. This study analyzed 102 Hong Kong hotel websites' home pages. Empirical findings showed that economy hotels had fewer image files than their luxury counterparts but the total file size of the former group was much larger than the latter. Moreover, most luxury hotels used script programs to handle sophisticated web functions such as member login and room availability; whereas only half of the economy and mid-priced hotels used script. In general, the difference on average web page size between luxury hotels and economy hotels was only 100KBytes (371KB and 271KB). Luxury hotels, however, contained an average of 47 objects and economy class hotels only contained 18 objects. As a result, when download speed is considered, the number of objects is not the major factor, but file size needs to be measured carefully.

Keywords: Hong Kong, hotels, web page, download speed, website optimisation.

1 Introduction

Ever since its introduction to the commercial world, the Internet has become a useful tool for marketers and consumers both for communicating information and online purchasing (Dellaert & Kahn, 1999). To this end, the rapid growth in the number of online users is clearly evident in the importance of the Internet. According to the Internet World Stats (2007), the global population of Internet users has increased 225% between 2000 to 2007. Web users also now expect more functionality (content) and richer information from the Internet (Pons, 2006). In response to this increasing expectation, business managers have , and will continue to, provide more online information on their websites. Although the number of web users has largely increased in recent years, slow web page download speed continues to be a major problem that vexes users. A large volume of web page content requires a longer web page downloading time (Galletta et al., 2004; Nah, 2003), causing lower service satisfaction and making some leave (Hoxmeier & DiCeare, 2000; Galletta et al., 2004; Rose et al., 2001). As such, any attempts to reduce web page download time can help retain most, if not all, web visitors, leading to higher website service quality (King, 2003).

Hong Kong, being a popular travel destination in Asia, largely relies on tourism to support its local economy (Chan and Law, 2006). In 2006, there were 25 million visitor arrivals in Hong Kong. Average hotel occupancy rates were 87% (Tourism Commission, 2007). At present, consumers commonly use the Internet to check travel related information before they physically visit a destination. As such, travel websites enable travellers to get a first expression of Hong Kong. To better serve this need, website designers must enhance web page performance by considering web page download speed.

Most prior studies of response time of tourism websites concentrated on the affectation of website design such as customers' perceptions or attitude, and subjective website performance evaluations. Only a limited number of prior studies has attempted to examine the factors that can affect web page download speed in the context of tourism. The primary objective of this research is, thus, to evaluate the general download speed performance of hotel websites in Hong Kong using five factors, namely HTML, image, external CSS, external script, and multimedia. A commercially available online website optimization analyser program was used as in the research.

2 Literature Review

Several prior studies have indicated that response time is a key aspect of e-commerce quality (King, 2003, McKinney et al., 2002; Torkzadeh & Dhillon, 2002; Turban & Gehrke, 2000). When download time is out of users' expectations, they will leave and seek alternative sites (Ranganathan & Ganaphy, 2002). This, in turn, results in low service performance comments from users and may even result in their abandoning a site forever (Shneiderman, 1998). In order to attract visitors and increase a website's competitiveness, website developers are paying more attention to web page download speed. Prior studies that are related to this topic largely fall into two main areas: users' perception and web delay factors.

The existing literature comprises many studies that investigate customers' performance, attitudes, and behavioural intentions at different web page delay time. Galletta et al. (2004) examined the relationship between users' perceptions and web page delay times at intervals of 0 to 12 seconds. In addition, Hoxmeier and DiCesare (2000), Ramsay et al. (1998), and Weinberg (2000) conducted similar studies. Findings of these studies all indicated that slow website response time could have a significant impact on online service, leading to low customer satisfaction and poor productivity among users (Dellaert & Kahn, 1999; Galletta et al., 2004; Nielsen, 1999; Rose et al., 2001).

Although slow web page download speed can lead to various problems, only a small number of published articles have investigated the relationship between web page delay impact factors and website optimization. Usually, large sizes of web page content (text, graphs, multimedia and codes) are the main factors affecting download speed (Jacko et al., 2000; Pons, 2006). Pons (2006) comments though that under the same situations, some large content web pages can be downloaded faster than small

content web pages. Therefore, a study on website download speed and website's response time would provide useful insights on the factors which would have an impact on download speed, leading to website optimization (King, 2001; 2003).

3 Methodology

This research investigates the general performance of hotel websites in Hong Kong. Weinberg (2000) indicated that a website's home page was the most important page within a website. It should have abundant content (text, graphs and multimedia), and a short download time. In addition, the home page is the first opportunity to give visitors a first impression of a site. Web page download time is difficult to measure because many factors can affect download speed. Examples include client broadband performance, computer performance, and server location. In order to provide an objective view of web page download performance, this study compared the file size rather than timing the actual download speed. The web analyzing tool used in this study was a commercially available website optimization analyzer. The test examined five basic web page design dimensions: *HTML, Image, External Scripts, External CSS files and Multimedia files* (see Table 1). Test results also reflect the total page size, composition, and download time of a website. In this context, the web analyzer can provide improvement recommendations. The software can also be applied to different areas such as personal blogs (http://www.lemongtree.com and http://www.osxcn.com), and business IT websites (http://webdesign.about.com, http://www.genealogy-computer-tips.com and http://www.webaim.org).

In Hong Kong, a total of 112 hotels were members of the Hong Kong Hotels Association in mid-2007. This study examined 102 hotel websites. The other ten websites could not be analyzed because they were either created by Microsoft's .NET application (e.g. /default.aspx) or the websites needed additional parameters to retrieve information (e.g. /index.html?propertyID=1826).

Table 1. Five basic webpage design dimensions

Basic Dimensions	Definition	Benefit for webpage
HTML	A computer language used to mark up web pages and display web content.	It is basically the universal language of web design, and the size of HTML is a key factor for fast page display (King, 2003).
Image & Multimedia	*Image and Multimedia files* display visual and aural product images such as video, audio and graphics (Chan and Law, 2006).	Multimedia & images have been shown to motivate and attract visitors to use a website (Hong, Thong, and Tam, 2004). Too many or too large sized images can lead to download delay (Perdue, 2001).
External CSS (Cascading Style Sheets) files	*CSS file* is a new style sheet language, which can be applied to any web page and used by both website designers and users to create elements such as colours, layout, and headers (Wikipedia, 2007 and Webopedia, 2007a).	CSS style web elements can save 25 to 50 percent of the file size compared to old-style web elements (King, 2003).
External Script	Script in computer programming languages is commonly called script languages. These languages are typed directly from a keyboard. The script languages can be written as internal or external part of the webpage program (Wikipedia, 2007).	External script means the program is written out of the whole web program, making it easier to change the webpage.

No officially classified star rating lists of hotels exists in Hong Kong. . The study, therefore needed to develop a proxy system to rate hotels. Three local and international hotel reservation websites (www.hotel.hk, www.hotels.com, and www.hotelsinhk.net) were compared, to classify hotels. Hotels were divided into one of three groups : i) 'economy class' representing two and three-star hotels, ii) 'mid price' representing four-star hotels, and iii) 'luxury hotels' encompassing five-star hotels. Table 2 shows the summary of different hotel categories.

Table 2. A Summary of Different Hotel Classes

Hotel Class	Hotel Main Pages Analyzed	Total Website Available
Economy	42	42
Mid-priced	38	42
Luxury	22	23
Total	102	112

In this study, empirical findings of various types of web services were displayed using different colors, which in turn, revealed whether the web page download speed was good, satisfactory, or problematic. A score of 3, 2, or 1 was then assigned for the good, satisfactory, or problematic performance in each of the analyzed types of service. Results were then analyzed by SPSS to compare mean scores.

4 Findings and Discussions

Five dimensions, namely HTML, image, external script, external CSS, and multimedia were analyzed. The average score hotels in each class is shown in Table 3.

Table 3. Average Scores for Different Dimensions of the Selected Hotels

Overall Rating		**Economy**	**Mid-priced**	**Luxury**	**All Hotels**
HTML (n=102)	Total no. of files	2.98	2.97	3.00	2.98
	Total Files size	2.68	2.74	2.64	2.69
Image (n=97)	Total no. of files	1.54	1.53	1.32	1.46
	Total Files size	1.26	1.19	1.36	1.27
External Script (n=72)	Total no. of files	2.33	2.04	1.95	2.11
	Total Files size	1.50	1.43	1.30	1.41
External CSS (n=70)	Total no. of files	2.96	2.89	2.74	2.86
	Total Files size	2.52	2.00	1.37	1.96
Multimedia (n=32)	Total no. of files	2.75	2.71	2.83	2.77
	Total Files size	1.08	1.07	1.00	1.05
Overall (n=102)	Total no. of Objects	1.38	1.24	1.14	1.25
	Total Web page	1.45	1.16	1.23	1.28
	Average Score	2.04	1.91	1.82	1.92

* *Scores ranged from 1 to 3, higher scores mean fewer files or smaller file size with shorter download time (Shaded colour shows the highest score in that row)*

The HTML dimension gets the highest score among all dimensions with an average of 2.98 points. Only two hotels had more than three HTML files and the size of HTML files was relatively small. Image files and multimedia files did not perform well because there were both large images and large numbers of images on luxury hotels' web pages (on average more than 47 images). Similarly, the average image file size for economy class was relatively large (more than 10KB each). In addition, using multimedia files was not as popular as images since only 31% the analyzed hotel web pages incorporated multimedia into their web pages. Inevitably, all hotel classes received very low scores (average = 1.05) and luxury hotels even scored 1.00, meaning that all luxury hotels' web pages had very large multimedia files. On the basis of the average scores, luxury hotels performed the worst (average score = 1.82); whereas economy hotels performed the best (average score = 2.04).

4.1 HTML

If a web page contains more than one HTML file, it means the web page has multiple frames. A search engine normally treats each HTML file as an independent web page. When customers retrieve hotel information from search engines, they may only get partial web information. As a result, many hotels have stopped using frames as their website templates. According to the findings of this study, eight economy and mid-priced hotels have multiple HTML files. Five of them had two HTML files, one had three HTML files, and two had five files. For the two that had five HTML files, their main pages were divided into four areas of top banner, top menu, content area, and footer. This way of arranging fragmented information could cause difficulties for visitors to retrieve the overall view of the website.

No significant difference were noted in hotels web page size among different hotel classes. The average HTML file size was about 14.2KB for economy hotels, and the corresponding numbers for mid-priced and luxury hotels were 14.1KB and 21.5 KB respectively (Table 4). However, great variation was noted in file size for hotels within each individual class. The size of HTML files for economy and mid-priced hotels ranged from 0.29KB to 68KB, and the range for luxury hotels was from 2.89KB to 57KB.

Table 4. An Analysis of Hotels' Main Page HTML Files

HTML		Number of Files	Total File Size (Bytes)	Average File Size (Bytes)
Economy (n=42)	Mean	1.22	17,321.07	14,203.28
	std	0.72		
Mid-priced (n=38)	Mean	1.16	16,320.16	14,094.68
	std	0.68		
Luxury (n=22)	Mean	1.00	21,520.18	21,520.18
	std	-		
All Class (n=102)	Mean	1.15	17,859.15	15,549.78
	std	0.60		

4.2 Image

Images are one of the most attractive and important items for web pages. As shown in Table 5, economy hotels' web pages had on average 15.41 images (ranging from one to 42 images), while luxury hotels had an average of 38.86 images (ranging from three to 111 images). When the total image file size was compared, economy hotels' image size was even larger than luxury hotels. As indicated in Table 5, the average file size of an image on economy class hotels' web page (10,688 bytes) was almost three times as big as the luxury hotels (3,317 bytes). Interestingly, five hotel web pages did not contain any images. Apparently, these hotels made use of multimedia files to replace all image files that made the web pages more interactive and attractive.

Table 5. An Analysis of Hotel Main Page Image Files

Image Files		Number of Files	Total File Size (Bytes)	Average File Size (Bytes)
Economy (n=39)	Mean	15.41$^{\Delta}$	164,699.62	10,687.66
	std	9.53		
Mid-priced (n=36)	Mean	18.75$^{\#}$	107,330.11	5,724.27
	std	16.59		
Luxury (n=22)	Mean	38.86$^{\Delta, \#}$	128,907.45	3,317.23
	std	37.13		
All Class (n=97)	Mean	21.97	135,290.03	6,158.20
	std	22.91		

$^{\Delta}$ *The mean difference for these two hotel classes is significant at the 0.05 level (p=0.000)*
$^{\#}$ *The mean difference for these two hotel classes is significant at the 0.05 level (p=0.002)*

4.3 External Script

To enhance the usability of web pages, many web designers make use of external script files to create special functions to cater for special needs. Among the 102 hotel web pages, 72 had external script files (70.59%). The number of external script files used for all classes of hotels web pages ranged from one to 15 files, with the average of about four to six files (Table 6). For luxury hotels, their main pages normally included many functions such as member login, availability search, newsletter subscription, and banner advertisement. The external script files sized in the range of 0.6KB to 250KB, except for two luxury hotels' external script files that were about 800KB.

Table 6. An Analysis of Hotel Main Pages' External Script Files

External Script Files		Number of Files	Total File Size (Bytes)	Average File Size (Bytes)
Economy (n=24)	Mean	3.54	39,363.04	11,114.27
	std	2.87		
Mid-priced (n=28)	Mean	4.96	46,722.18	9,411.66
	std	3.77		
Luxury (n=20)	Mean	5.70	127,879.05	22,434.92
	std	3.74		
All Class (n=72)	Mean	4.69	66,812.71	14,232.29
	std	3.55		

4.4 External CSS

On average, about 70% of the hotel web pages made use of external CSS files as web templates. More specifically, 26 hotels (18.20%) used multiple external CSS files for handling different needs. For web pages that had two or more external CSS files, one was used as the standard format and the remaining ones were used for special

occasions such as festivals and special function format like forms printing. As a whole, luxury hotels' main pages contained two external CSS files, while economy hotels only had 1.22 files (Table 7). Economy hotels' external CSS file size ranged from 0.52KB to 28.8KB, whereas the corresponding numbers for luxury hotels were 1.28KB and 73KB respectively. Thus the average size of external CSS files for luxury class hotel was more than three times of that for economy hotels. Seemingly, the size of external CSS files could affect the overall website performance because every time when a visitor clicks a new page, the relevant external CSS file would be loaded. If the file size gets large, the overall website loading time will be slowed down.

Table 7. An Analysis of Hotel Main Pages' External CSS Files

External CSS Files		**Number of Files**	**Total File Size (Bytes)**	**Average File Size (Bytes)**
Economy (n=23)	Mean	1.22$^{\Delta}$	5,478.70$^{\#}$	4,500.36
	std	0.52		
Mid-priced (n=28)	Mean	1.54	11,776.25	7,668.26
	std	0.92		
Luxury (n=19)	Mean	2.00$^{\Delta}$	19,242.84$^{\#}$	9,621.42
	std	0.88		
All Class (n=70)	Mean	1.56	11,733.70	7,535.40
	std	0.85		

$^{\Delta}$ *The mean difference for these two hotel classes is significant at the 0.05 level (p = 0.007)*
$^{\#}$ *The mean difference for these two hotel classes is significant at the 0.05 level (p = 0.009)*

4.5 Multimedia Files

Among the analyzed hotel web sites, only 32 home pages (31.37%) contained multimedia files (Table 8). Among the 22 luxury hotels, only six used no more than three multimedia files on their front pages. Files size ranged from 139KB to 0.58MB. Both economy class and mid-priced hotels' web pages had no more than three files with the size ranging from 12.3KB to 1.32MB and 4.8KB to 2.7MB, respectively. The opening time for the two hotels that had multimedia files larger than 1MB was obviously slower than those of other hotels.

Table 8. An Analysis of Hotel Main Pages' Multimedia Files

Multimedia Files		**Number of Files**	**Total File Size (Bytes)**	**Average File Size (Bytes)**
Economy (n=12)	Mean	1.67	370,364.33	222,218.60
	std	1.07		
Mid-priced (n=14)	Mean	1.86	441,372.50	237,297.04
	std	0.86		
Luxury (n=6)	Mean	1.33	355,976.33	267,651.38
	std	0.82		
All Class (n=32)	Mean	1.69	398,732.66	236,286.02
	std	0.93		

4.6 Overall Web Page Performance

A significant difference in average number of objects was noted between economy and luxury hotels. Within each of the hotel classes, members also exhibited wide differences in overall performance (Table 9). When the number of objects was considered, economy and mid-priced hotels ranged from one to 49 and 103 objects, and luxury hotels ranged from four to 128 objects, respectively. Total file size for economy and mid-priced hotels ranged from 0.29KB to 1.4MB and 2.7MB, whereas file size for luxury hotels ranged from 75KB to 1.36M. Apparently, the control of overall file size for luxury hotels was better than economy and mid-priced hotels in that luxury hotels were able to maintain a reasonable amount of information on the web page, while ensuring web pages were not oversized to slow download time.

Among the analyzed web pages, luxury hotels had 2.5 and 2.0 times more objects than economy and mid-priced hotel web pages respectively. Although the number of images on luxury hotels' websites was much larger, the total file size for economy hotels (278KB) was 26% smaller than luxury hotels (380KB) (Table 9). As a result, the average object size for economy and mid-priced hotel web pages was almost double the size of luxury hotels. When checking each hotel page size individually, the total file size ranged from 4 KB to 2.7MB.

Table 9. An Analysis of Hotel Main Pages' Overall Size and Number of Objects

Total Web Page		Number of Objects	Total File Size (Bytes)	Average Object Size (Bytes)
Economy (n=42)	Mean	18.67$^{\Delta}$	278,485.52	14,918.87
	std	11.25		
Mid-priced (n=38)	Mean	24.39$^{\#}$	323,717.05	13,269.95
	std	17.98		
Luxury (n=22)	Mean	47.32$^{\Delta, \#}$	380,384.59	8,038.56
	std	39.00		
All Class (n=102)	Mean	26.98	317,314.72	11,760.94
	std	24.65		

$^{\Delta}$ *The mean difference for these two hotel classes is significant at the 0.05 level (p =0.000)*
$^{\#}$ *The mean difference for these two hotel classes is significant at the 0.05 level (p =0.001)*

5 Implications and Limitations

This study shows the presence of the recent practice of replacing image files with multimedia files, making sites more interactive and attractive for visitors. Moreover, with the increasing popularity of broadband Internet connections, download time for large files has become less of a concern for web designers. This study determined that the average image size for economy hotels was relatively high (10.4KB each). With advanced image compression technology, the image size can be largely reduced, making download time faster or enabling more images to be placed on a web page.

There are a few limitations in this study. First, this study has analyzed the first entry page of hotel websites but a few hotels only used the front page as a cover page that

did not show the actual layout of the websites. Additionally, the websites that were created by .NET applications were unable to be analyzed by the commercial software. Since .NET application is the latest technology, findings of this study could not reveal the latest web development. Finally, many chain hotels share the same web template irrespective of whether the hotel was an economy, mid-priced or luxury one. Therefore, the comparison of different hotel classes might not represent actual performance. Future research is thus recommended to investigate web performance for individual hotels versus chain hotels.

6 Conclusions

After the practical discovery that search engines treat individual HTML frames as an individual page, only a small number of hotels now use frames in their web design. As such, more than 90% of the hotels performed well in the HTML part of this study. Moreover, to make a website more interesting and attractive, five economy and mid-priced hotels purely used multimedia files on their main web home pages. Also, script programming plays an important role on luxury hotel websites as their file size was relatively larger than the others. Luxury hotels usually put the member login and room availability on the first page in order to create a convenient environment for visitors to make reservations.

In order to provide sufficient information on the website and not to affect the download time, web designers should compress images and multimedia files using image compression software to minimize the file size. The reduction of the size of their images and multimedia files while increasing number of images should be applicable not only to luxury hotel websites but also to all hotel websites. Since economy hotels' web page size was only 100KB smaller than luxury hotels, the downloading time for this 100KB would not have much effect on the opening speed of a web page if a broadband connection is used. For this reason, luxury hotels prefer to have larger page size to maintain information richness. Second, as the home page provided visitors the first impression of the hotel, to supply them with the necessary information, the home page should include the most attractive information of the hotel such as promotion and room availability.

The research findings show that the overall performance of downloading images and multimedia were not ideal. Luxury hotel websites have the largest sized multimedia files among all hotel websites. On one hand, it is good for hotels to promote their products and attract more visitors. On the other hand, users may leave a website if it takes too long to wait for the image to be displayed. As mentioned previously, the average image size for economy hotel was three times larger than luxury hotels. If the economy class hotels can further compress their image files, their downloading speed could be further improved.

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Adoption of E-mail Marketing in the Hotel Sector

Matthias Fuchs
Mario Tuta
Wolfram Höpken

eTourism Competence Center Austria

{firstname.lastname}@etourism-austria.at

Abstract

The paper identifies determinants of adoption behavior concerning E-mail marketing in the hotel sector. Based on the technology adoption literature and data generated in 241 hotels, first, a logistic regression is performed to identify the drivers behind the usage decision. Secondly, by the use of linear structural equation models (SEM), the determinants of both adoption-intensity and adoption-intention are empirically deduced. Finally, managerial implications and research challenges regarding the issue of E-mail Marketing in tourism are discussed.

Keywords: E-Mail Marketing, adoption behaviour, hotel sector, logistic regression, SEM.

1 Introduction

Only in a few industries are the generation, exchange and processing of information as important for daily operations as in the travel and tourism sector. Both, promotion and distribution of tourism products heavily depends on its multi-medial presentation (Wang & Cheung, 2002). Thus, ICTS are indispensable for the global marketing of tourism service products. In this regard direct marketing permits a maximum of customer orientation, personalisation and individualization (Marinova et al., 2002). Murphy (2003) points out that for customer communication the Internet surmounts the trade-off between information richness (e.g. actuality, individualization, etc.) and customer-reach particularly through E-mail Marketing (E-MM). Until today, however, there has been a lack of reliable adoption studies regarding E-MM in tourism. Therefore, the aim of this paper is to identify the determinants of adoption behaviour concerning E-MM in the hotel sector.

The paper is structured as follows: Based on a literature review, section two discusses various E-MM types and sketches chances and risks emerging from the marketing instrument. Prominent E-MM studies in tourism are also reviewed. Section three summarizes technology adoption literature. From this base an adoption model to explain both future adoption intention as well as actual adoption levels regarding E-MM in the hotel sector is proposed. Having briefly outlined the various operationalization steps, section four discusses the research design. Section five presents findings from the adoption study undertaken in Winter 2007. Finally, the conclusion section deduces managerial implications and proposes future research activities regarding the issue of E-mail Marketing in tourism.

2 E-mail Marketing – Some Theoretical Considerations

E-mail Marketing (E-MM) permits strong goal-orientation, personalization, individualization and the most accurate measurability of a campaign's effectiveness (Barowski, 2000). As a means of commercial communication, E-MM uses E-mails to deepen the relationship with current or past customers to increase their loyalty (Bourland & Handley, 2000). They are also dispatched to recruit new customers or to convince existing ones to buy special offerings. Frequently used types of E-MM are *newsletters*, particularly supporting customer retention through regular and permanent E-mail transmissions (e.g. target-group-oriented contributions, promotional announcements or web-links). Electronic newsletters have advanced to the most accepted and effective instrument within electronic marketing (Katz, 2002). Another E-MM type is represented by *commercial E-mails,* which form the core element of any on-line advertising campaign. Typically, they involve a customer's agreement to receive the E-mail. In order to positively stimulate the recipient, commercial E-mails often contain incentives, like coupons, vouchers or abatements (Murphy, 2003). Furthermore, *viral marketing* can be interpreted as the Internet equivalent of *word of mouth*. The idea is to encourage individuals to forward promotional messages to other potential customers (Murphy, 2003).

The dramatic increase of commercial E-mails during recent years has, however, led to gradually overflowing E-mail accounts and to an increased rate of unread E-mails (Daniels, 2004). Particularly through uninvited Junk-mails (*Spam*) the image of E-MM has been damaged and even for well established firms it became difficult to successfully employ E-MM (Marinova et al. 2000). *Permission marketing* aims at resolving this problem by utilizing well established relationships between customers and suppliers. Users have the option to voluntarily register in the advertisers' mailing list, thus, permitting them to receive promotional information. A further E-MM application is given by *reminders*. If desired a 'friendly reminder' points out approaching fixed-dates (e.g. a concert, a closing sale). A final noteworthy E-MM type is a *pushed notification*. It is automatically dispatched via E-mail (or *SMS*) in a specific contextual situation. Tourism examples are storm- or congestion information, respectively (Fuchs et al, 2007). The advantages from E-MM may be summarized as follows (Barowski, 2000). Production costs for E-MM compared to direct mailings are negligible, as neither paper nor postal charges are involved. Compared to paper-based advertising, E-mails arrive to the customer within seconds and compared to websites which are 'passively waiting for visitors' E-MM actively reaches out to a set of pre-specified recipients. In addition, messages can easily be tracked as unclaimed E-mails may be identified (e.g. due to non-activated E-mail addresses or *bounce-backs*). With open-rates, advertisers can monitor the response-behaviour. Of particular interest is the share of new subscribers and the induced *conversion rate* (Bourland & Handley, 2000). Finally, E-MM is a segment-specific and personalized way to approach the customer. For instance, depending on the type of interaction between customer and advertiser relevant follow-up messages may automatically be triggered. To summarize, marketing science approved E-MM as being highly

effective if implemented and executed properly (Hoffman, 2000). However, although properly implemented E-MM can show remaining risks as even legitimated E-mails can be blocked by spam-filters due to incorrect classification (O'Connor, 2006).

A good reason to apply E-MM in tourism is given by the fact that Internet users are usually well educated, regularly travelling, benefit from a relatively higher income and tend to spend larger amounts for travel and tourism purposes. Secondly, most PC-users check their E-mails first after having logged-in. Thirdly, E-mails are the most prevalent Internet technology among global hotels (Wei et al. 2001) and consumers' most popular Internet activity (Ramsey, 2001; Leuenberger et al., 2003; Schegg et al., 2003). A challenge, however, still remains as E-mail-based campaigns must be arranged in such a way to ensure user attention and to provide the recipients a real value-added. Murphy (2003) points out that, although only few E-MM studies in tourism exist usage statistics suggest that tourists are quite accessible to E-MM. This view is corroborated by Kohl (2000). Her study reports from 'Mirage' Las Vegas hotels having carried out an E-MM campaign for special room offerings addressed to 8,000 individuals. As a consequence, a totality of 3,500 persons visited the hotel website and, interestingly, about 2,000 tourists have booked a room due this special offer. Furthermore, the study from Marinova et al. (2002) observed that a more general address form led to a significantly lower '*opt-out*' behaviour than a more personalized salutation form. The study also showed that a theme specific subject line does not affect the opting-out behaviour of hotel guests. Finally, O'Connor (2006) analyzed E-MM campaigns arranged by international hotel chains concerning the accordance with existing law. Surprisingly, compared to other sectors the hotel sector emerged as being highly lawful. Only 6% of analyzed E-mails displayed misleading subject lines and 99% of the dispatcher's completion fields proved to be valid. However, 37% of the observed E-mails didn't show a valid postal address, thus, violating the CAN-SPAM Act 2003. To summarize, existing Spam laws (EU: E-Commerce Directive 2000, European Privacy & E-Communications Regulations 2003; USA: CAN-SPAM Act 2003) don't strive to forbid commercial E-mails, but to regulate how online marketing campaigns could apply E-mails as a legitimized communication instrument.

3 Technology Adoption Models – A Literature Review

The following section briefly discusses prominent adoption models. The *Technology-Organization-Environment* Framework (TOE) is based on the work of Tornatzky and Fleischer (1990) and has also been empirically validated (Kuan & Chau, 2001; Zhu et al., 2002). The following factors determine adoption processes of (technological) innovations at the firm level. The *technological* context describes internal and external technologies relevant to the firm. The *organisational* context considers the firm's size, centralization and formalization level, the complexity of leadership structures and the amount of available resources. The *environmental* context comprehends the branch of economic activity, the competitive level and the style of public governance. Very similar, according to Iacovou et al. (1995) technology adoption is affected by experienced advantages from a specific technology, financial

and organizational resources targeted to technology projects and by external impacts stemming from competitors' and customers' requirements. According to *Innovation Diffusion Theory* individuals initially form attitudes towards a specific (e.g. technological) innovation which, in turn, leads to a decision whether (or not) to adopt (Rogers, 1995). If the innovation is assumed as being 'better' than an existing system (*relative advantage*), easy to apply and compatible with both existing systems and users' expectations (*compatibility*) then positive attitudes will emerge. Thus, it is likely that the accomplished adoption decision will arise in favour to the technological innovation. A further vein of technology adoption research is bearing on the *Technology Acceptance Model* (Davis 1989). TAM is based on Fishbein and Ajzen's (1975) *Theory of Reasoned Action* focusing particularly on decision maker's attitudes and beliefs. Davis et al. (1989) deduced that the adoption decision is significantly influenced by the individual intention to use a technological system. They further argued that the adoption intention is determined by both the individually perceived usability (i.e. *ease of use*) as well as the perceived utility (i.e. *usefulness*) of the system, respectively. TAM has been employed in combination with the TOE Framework (Thong, 1999; Grandon & Pearson 2004; Al-Qirim, 2005). Individual characteristics of the decision maker include, for instance, the innovation propensity and technological skills and are particularly considered when analyzing technology adoption within micro- and small-firms as decision making is mainly dependent on a single person - the entrepreneur. To summarize, the sketched models show strong communalities and, thus, have commonly contributed to the construction of the below presented adoption model for E-MM in tourism.

4 Model Building and Research Design

Tornatzky and Klein (1982) have found that experience-based (i.e. subjective) characteristics explain adoption behaviour well. Similarly, Moore and Benbasat (1991) bring forward the argument that '*because different adopters might perceive primary characteristics in different ways their eventual adoption behaviours might differ*' (Moore & Benbasat, 1991, p. 194). Accordingly, the below study is based on E-MM characteristics subjectively perceived by hotel managers. Below, the operationalization of model constructs and underlying hypotheses (*H*) are discussed.

- *Organizational Context*: Wang and Cheung (2004) identified technical competencies to positively determine technology adoption (*H1*). Competencies are measured by the perceived competencies with online marketing and E-MM. As a proxy for financial resources corporate success (i.e. sales and capacity utilization) is hypothesized to be positively related to adoption behaviour (*H2*).
- *Innovation Context*: According to Kuan & Chau (2001) relative advantages include perceived advantages from E-MM compared to traditional advertising as well as strategic effects which positively affect business processes and customer relationships (*H3*). Furthermore, adoption behaviour is more likely if the innovation is compatible with existing practices and technical systems (*H4*).
- *Environmental Context*: According to Ching and Ellis (2004) managers reported that their adoption decisions are triggered by customer requests. Similarly, also competitive pressure is driving adoption behaviour (Iacovou et al., 1995; *H5*).

- *Firm Related Context:* Larger firms will rather dispose of resources for technology investments and will more likely start risky investments (Wang & Cheung 2004; *H6*). Furthermore, the larger the firm's scope the larger are coordination costs. As digitalized business processes are lowering coordination costs, firms with a larger scope will more likely adopt new ICTS (*H7*). According to Zhu et al. (2002) the hotel's scope is operationalized by the number of divisions and establishments. With regard to hotel type, one-man businesses and chains are considered. A further distinction is made for the category (5- to 1-star). Hoontrakul and Sahadev (2003) reported that hotels from higher categories could tend to more likely employ ICT innovations (*H8*). According to the same authors a cumbersome redeployment of IT systems grown in the course of time is not necessary for young firms. Thus, younger firms will employ new technologies more likely than older companies (*H9*).
- *Decision-maker's Context*: Younger decision-makers initiate innovations more often and tend towards more ambitious projects (Ching & Ellis, 2004). In particular they better recognize new application fields for ICTS (*H10).* A further decision maker characteristic is considered by the formal education level (*H11*). Finally, Ching and Ellis (2004) proved that cosmopolitanism positively determines adoption behaviour (*H12*).

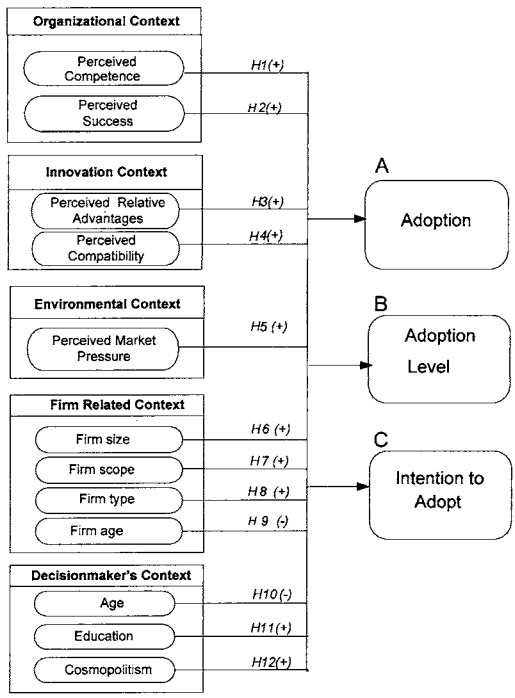

Fig. 1 Hypotheses concerning the Adoption of E-MM in the Hotel Sector

Questionnaire items were developed on the base of E-MM and adoption literature, respectively. Measurement proceeded in the form of statements to be rated by a 6-point *Likert-scale* (6=completely agree; 1=don't agree at all). The *endogenous* construct was divided into A) '*adoption*' (i.e. yes/no), B) actual '*adoption level*' (usage intensity of E-MM) and C) '*intention to adopt*' E-MM in the future (Figure 1).

In the course of a *pre-test* eight hotel managers were asked in Dec. 2006 to answer the questionnaire. Suggestions were considered and, subsequently, a quantitative survey has been conducted in a joint-venture with the E-MM company XQueue (Offenbach a. M.). The study took place in the alpine regions of Austria and the German speaking South Tyrol (Italy). After contacting subjects by telephone, a total of 925 hoteliers agreed to participate at the online survey. Thereupon, an E-mail linking to the online survey was sent to hotel managers in February 2007.

5 Empirical Findings from the Adoption Study

From the 925 hotels pertaining to the 2-, 3- 4- and 5-star category a totality of 241 completely filled-out questionnaires were returned. This corresponds to a response rate amounting to 26%. In accordance with the population base the share of 3- and 4-star hotels is largest with a ratio of 44% each. Younger managers participated more than older ones. Precisely, 24% were below 30 years, 34% between 30 and 39 years, 30% between 40 and 49 years and only 12% were older than 50 years. Furthermore, 53% of hotels had between 10 and 49 employees, whereas, typically in alpine hotels, 38% employ less than 10 employees. A significant share (75%) of managers indicated that they apply E-MM already today. 46% were offering the possibility to subscribe to an online *newsletter* at their hotel website. However, 69% are sending commercial e-Mails less than four times per year. Nevertheless, 72% said that they would augment E-MM applications in the future. Finally, from those hoteliers who don't apply any E-MM measures yet (25%), the majority (77%) indicated to make use of E-MM in the future. The 241 managers expressed themselves about perceived advantages of E-MM in the hotel sector. More precise, on a 6-point *Likert-scale* (i.e. 6=completely agree) they strongly agreed that advantages from E-MM are stemming from the '*promptness of execution*' (mean: 5.31) and from the ability to '*improve the competitive position*' and '*customer services*', respectively (mean: 4.85 each). With regard to eventual disadvantages, however, only few agreed that E-MM would '*not be compatible with the existing technological system*' (mean: 3.08). Similarly, only 4% criticize that '*E-MM would be difficult to integrate in the actual marketing strategy*'. Finally, the willingness to adopt E-MM not only may be traced back to recognized advantages. A significant *environmental pressure* can be observed: About 60% agreed that their guests regularly ask for an online newsletter. In addition, 83% recognize critical *competitive disadvantages* if they wouldn't employ E-MM in their future business (Fuchs et al. 2007).

Before going on to verify dependence structures, a *confirmatory factor analysis* was carried out with AMOS 7.0 to evaluate construct validity of the latent *exogenous* constructs proposed by the adoption model (Hair et al. 2006). The Chi^2 test yields a statistic of 86.4 ($df = 180$) and a corresponding p-value of .103. Thus, the model fits

the data well. Accordingly, both, Adj. Goodness of Fit Index (AGFI) and Root Mean Squared Error of Approximation (RMSEA) are scoring at .923 and .041, respectively. All other fit measures approved the model and ranked above the recommended thresholds. Finally, all regression weights were significant and the squared multiple correlations showed a respectable portion ranging from .39 to .93 (Figure. 2).

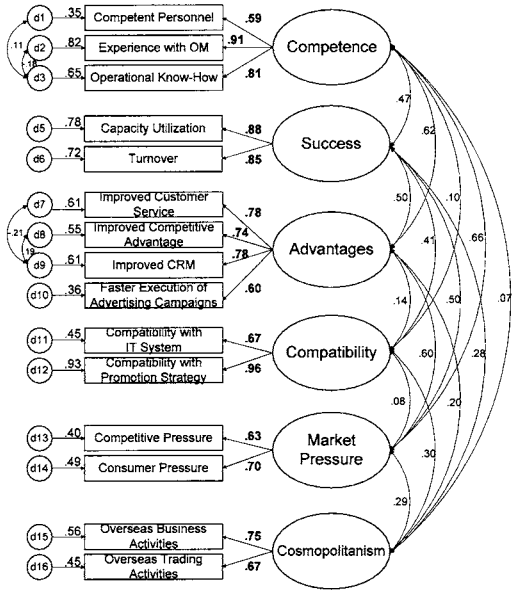

Fig. 2 Results from Confirmatory Factor Analysis for Latent Model Constructs

From the 241 analyzed cases, 59 hotels (i.e. 24.5%) don't apply E-MM yet, whereas 182 (i.e. 75.5%) integrate E-MM in their promotional campaigns. In order to identify drivers behind the decision whether to employ E-MM a *logistic regression* was employed. Starting with *Nagelkerke's* R^2, values larger than .4 were defined as *satisfactory* (Krafft, 2000). For the employed study the value amounts at .439 - well above the threshold (Table 1). Thus, the model shows satisfactory *explanation power* to predict adoption decisions regarding E-MM in the hotel sector.

Regression coefficients are checked with respect to significance, direction and (relative) magnitude (Hair et al., 2006). Like in other adoption studies (Kuan & Chau 2001; Zhu et al. 2002; Wang & Cheung 2004) a significant impact on the decision to use E-MM stems from embodied technical *competencies*, thus, confirming hypothesis H1A. In accordance with H2A the perceived *firm's success* affects the employment decision of E-MM. Thus, although significant only at the level of $p = 0.08$ one can tentatively generalize that there is a positive relationship between firm success and E-MM adoption. Again fully consistent with H3A, perceived *relative advantages* significantly affect the E-MM adoption decision. As postulated by *Innovation*

Diffusion Theory (Premkumar & Roberts, 1999) and hypothesized by H4A the obtained results suggest a significant impact from the perceived *compatibility* on the adoption decision. Interestingly, the *environmental factor* comprising the pressure stemming from both competitors and customers represents the largest single determinant on the adoption decision. Thus, hypothesis H5A is also confirmed. Finally, like in the study from Ching and Ellis (2004) *cosmopolitanism* shows a significant positive relationship with the adoption decision in favour of E-MM, thus, confirming hypothesis H12A. In contrast to the literature, however, neither the measured *firm related factors,* such as firm size (H6A), scope (H7A), type (H8A) and age (H9A), nor the remaining *decision maker's* dimensions such as manager's age (H10A) and education level (H11A) showed any relationship with the decision whether (or not) to adopt E-mail Marketing in the hotel business.

Table. 1. Results from Logistic Regression Analysis

Exogenous construct	Coefficient	Wald Statistic	Significance
Competence	.701	14.681	< .001
Success	.310	2.859	.081
Advantages	.433	5.679	.017
Compatibility	.445	6.542	.011
Market Pressure	1.306	39.306	< .001
Cosmopolitanism	.412	3.757	.051
-2 log likelihood = 184.095; Cox & Snell R^2 = .316; Nagelkerke's R^2 = .439			

In the next step a *linear structural equation model* (SEM) based on maximum likelihood estimates using AMOS 7.0 was employed to detect the factors determining the adoption level concerning E-MM in hotel businesses. The items 'frequency of sending commercial E-mails' and 'intention to increasingly employ E-MM in the future' formed the latent *endogenous* construct. For the sub-sample composed by 182 hoteliers already adopting E-MM, the fit measures are highly satisfactory. The *Chi²*-value stands at 23.542 (*df* = 12) and shows a corresponding *p*-value above the threshold value of .05. Accordingly, both, Adj. Goodness of Fit Index (AGFI) and Std. Root Mean Squared Residual (SRMR) are scoring at .930 and .046, respectively. All other fit measures (NFI, CFI, χ^2/df, RMSEA) approved the model and ranked above the recommended thresholds (Hair et al, 2006). Interestingly, a total of only four factors pertaining to the *environmental*, the *firm-related* and the *decision maker's* context, respectively, are sufficient to explain about 88% of the total variance of the endogenous construct (Figure 3). Obviously, the higher the perceived pressure stemming from both, competitors and customers the higher the actual adoption level of E-MM. Thus, H5B is confirmed. However, in contrast to hypothesis H6B, smaller hotel companies employ E-MM more often. Consistent with literature is the finding that younger hoteliers apply E-MM more extensively, thus, confirming hypothesis H10B. Finally, the strongest single determinant on the current adoption level stems from the *cosmopolitanism* of the decision-maker, thus, confirming H12B. The

exogenous construct was measured by the variables 'business activities overseas' and 'presence on trading fairs overseas' (Ching & Ellis, 2004). To conclude, all other proposed exogenous variables didn't affect the adoption level at all. Put differently, the hypotheses H1B, H2B, H3B, H4B, H7B, H8B, H9B and H11B are not verified.

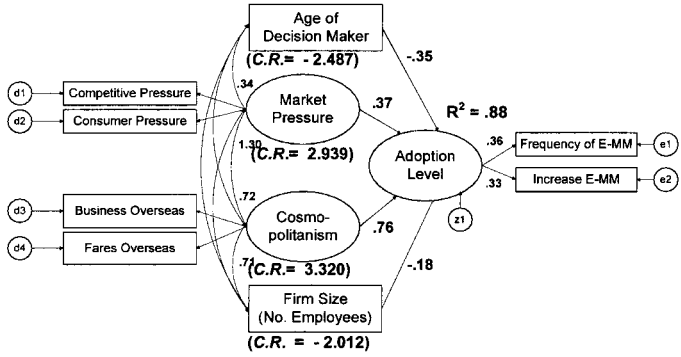

Fig. 3 Results from SEM 'Adoption Level' (C.R. = *Critical Ratio*)

In a third and final step, the *exogenous* constructs were hypothesised as possible determinants for the manifest variable *intention to adopt* E-MM in the future. Again a *linear structural equation model* was employed for the sub-sample composed by 59 hoteliers not having adopted any E-MM measures yet. Although this sample size must be defined as rather small for SEM, fit measures are again highly satisfactory. Thus, the obtained results are presented but should be interpreted with caution (Hair et al., 2006). The *Chi²*-test yields a statistic of 89.160 (*df* = 52) and the corresponding χ^2/df = 1.89, well below the upper threshold value. Also the Adj. Goodness of Fit Index (AGFI) and Std. Root Mean Squared Residual (SRMR) are scoring at .909 and .047, respectively. All other fit measures (e.g. NFI, CFI, RMSEA, etc.) approved the model and ranked above the recommended thresholds. A total of five factors pertaining to the *organizational,* the *innovation*, the *environmental* and the *firm-related* context, respectively are explaining about 56% of the variance of the endogenous construct (Figure. 4). Consistent with theory is the fact that individual competence level acts as moderate determinant for the intention to adopt E-MM in the future. Thus, H1C is confirmed. However the second *organisational context* dimension, the perceived level of organisational success does not affects the intention to adopt E-MM at a significant level (i.e. C.R. < 2.0) Similarly, the perceived advantages from E-MM show neither a large nor a significant impact on the adoption intention. However, the largest single determinant is again formed by the perceived market pressure. Thus, similarly with the adoption level, the higher the perceived pressure stemming from both competitors and customers the higher the intention to adopt E-MM in the future. H5C is thus confirmed (Ching & Ellis, 2004). Finally, both, a moderate as well as a significant impact stems from the *firm-related* dimension 'firm scope'. According to H7C, the higher the number of divisions and establishments of the hotel company, the higher the intention to adopt E-MM in the future (Zhu et al. 2002). To conclude, all the other proposed exogenous variables didn't affect the intention to adopt E-MM. Put

differently, the hypotheses H2C, H3C, H4C, H6C, H8C, H9C, H10C, H11C and H12C are not verified (i.e. rejected).

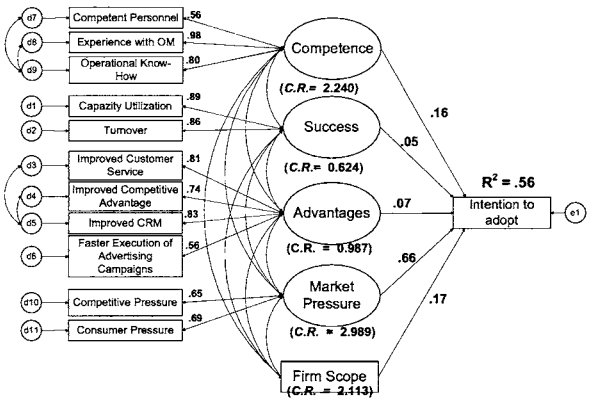

Fig. 4 Results from SEM 'Intention to Adopt' (C.R. = *Critical Ratio*)

6 Conclusions and Outlook

The study systematically investigated the factors motivating decision makers to adopt E-mail Marketing in the (alpine) hotel industry. For this aim, a perception-based adoption model was developed after reviewing existing adoption literature. A number of differing determinants was examined at the *organizational*, *innovation*, *environmental*, *firm* and *decision-maker's* level, respectively. By empirically calibrating three dependency models hypotheses were tested to identify the drivers affecting the past adoption *decision* of E-mail Marketing, the present adoption *level* (i.e. usage intensity) and the *intention* to adopt E-mail Marketing in the future (i.e. usage intention). Concordant with the study of Wang and Cheung (2004) the presented study shows that the past adoption *decision* is mainly affected by the managers' perceptions of *environmental* conditions (i.e. pressure from customers and competitors), *organizational* conditions (i.e. technical competence, success), *innovation* conditions (i.e. advantages and compatibility) as well as by the individual cosmopolitanism (i.e. pertaining to the *decision maker's* context). Instead, the actual adoption *level* (i.e. intensity) is mainly determined by the perceived pressure from customers and competitors (i.e. *environmental* context), the firm size, the decision maker's age, and the individual level of cosmopolitanism. Finally, the *intention* to adopt E-MM in the future is affected by the perceived technical competence (i.e. *organisational* context), the perceived market pressure (i.e. *environmental* context) and the firm's scope (i.e. *firm related* context). To summarize, the *environmental* context, namely the experienced pressure from both consumers and competitors, emerged as a through-passing determinant for *all* the three analysed adoption-phases (i.e. past adoption *decision,* actual adoption *level* and *intention* to adopt in the future).

The obtained study results are of particular importance for professional E-Mail Marketing providers. More precisely, their sales strategies directed to the hotel sector could be effectively enhanced by firstly highlighting the pressure from both customer and competitor markets. Secondly, the effectiveness of previous sales strategies can be further improved by offering accompanying training services as well as by delivering information about both system's and technical requirements. Thirdly, in the course of their sales activities professional providers of E-MM could highlight the various advantages perceived by hotel managers attributed to the actual usage of E-MM. The latter can be summarized as the improvement of customer services, a more advantageous competitive position, a more effective customer relationship management (CRM) and finally, a dramatically faster execution of advertising campaigns. Similarly to Hoontrakul and Sahadev (2004), the study revealed that neither 'hotel type' nor 'hotel category' affects the attractiveness of e-Mail-Marketing as perceived by hotel managers. Thus, no specific sales strategy by hotel type or hotel category needs to be established by E-MM providers when focussing the hotel industry. To conclude, as E-MM is likely to grow in the future, specialized providers will be confronted with a huge market potential in the hotel industry. For future research it is suggested to pursue representative market tests to identify the most adequate e-Mail Marketing campaigns designed for the hotel industry (Marinova et al., 2002). Finally, acceptance studies should be performed with end-users to detect successful types of E-MM that are most likely attracting potential hotel guests.

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Selling Accommodation Packages in Online Auctions - The Case of eBay

Matthias Fuchs, Wolfram Höpken, Alexander Eybl and Jürgen Ulrich

eTourism Competence Center Austria

{firstname.lastname}@etourism-austria.at

Abstract

In today's e-business era online auctions emerged as highly effective distribution channels. As online auctions display both, low entry and exit barriers and vast coverage rates, they also augment distribution potentials of hotel companies. This paper identifies success factors that positively affect final prices obtained in online auctions for hotel room vouchers. Based on data of 814 auctions at eBay regression analyses were conducted to identify significant relationships between auction characteristics and the obtained final price. By drawing on these results, a prototypically implemented software agent for optimally listing accommodation packages in online auctions is presented.

Keywords: online auctions, accommodation packages, eBay, listing component.

1 Introduction

Sharpened competitive dynamics and shortened product life-cycles provoke quick changes in the firms' economic environment, wherefore disadvantages of static pricing mechanisms become more and more apparent. Economic literature highlights auctions as *the* dynamic pricing instrument for the eCommerce era (Bapna et al., 2004; Elmaghraby, 2004). Indeed, auctions have the ability to flexibly setting prices based on the concurrence of supply and demand hereby fulfilling the following market functions (Klein, 1997, p. 3): Auctions coordinate demand and supply through market-cleaning prices so that a maximum number of products can be sold (i.e. *coordination function*); especially for rarely traded commodities, auctions allow pricing without prior price estimates (i.e. *price-setting function*); auctions serve as selling mechanism for difficultly sellable products, such as residual seats of an airplane (i.e. *allocation function*); finally, auctions attract a huge number of bidders, thus, representing an additional distribution opportunity to achieve new customers (i.e. *distribution function*). Vendors benefit particularly from the latter function as it multiplies their customer acquisition base. As a consequence of the emergence of market-cleaning prices which tend to both depress prices and to abolish market frictions, crucial advantages are especially experienced by bidders from the gain of market transparency. In order to not lowering profit levels through the use of online auctions, however, firms must strive to pass the pressure of prices on to their own suppliers. This proliferation effect will be even more pronounced when procurement and acquisition processes will switch to auction-like markets as well (Nissanoff, 2006).

Online auctions have tremendously gained popularity in the past years (Ghani, 2005). eBay, one of the most successful electronic marketplaces, has become synonymous with online auctions, growing at a high rate, both in sales volume and usage. For instance, the value of sold items in 2006 stood at $ 52.3 billion (Nielsen, 2006). With 18 million unique-users in Germany, eBay is showing a market share of around 35% within the eCommerce segment targeting private customers (eBay Germany, 2005). On average, German users are spending 2 and 1/2 hours per month on eBay. Put differently, 12.5% of the whole online-time is used for eBay sessions (eBay Germany, 2005). Previously intended as a pure C2C marketplace, more and more professional sellers are using the eBay platform to sell their items. Due to the high market potential, a growing share of tourism suppliers has recently started to sell services and products through eBay. For instance, in 2005 the eBay item category '*Travel*' had about 25,000 listings at any given time and 5 million visitors per month (eBay Germany, 2005). More precisely, eBay Germany is listing more than 7,000 items in the *short-term lodging category* where on average every 4 minutes one voucher for a hotel room is sold (Cultuzz, 2005). Finally, every auction within the short-term lodging category has about 300 visitors (Cultuzz, 2005). Understandably, for a growing number of hotels, eBay becomes a valuable additional distribution channel displaying both low entry and exit barriers.

The scope of the paper is, firstly, to identify the determinants which are positively affecting final price levels with online auctions for hotel room vouchers. For this aim, auction data was collected from 814 eBay auctions (Fuchs et al. 2006). Subsequently, regression analyses were conducted to identify significant relationships between auction characteristics and the final price (Ramsay & Silverman, 2002). Secondly, the features of a software application for optimally listing accommodation packages in online auctions are presented. It will be demonstrated how the obtained empirical results are employed to adjust the online auction's configurations for accommodation packages. The paper is structured as follows: Section 2 presents previous research related to the identification of price determinants in online auctions. Section 3 discusses model building issues and sketches data collection. Section 4 highlights empirical results. By drawing on these results, section 5 presents a newly developed and prototypically implemented software component which automatically lists accommodation packages in the online auction at eBay. Finally, the outlook section sketches future research endeavours in the field of online auctions in tourism.

2 Price Determinants in Online Auctions

Final prices obtained with auction-type markets are characterized by huge variations. These are even stronger for perishable (e.g. tourism) services as they cannot be stored. If, for instance, a hotel room remains empty this loss cannot be regained. However, prices for service products are also volatile as they change according to supply and demand. For instance, when business is slow, a tourism supplier may offer a limited number of services at a low rate to attract additional demand in the short-term. Furthermore, tourism products are highly heterogeneous and complex. Thus, auctions even in the same tourism category differ in many attributes (e.g. number of persons

and overnights, hotel category). Finally, bidders have no clear market prices in mind because tourism service products show relatively high individualization potentials. Thus, economists would ascertain that tourism services are showing a large share of '*private value components*' (Wirtz, 2000; Bajari & Hortacsu, 2003).

Success factor research within the online auction domain has particularly focused on *price determinants* (Lee et al. 2000; Wan & Teo, 2001; Hayne et al. 2003; Bapna et al. 2004; Ghani & Simmons, 2004; Ghani, 2005). Erlenkaemper (2005) identified the following factors showing a significant relationship with the final price obtained at online auctions: The starting price, the number of bids, the number of pictures used and the quality of the product description. At the same time, the starting price, the auction's duration, the number of pictures used and the number of competitors within the same product category significantly affected the number of bids. Similarly, Lucking-Reiley et al. (1999) analyzed auctions on the eBay.com platform and obtained the following results: The seller's reputation proved to have a significant impact on the auction's final price. Particularly negative customer feedback will affect the price level negatively. In contrast, the starting price has a positive influence on the final price level. Finally, the number of bids was negatively influenced by the starting price. A further study on eBay.com focusing on price explanations was conducted by Wan & Teo (2001). They gathered 1,251 auctions to explore the impact of five independent variables on auction's final prices. In their study the seller's reputation was not identified as a significant influence on final prices. However, the starting price proved to affect the final price significantly. Moreover, the final price was positively influenced by the number of bidders. Furthermore, Bajari and Hortacsu (2003) analyzed the relationship between number of bids, starting price and sellers' reputation. They found out that a lower starting price would increase the number of bids. However, both starting price as well as the number of bids is positively related to the final price of the sold item. Finally, Lee et al. (2000) and Houser & Wooders (2000) concentrated their studies on the relationship between sellers' reputation and the final price. Although they ascertained a positive relationship both groups of authors identified a relatively higher impact from negative feedback on the final price level in the observed online auctions.

To summarize, with regard to price determinants in online auctions, the only consistent results from past empirical studies for differing product markets is the impact of the number of *bids* on the final price level and the impact of the *starting price* on the number of bids. Thus, due to this relatively small generalisation potential, there is a need for sector-specific online auction research (Young-Hoon & Bradlow, 2005).

3 Model Building and Data Collection

Because of the huge number of automatically recorded auction data eBay proves to be a highly convenient data source for the accomplishment of empirical analyses (Ghani, 2005; Lerg, 2006). Before data collection has started for the empirical study the variables in the explanation model have been defined and structured in accordance

with the above sketched studies (Figure 1). Although no auction study so far considered the number of *visits* the variable was also integrated in the model as it was supposed that eBay's listing enhancement features would positively affect the number of visits, while the latter would, subsequently, increase the number of bids.

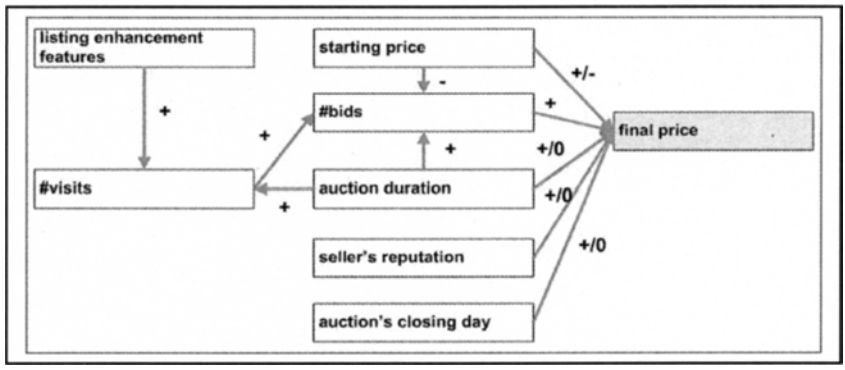

Fig. 1: Explanation Model of Price Determinants in Online Auctions

The model variables were classified into the following groups:

- *Auction features* are settings made by sellers or attributes assigned by the auction system (e.g. start time, duration, number of bids, category, final price and listing enhancement features, like preview picture or surrounding border).
- *Product features* describe the (i.e. tourism) product being sold (e.g. type of accommodation, number of persons, number of nights and additional services, such as breakfast or full-border).
- *Seller features* describe the seller (e.g. seller's eBay username, seller's origin and seller's reputation in terms of number of positive and negative feedbacks from past auctions).
- *Bid-histories* represent the temporal sequence of biddings (e.g. bidder's name, bid amount, time of bid, bidder's origin and bidder's feedback score in terms of the number of positive minus negative feedbacks from past auctions).

In order to collect the necessary data a software application which automatically extracts auction features through eBay's *Application Programming Interface* (API) was developed. More precise, eBay's API is an XML-SOAP interface that enables third party applications to communicate with the eBay platform. API may be used to display eBay listings or to automate listing processes and transactions. In addition to automation of business processes, eBay's API is an excellent way of retrieving auction data for research purposes as unbiased auction data can be gathered quickly and be saved in a database (Lerg, 2006). Thus, for a two month period during fall 2005 the application automatically collected auction data at eBay from the short-term lodging category with respect to accommodation packages restricted to Austria (i.e.

the 'buy it now category' was not considered). However, the number of visits has been integrated manually based on the actual counter available for each individual auction at eBay.

4 Empirical results

The objective of the below analyses was to identify significant relationships between particular auction features and the auction's final price level in order to give sellers advice on how to maximize their expected online auction performance (Erlenkaemper, 2005). Data comprising a totality of 814 auction sessions was gathered from the German eBay's *short-term-lodging* category during Sept. to Nov. 2005. From this sample, it emerged that 50% of bidders came from Austria, 44% from Germany and 4% from Switzerland. In almost four out of five auctions (i.e. 79%) a 4 star hotel was sold and 80% of the vouchers were for two persons. In Table 1, next to sample share and obtained final prices, accommodation packages with highest success rates (i.e. products sold) are displayed.

Table 1: Success Rate and Avg. Final Price of Accommodation Packages

Accommodation Packages	Sample Share	Success Rate	Avg. Success Rate at eBay	Average Final-Price	% Share below Market Price
4 star, 2 person, 1 night	8%	94%	46%	80.50 €	47%
4 star, 2 person, 2 nights	29%	90%	46%	154.10 €	29%

Compared to the typical success rate on eBay (i.e. 46% accoding to Auctionsoftwarereview, 2005) the emerging results concerning accommodation packages are extremely high (i.e. 94% and 90%, respectively). The quantitatively most prominent accommodation package, namely vouchers for *2 persons & 2 nights in a 4 star hotel* (i.e. 29% of the sample, $N = 234$) was chosen to empirically identify price determinants with online auctions. According to Koop (2000) and Ramsay & Silverman (2002) *multiple regression analyses* have been conducted to find out significant relationships between both product and auction characteristics and the corresponding *final price* level, number of *bids* and the number of *visits*, respectively. These relationships could be subsequently identified as success-factors positively affecting auctions' final price level (Jiménez-Zarco et al. 2006).

With an F-value of 110.34 the model proved to be significant and the selected variables explained 72.4% (adj. R^2) of the variance of the dependent variable '*final-price*' (Hair et al., 2006). The following price determinants have been identified: A higher *starting price* directly leads to a higher final price. Moreover, the number of *bids* is affecting the final price in a positive way. Both, the *listing enhancement features* 'subtitle' and 'bold' are furthermore leading to higher final prices. Interestingly enough, the duration of the *seller's membership* on eBay was identified as being *negatively* related with the final price level. Obviously, it appears that new sellers would be perceived as relatively more attractive. Another possible explanation may be that accommodation products must be consumed in the hotel which is why the

seller's membership duration does not enhance the trust of bidders in the seller. This interpretation is supported by the following result: In contrast to other studies (Lee et al. 2000) a direct positive influence of the seller's feedback profile on the final price level was not empirically identified.

As also identified by non-tourism studies the number of *bids* turned out to be an influence factor for auction's final prices (Wan & Teo, 2001; Bajari & Hortacsu, 2003). This influence factor, however, may be interpreted as another dependent variable influenced by several factors of managerial interest. Thus, a further regression was employed with number of bids as *dependent* variable. Having an *F*-value standing at 75.99 the model proved to be significant again and the independent variables explained 46.2% (adj. R^2). According to other studies, the *starting price* has a strong *negative* impact on the number of *bids* (Lucking-Reiley et al. 1999; Erlenkaemper, 2005). Thus, a higher starting price would lead to a decreasing number of bids which, in turn, will lead to a lower final price. As already discussed, however, the starting price has a *direct* positive influence on the final price. Through a series of *T-tests* (Ramsay & Silverman, 2002) it could be found out that an optimal starting price is standing at 80 € and would so improve the chance to yield a final auction price ranging in the upper-quartile of the auction's final price distribution. Furthermore, the number of *visits* proved to have a significant positive impact on the number of bids. Similarly to other studies, the *seller's feedback profile* turned out to show a significant relationship with the number of *bids* (Lee et al. 2000; Melnik & Alm, 2002). Finally, it emerged that an auction showing a seven days' duration received the most bids.

As the number of *visits* was identified as an influencing determinant for the number of *bids*, a regression with 'number of visits' as dependent variable was finally performed. Although the model proved to be significant (i.e. *F*-value = 25.04) only 21.6% (adj. R^2) of the variance of the dependent variable could be statistically explained. Three of eBay's dutiable *listing enhancement features* turned out to have a significant positive impact on the number of visits. More precise, the *gallery picture feature* adds a thumbnail preview into the item list. Choosing the *border feature* the auction is enhanced by a surrounding border within the item list. The *secondary category* feature gives the seller the option to put the auction into two distinct eBay categories. Fig. 2 summarizes the significant relationships if putting all regression results together.

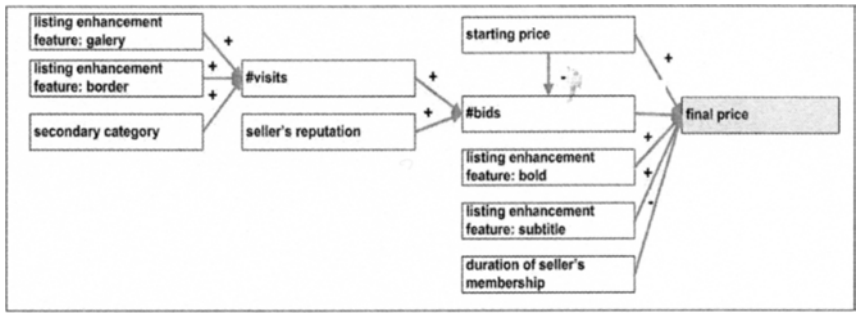

Fig. 2: Direct and indirect Determinants on Auction's Final Price

Based on online auction data it could be shown that the employed models are able to satisfactory explain the dependent variables of managerial interest, namely *final price*, number of *bids* and *visits*. The obtained empirical results can now be used to optimize auction features in order to sell accommodation packages at a more successful rate. For instance, for the best selling accommodation package (i.e. a voucher for '*2 nights-two persons in a 4-star-hotel*') a *seven day* auction duration should be chosen and the *starting price* should be set at 80 €, as this price level optimally compensates the opposing forces of the (directly) positive and the (indirectly) negative impact of the starting price level on auctions' final-prices. As far as listing enhancement features are concerned the option *subtitle*, *gallery picture* and either *bold* or *border* option should be chosen (Fuchs et al. 2006).

5 A Software Agent for Selling Accommodation Packages on eBay

As it was demonstrated, selling accommodation items on eBay is a process that requires a great amount of both, knowledge and time. The seller has to set the optimal starting price, the auction duration and to specify the various listing enhancement features. Ideally, he should also track his listings. After the auction has ended, he has to interact with the high bidder to finalise sales in terms of collecting the payment and sending the merchandise. Finally, he has to do the accounting and to pay auction fees. Due to a lack of both, auction specific know-how and time, many (e.g. tourism) sellers show barriers to use online auctions and are, thus, hiring trading assistants (Schloemer & Dittrich, 2004). The latter are experienced independent eBay members who sell items for third parties on eBay (e.g. see for more information: *eBay's Trading Assistant Program*, 2007). In this section, a software agent that supports hotel managers selling their accommodation packages on eBay will be presented. Its main purpose is to optimize the auction design by listing the right accommodation package with the appropriate auction features on eBay. Secondly, many cumbersome and time consuming steps of the auction process can be automated through the software agent.

5.1 System Overview

The prototypically implemented system is designed as an extension of an online booking platform. Its main purpose is to support sellers of tourism products and

services (i.e. hotels and apartments) selling their products on eBay. It will help them introducing eBay as a new and successful distribution channel. However, also hotels that are already selling accommodation packages on eBay can use the system to improve their business processes. The presented software agent optimises the auction design by recommending and setting certain auction features that positively influence the final price obtained at eBay (Ockenfels, 2002). It uses the knowledge gained in the study that has been described in the previous sections. Furthermore, by using eBay's API many steps of the auction process can be automated and, consequently, hotel managers can list vouchers for their hotels with little effort on eBay. More precisely, during this automated process four different stakeholders are involved in the system: *(i)* the online platform as the supplier of the software agent, *(ii)* the hotel companies as the users of the system, *(iii)* eBay as the distribution channel and (*iv*) eBay high bidders as the hotels' (and the booking platform's) customers. An overview of the software agent system and its stakeholders involved is given in Fig. 3.

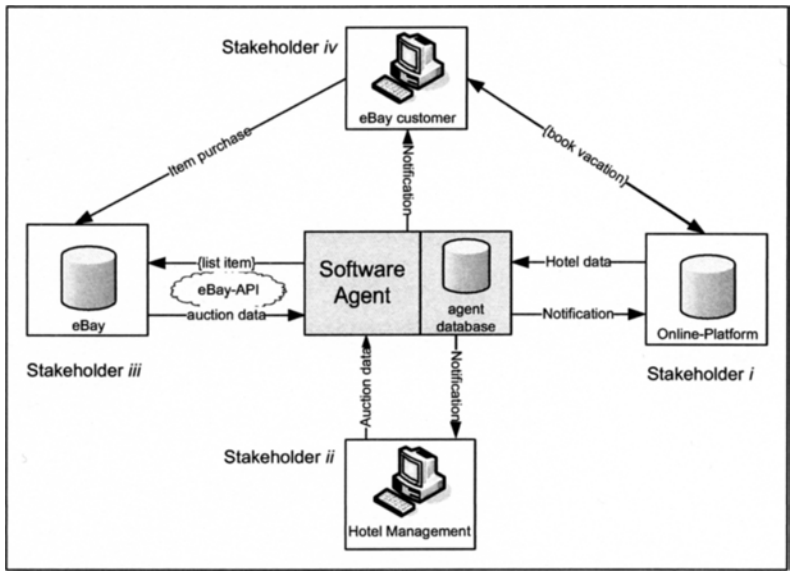

Fig. 3: Software Agent System for Selling Accommodation Packages on eBay

Finally, the software agent system offers support for all the various phases of an online auction (Young-Hoon & Bradlow, 2005).

- **Before the auction:** Sellers can access the system through a website where they enter a few auction parameters (e.g. type of room, number of nights, restrictions that may apply). The form is kept as simple as possible. For this reason, users who are not familiar with the eBay system can still list auctions easily. The other data that is necessary for the eBay auction (e.g. product description, pictures and imprint) comes from the online platform's databases or is automatically set by the software agent (e.g. start price, auctions duration, listing enhancement features).

The data is merged into an auction template. Finally, the auction is transferred to the eBay system (i.e. using eBay's API).

- **During the auction:** Auction data of all auctions inserted through the agent will be stored in a separate database for analytical purposes. As soon as the auction is transferred to the eBay system the remaining auction process is taken over by the agent and the booking platform. The seller may still want to track his auctions. For this reason, the system shows a list of all the seller's current and past auctions with current price, high bidder and time remaining, respectively.
- **After the auction:** After the auction has ended the system will notify the high bidder with the payment modalities by email. Subsequently, the booking platform will collect the payment and will send out the voucher electronically. After payment has been received the system will leave positive feedback on eBay for the high bidder. Finally, the customer can book his vacation via the online platform. Thus, the hotel management does not have to care for accounting of their sold vouchers. Furthermore, it receives sales reports as data generated by past auctions is used to generate useful statistics.

Table 2 summarises the necessary steps of a typical auction process at eBay and the corresponding stakeholders involved.

Table 2: Steps of vending process on eBay
(A = Automated, O = Online Platform, H = Hotel Management, C = Customer)

#	Description of step	A	O	H	C
1	List the item on eBay	x	x		
2	Answer customers' questions		x	x	
3	Purchase the item				x
4	Send information to customer about further proceeding	x			
5	Collect payment		x		x
6	Booking of the concrete vacation		x		x
7	Leave feedback on eBay		x		x
8	Finance & Accounting	x	x		
9	Manage data, generate statistics	x			

5.2 System Benefits

The users of the system will gain the following benefits. Firstly, the hotel management does not have to be familiar with the eBay-system which will be especially helpful to first time eBay sellers (e.g. to set up an eBay account). Furthermore, a professional auction design containing all the necessary and required information (e.g. hotel description, pictures, legal notice) is implemented for each seller. Secondly, through the use of a sophisticated auction design with the appropriate features, the auctions will attract more bidders and thus generate higher final prices for the sellers. Moreover, accommodation packages are sold through a common eBay account. As this account will be used by many hotel companies it will generate enough sales to get the '*Power Seller*' status (Schloemer & Dittrich, 2004). Power sellers are eBay's top sellers who sustain a consistent high volume of monthly sales at highly satisfactory feedback levels. As pointed out by Lee et al. (2000), potential buyers have more trust in sellers with good reputation (i.e. Power Sellers).

Thus, more bidders, more bids and higher final prices can be expected. Thirdly, the automation of the whole transaction process saves time and effort as most of the steps of the auction process can be automated or be semi-automated.

To summarize, hotel operators considering eBay to auction off parts of their bed capacity can use the presented software agent in the form of a convenient front end interface providing a web form to support the following specifications: Room type (i.e. single or double room), number of overnights, validity restrictions concerning the saleable voucher as well as duration and starting price of the auction, respectively. In the case of a *four star accommodation package* offered for two persons and two nights, based on the above findings a starting price standing at 80,- € and a 7 days' auction duration will be recommended. Finally, as far as listing enhancement features are concerned the option *subtitle, gallery picture* and either *bold* or *border* option will be automatically advised by the software agent system for selling accommodation packages on eBay.

6 Conclusions and Outlook

The employed empirical models showed both significant and expected relationships. More precise, as identified by other studies (e.g. Erlenkaemper, 2005) the following significant relationships between the economically relevant variables '*starting price*', '*number of bids*' and '*final-price'* were found: A low starting price, on the one hand, directly leads to a lower final price. However, by increasing the number of bids a low starting price will, on the other hand, induce a higher final price. An impact of the seller's reputation was identified only with respect to the *number of bids* (Melnik & Alm, 2002). Finally, no other (i.e. non-tourism) studies so far considered the variable '*number of visits*' in their empirical models. As could be shown, *listing enhancement features* do have a significant impact on this variable. However, whether the auction ended during the week or on weekends did not significantly affect the final price (Fuchs et al, 2006).

The models presented in this paper could be improved by adding further exogenous influence factors, like weather conditions or the current competitive situation on the auction platform (Erlenkaemper, 2005). Moreover, some by nature high-dimensional factors are so far described using only a one-dimensional indicator. For instance, the seller's feedback profile was described by the ratio of the number of positive feedbacks and the number of total feedbacks. By quantifying those multi-dimensional factors more precisely, the explanation power of the models presented above could be further improved and, more important, the relative impact of various quality dimensions of the sold product on the online auction's performance level could be systematically identified (David et al. 2003; Khopkar & Resnick, 2005).

Data collection through the above presented eBay *Application Programming Interface (API)* is a highly efficient way to obtain reliable data for empirical research purposes (Lerg, 2006). Most of the previous auction research studies, however, only used *web crawlers* to gather data or obtained their data by manual steps (Bajari & Hortacsu, 2003; Erlenkaemper, 2005). Especially the collection of *bid histories* would be very

time consuming without using eBay's *Application Programming Interface* (API). Moreover, some data (e.g. zip codes of bidders) is only available by using the API. A future vein of analysis in the field of online auction research in tourism is the conduction of valid surveys with high bidders to find out typical patterns of their search and bid behaviour and to register their evaluative behaviour (Young-Hoon & Bradlow, 2005). The results obtained from such empirical models could furthermore be used to predict expected returns of a particular auction already before it starts. Based on these forecasts, new service products, such as an *auction price insurance* (Ghani, 2005) may be offered to insure sellers against unsatisfactory final prices.

The presented prototypically implemented software application optimizes auction designs based on the knowledge gained from the empirical study discussed above. Furthermore, the system automates most steps of the auction process, saving sellers time and effort. The software agent can, however, be further improved by continuously analysing eBay's travel categories. With the auction data obtained, for instance, indices could be generated in order to determine the market capacity and to dynamically deduce more sophisticated recommendations for online auctions, such as optimal listing time and periods, respectively (Ockenfels, 2002).

These indices can be represented in a knowledge base, together with suggestions from existing (e.g. online) auction studies (Young-Hoon & Bradlow, 2005). Finally, new automated information services, such as a *listing optimizer,* may be offered to provide suggestions for sellers about when, where and how (i.e. in terms of auction features) to list a specific (e.g. accommodation) product in online auctions. Based on this intelligent mechanism, new software applications can be developed that *automatically* list the most adequate accommodation packages on the right time on online auction platforms.

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Evolving Internet Use by Malaysian Hotels

Noor Hazarina Hashim[a]
Sharifah Fatimah Syed Ahmad[a]
Jamie Murphy[a]

[a] School of Business
University of Western Australia, Australia
hashin01, syedas01@student.uwa.edu.au
jmurphy@biz.uwa.edu.au

Abstract

This study used the diffusion of innovations (DOI) and Miles and Snow's business strategy to investigate evolving Internet use by Malaysian hotels. Unlike previous studies, this paper included email and a new temporal measure, website age. The study proposed that Malaysian hotels' Internet use evolved in six-stages from no adoption to advanced website. Against expectations, one stage emerged suggesting no evolving Internet use, reflecting a bandwagon effect. This counterintuitive finding adds to the growing study of evolving Internet use. In line with DOI and Miles and Snow, large, high rated, affiliated, and Prospectors hotels led in evolving Internet use.

Keywords: technology adoption, hotels, websites, Malaysia, bandwagon effects.

1 Introduction

Despite a proliferation of hospitality and tourism Internet research (Hashim, Murphy, & Law, 2007a), most studies ignore the top Internet application in their adoption model. Email continues to be the most popular Internet application adopted by hotels, globally (Wei, Ruys, van Hoof, & Combrink, 2001) and regionally (Hashim & Murphy, 2007). Email provides one-to-one interactions that influence service quality and customer opinions (Marinova, Murphy, & Massey, 2002).

This study adds to Internet research in four ways. Firstly, the study extends DOI (Rogers, 2003) to evolving Internet use by introducing a new temporal variable, website age. Secondly, it adds to the limited application of Miles and Snow business strategy to evolving Internet use, particularly in hospitality. Thirdly, it extends this research stream by including email in the adoption model. Lastly, this study contributes to the limited number of Internet studies of Malaysia's hospitality industry.

This paper proposes a six-stage Internet adoption model for 530 Malaysian hotels: (1) no adoption (2) email (3) simple websites (4) interactivity (5) transactions and (6) personalisation and loyalty building (Hashim, Olaru, Scaglione, & Murphy, 2006). It draws upon the DOI and Miles and Snow business strategy types (1978) to address three questions related to evolving Internet use. How do hotel profiles – size,

affiliation and rating – and business strategy relate to evolving website use? Finally, does website age reflect evolving website use?

The following section reviews Internet evolution and how both DOI and Miles and Snow (1978) help explain organisational Internet use. The methodology explains three data sources. The study then applies multivariate cluster analysis and validates the cluster with an artificial neural network technique. This paper closes with limitations, academic and managerial implications, and future research suggestions.

2 Literature Review

Studies of Internet evolution use complexity and sophistication to reflect diffusion (Walcott et al, 2001; Chu, Leung, Hui, & Cheung, 2007). In addition, website studies use different terms and stages, such as three to six-stage models to reflect evolving website use (Ngai, 2003; Hashim et al., 2006). For instance, terms such as publishing sites or brochureware reflect an early online presence with brief and static organisational information (Teo & Pian, 2004; Yuan, Gretzel, & Fesenmaier, 2006)

From the 1990s to the early 2000s, e-commerce websites evolved from a limited function in the pre-web era to an integrative website era (Chu et al., 2007). In the first and second stages, pre- and reactive-web, websites were a one-way tool for information, publishing, broadcasting and advertising (Chu et al., 2007). At the third stage, interactive-web, websites added online sales and marketing activities such as booking requests and promotions. Communication and browsing evolved from one-way broadcasts into two-way interactivity (Chu et al., 2007). Interactivity allows sellers to customise services, which encourage online buying and selling (Chu et al., 2007). Similarly, Internet security technology such as cryptography and encryption increases users' confidence and trust in online activities (Chu et al., 2007). Finally, integrative websites expanded from online trading to e-business management such as supply chain management.

Diffusion studies investigate technology adoption and evolving technology use. DOI theory suggests organisational Internet use evolves, and that factors such as leader characteristics or internal and external structure influence organisational innovativeness (Fichman, 2000; Rogers, 2003). For instance, strategic management studies suggest organisational orientation influences how firms compete and deploy technologies (Segars, Grover, & Kettinger, 1994). Organisations increase their chance of success if they align and complement their Internet use with their business practices and strategy (Apigian, Ragu-Nathan, & Ragu-Nathan, 2005; Kearns, 2005). A widely applied strategic management theory, Miles and Snow's (1978) business strategic types classifies organisations from high to low adaptive capacity, respectively: *Prospectors*, *Defenders*, *Analysers* and *Reactors*.

Miles and Snow (1978) focus on an organisation's capability to adapt its products or markets to align with its environment. Their adaptive capability typology suits Internet business activities due to the Internet's dynamic nature. Studies use the typology to examine how strategic types differs in their Internet use and cope with

rapid changes (Auger, 2003; Apigian et al., 2005; Kearns, 2005; Schegg, Scaglione, Liebrich, & Murphy, 2007)

Besides organisational variables (Fichman, 2000; Rogers, 2003), later studies used a temporal measure, domain name age, to show evolving Internet use (Scaglione, Schegg, Steiner, & Murphy, 2004; Murphy, Olaru, & Schegg, 2006). Yet, establishing the age of names in global domains such as *.com* or *.org* is problematic; changes in registrars can render the age invalid. Website age from the Internet Archive's (*www.archive.org*) Wayback Machine (WM) is an alternative and seemingly better temporal measure (Hashim, Murphy, & O'Connor, 2007b).

3 Data acquisition

The data stemmed from a census of the 540 hotels registered with The Ministry of Tourism Malaysia in 2005. This study validated and updated the hotel information through the hotel's website and using responses from a questionnaire distributed from April until July 2006. The questionnaire requested general hotel information such as year of establishment, size, rating, affiliation status and each hotel's business strategy type based on Conant, Mokwa and Varadarajan's (1990) multi-item scale.

By July 2006, 242 hotels responded, a 45% response rate. Eight hotels were no longer operating and two hotels declined to participate, reducing the population to 530 hotels. Given no hotel url or email address, keying each hotel's name into Google and Yahoo! helped find hotel website and email addresses. The search identified 315 (59%) hotels with a website and 359 (68%) hotels with email. For inconsistencies, this study assumed information from the hotel's website and questionnaire was correct rather than the Ministry of Tourism information.

On 1 May 2006, keying the 315 hotels' urls into the WM yielded 281 websites' age, when a website went online. The average website age was 1918 days or just over five years. The oldest website aged 3459 days while the youngest website was 216 days. Finally, this study content analysed the websites for features (see Table 2 later) identified in a meta-analysis of hospitality and tourism website studies (Hashim et al., 2007a). After two pre-tests using two coders, one researcher content analysed the hotels' websites from 6-12 November 2006 for the presence of 22 features.

4 Analysis and results

4.1 Malaysian hotels Internet use

Table 1 shows the hotels' Internet adoption. Of 530 hotels, 160 (30%) had no Internet adoption. Fifty-four (10%) hotels adopted email and 315 (60%) had email and websites. A positive relationship between hotel profiles and Internet adoption levels supported the DOI theory. Hotel size, measured through number of rooms, indicated that compared to smaller hotels, larger hotels had the highest Internet adoption. In terms of ratings, more than half of the one and two star hotels had not adopted the Internet. Yet only three of the 157 high-rated hotels had not adopted the Internet. One to three stars hotels had equal presence in the second stage, email adoption. The four

and five star hotels had their highest presence with website and email adoption. Finally, almost nine out of ten affiliated hotels adopted both email and websites.

Table 1. Hotel profiles and Internet adoption

Profiles	N	*Stage 1*: No adoption	*Stage 2*: Email only	Website and email
N	**530**	**161**	**54**	**315**
Size				
Average number of rooms	530	72	122	**214**
ANOVA F (p value)		*91.96, p<.001*		
Rating (%)	**530**	**%**	**%**	**%**
One and two star	225	**62**	12	26
Three	148	13	12	**75**
Four and five	157	2	5	**93**
Kruskal Wallis (p value)		*209.90, p<.001*		
Affiliation status (%)	**530**	**%**	**%**	**%**
Affiliated	207	6	5	**89**
Non-affiliated	323	**46**	13	41
Chi Square (p value)		*120.82, p<.001*		
Business strategy types (%)	**242**	**%**	**%**	**%**
Prospectors	63	2	12	**86**
Analysers	85	11	14	**75**
Defenders	71	18	16	**66**
Reactors	23	26	22	**52**
Chi Square (p value)		*16.26, p=0.012*		

Numbers in bold indicate the leader within hotel profiles and business strategic types

Classifying the hotels on business strategy showed the Prospectors led in Internet adoption followed by Analysers, Defenders and Reactors. The results align with Miles and Snow's (1978) technology adoption and use. Prospectors, the innovative organisations, lead technology adoption while the careful Analysers follow the industry leader before adopting a new technology. Defenders are slow to adopt new technology as they seldom make major changes in their technology, structure and operations. Finally, slightly half the Reactors had adopted website and email.

These results describe the profiles and business strategy type for hotels at the first two stages – no adoption and email adoption – in Hashim et al's (2006) six-stage Internet adoption model. To examine how the hotels evolved in the remaining four phases, this study clustered the 315 hotels on website features.

4.2 Investigating the evolving website use

Cluster analysis classifies similar cases into groups and covers disciplines such as psychology, biology, sociology, economics and marketing, using names such as typology construction, Q analysis or classification analysis (Hair et al, 2006). This

study used Ward's hierarchical cluster technique (Hair et al., 2006). The clustering started with 22 features, and then eliminated the least significant discriminator, testing solutions for 20, 19, and 18 features across three to five clusters. Four clusters across 19 variables best differentiated among groups.

Table 2. Profile of multivariate clusters (315 hotels and 19 features)

Features	% average presence	Simple savvy	Showtime	Stagnating	Sophisticated	chi square	p-value
Website age (days)		*1737*	1812	2042	**2458**		
Online reservations	81	82	79	***66***	**98**	**14.97**	**.002**
Email	40	**93**	19	***4***	44	**163.57**	**<.001**
Map	80	***66***	**95**	70	**90**	**23.26**	**<.001**
Phone	70	**95**	***0***	86	**100**	**267.33**	**<.001**
Physical address	71	**96**	***4***	87	**98**	**236.64**	**<.001**
Promotions	77	***67***	74	***68***	**100**	**18.26**	**<.001**
Room information	71	**95**	***4***	86	**100**	**9.04**	**.029**
Download/Printables	30	***7***	***11***	***7***	**34**	**22.6**	**<.001**
External Link	36	***28***	***32***	***29***	**56**	**11.37**	**.01**
Flash Page	27	25	**45**	29	***7***	**16.91**	**.001**
Membership	31	***6***	***11***	***9***	**98**	**174.51**	**<.001**
Personal login	26	6	11	***0***	**85**	**157.73**	**<.001**
Enquiries/Feedback	53	***36***	48	46	**81**	**23.03**	**<.001**
Press release/News	20	24	15	***7***	**34**	**14.12**	**.003**
Multilingual site	22	***13***	21	***9***	**46**	**25.35**	**<.001**
Sitemap	19	18	19	***4***	**34**	**15.30**	**.002**
Search function	22	18	13	***5***	**53**	**41.64**	**<.001**
Date last update	10	***7***	***5***	***5***	**22**	**12.30**	**.005**
Branded email	27	**63**	***2***	***0***	42	**131.31**	**<.001**
N	**315**	**99**	**119**	**56**	**41**		

Numbers in bold indicate cluster leaders and numbers in italics indicate cluster laggards.

Cluster results are often descriptive, a thereotical, noninferential. In addition, cluster membership changes depending on the number of variables. Thus, validating a cluster solution helps check the generalisability and stability of the result (Hair et al., 2006). An Artificial Neural Network using a Kohonen network validated the multivariate cluster (Murphy et al., 2006). After testing for four solutions across 22, 20, 19 and 18 variables, four clusters across 19 variables best differentiated among groups, with significant cluster different on 17 variables and 95% agreement with the multivariate solution (X^2 = 407.43, df =9, p<.001). To investigate evolving website use, Table 2

presents the multivariate cluster results, from the youngest to the oldest cluster based on website age.

The website clusters failed to resemble the latter stages of the Hashim et al. (2006) model and the website age suggested that at least one cluster of hotels, *Stagnating*, failed to evolve. Although this cluster had the second oldest website age, these hotels lagged other hotels in the presence of almost all features and failed to lead in the presence of any feature. Similarly, the *Showtime* cluster failed to surpass the youngest cluster, *Simple Savvy*, in the presence of most website features.

The *Simple Savvy* cluster had the youngest website age and resembled Stage 3 in the six-stage adoption model. These hotels were leaders in providing contact and product information such as email, physical address, phone number and room information. This cluster led in the use of branded email addresses and performed above average in other savvy features such as online reservations and press releases.

The second youngest cluster, *Showtime*, performed below average across most features but led in providing maps and animation. This cluster and the *Stagnating* cluster may reflect bandwagon effects, that is, adopting technologies with no strategy for using the technology (McBride, 1997). Finally the oldest cluster, *Sophisticated*, had the highest presence in 15 of 19 features. This cluster dominated in providing online transactions, promotions and loyalty features such as membership and personal login to help to build customer relationships.

4.3 Investigating cluster profiles

Table 3 shows the hotel profiles, strategic types and average website age for the four clusters. Using an ANOVA test for the log transformed number of rooms (an abnormal distribution based on the Kolmogronov Smirnoff test) and website age, Chi Square tests for chain-affiliation and Kruskal-Wallis tests for star rating, the results showed significant differences across hotel size, rating, affiliation and website age.

The *Sophisticated* cluster had the most rooms, almost double the number of rooms as the other clusters. As for star rating, the one- and two-star hotels had their highest present in the bandwagon clusters, *Showtime* and *Stagnating*, and no *Sophisticated* presence. Most three-star hotels were in the *Simple Savvy* cluster and just two were in the *Sophisticated* cluster. Finally, the four- and five-star hotels had their highest presence in the most advanced cluster, *Sophisticated* and lowest presence in the *Stagnating* cluster. Affiliated hotels were mainly in the *Sophisticated* cluster and mixed across the other clusters. Non-affiliated hotels were mostly in the *Simple Savvy* and *Stagnating* clusters.

Table 3 Cluster Characteristics

	N	Simple savvy	Showtime	Stagnating	Sophisticated	Kruskal Wallis/ chi square/ ANOVA	p-value
Cluster size	**315**	**99**	**119**	**56**	**41**		
Size	**315**						
Average number of rooms		199	196	173	**366**	**12.00**	**<.001**
Rating	**315**	%	%	%	%		
One and two	58	21	**43**	**36**	0	**9.90**	**.007**
Three	111	**43**	34	21	2		
Four and five	146	27	27	8	**38**		
Affiliation	**315**	%	%	%	%		
Affiliated	183	25	21	22	**32**	**35.19**	**<.001**
Non-affiliated	132	40	12	**46**	2		
Business strategy	**177**	%	%	%	%		
Prospector	54	15	37	9	**39**	10.11	.342
Analyser	64	38	**48**	11	3		
Defender	47	**36**	32	23	9		
Reactor	12	17	25	**58**	0		
Average website age (days)		1737	1812	2042	**2458**	**7.66**	**<.001**

Note: Numbers in bold indicate the leader within hotel profiles and business strategic types.

The analysis of business strategic types indicated no significant difference across cluster solutions. Yet as the following section will explain, the business strategic types provided insights into evolving website use.

5 Conclusions

The results show a positive relationship between hotel profiles and business strategic types, and suggest a counterintuitive finding on website age reflecting Internet evolution. Unlike a study showing a positive relationship between domain name age and website features (Murphy et al., 2006), these results showed varying relationships between website age and website features. Although the *Sophisticated* cluster had the oldest websites, the next two oldest clusters – *Showtime* and *Stagnating* – had few features compared to the other clusters. Finally the youngest cluster, *Simple Savvy*, seems to have leapfrogged other clusters in evolving website use.

5.1 Academic implications

This study adds to the paucity of Internet studies in the Malaysian hospitality industry. The results support DOI theory as large, high rated, affiliated hotels led in Internet use. The Miles and Snow (1978) business strategy and website age add information about hotel's characteristics evolving Internet use.

Most diffusion studies investigate technology adoption using a single point in time. Investigating the evolutionary aspects of business and consumer Internet use has interested academics since 1994 (Teo & Pian, 2004). Yet longitudinal studies are time consuming, and some websites might undergo a rapid change in their content or even disappear (Hashim et al., 2007b). Website age opens another tack for investigating evolutionary Internet adoption and use. The results as in the *Stagnating* cluster show early adoption may not lead to successful implementation. An assimilation gap explains why widespread acquisition of an innovation may not lead to 'widespread deployment and use by acquiring organisations' (Fichman & Kremerer, 1999, p. 256).

Hotels in the *Sophisticated* cluster had the most advance website features and oldest website age. Prospectors high presence in this cluster, supports the Miles and Snow's (1978) theory on their innovativeness and technological superiority. Prospectors led in website design by having advanced website features (Teo & Pian, 2004; Apigian et al., 2005; Kearns, 2005; Schegg et al., 2007). For instance, Auger (2003) found Prospectors placed significantly more importance on collecting customer information on their websites than Analysers did.

Despite being the second earliest to adopt websites, hotels in the *Stagnating* cluster seem to be clueless in their website use. This reflects an Internet bandwagon problem, joining an increasingly popular trend (McBride, 1997). More than half the hotels in this features-poor cluster were Reactors, and Prospectors had the least presence in this cluster. Reactors probably adopted the Internet due to competitive pressure. The results support findings of Reactors providing incomplete information on their website (Kearns, 2005). Similarly, a study on Swiss hotels argued Reactors had the least marketing features on their website (Schegg et al., 2007).

The *Showtime* cluster performed below average across most features but led in providing maps and animation. This cluster had the biggest cluster size and was the third cluster to adopt website. Though still early in their adoption, hotels in this cluster reflect assimilation gaps in using their websites effectively. Finally, hotels in the *Simple Savvy* cluster - the last to adopt websites - seemed to use their sites for the simplest purpose, disseminating information. Analysers had the highest presence in both clusters. Because of their hybrid characteristics, part Prospectors and part Defender, Analysers could be innovative in turbulent environments and reactive in stable environments (Auger, 2003; Conant et al., 1990).

5.2 Managerial implications

As the Internet becomes essential for operational and strategic purposes (Buhalis & Zoge, 2007), hotels without the Internet face competitive disadvantages. Managers of *Simple Savvy*, *Showtime* and *Stagnating* hotels should reflect on ways to improve their online presence by adding useful features to their websites. Website with pleasant audio and visual features such as video and music may make appeal to some visitors but take longer to download. Research suggests media richness features such as flash, sounds and music add little to customer purchases online (Liang & Lai, 2002).

In addition, it seems time for the bandwagon clusters, *Showtime* and *Stagnating*, to re-evaluate and revise their objectives for going online. After being online for five years, Malaysian hotels in the *Stagnating* cluster seem to have little sense of direction with their online presence. The management may reflect on outsourcing certain aspect of their website management to website specialists such as how to obtain online customer information for developing new marketing strategies.

Furthermore, evaluating performance based on website features is insufficient. Hotels should assess other e-service features such as email correspondence for online complaints and enquiries. The assessment will provide hotels with details on the strengths and weaknesses of their e-services, such as the level of responsiveness and customer satisfaction.

Finally, despite supporting previous studies and the new finding, this study has limitations. The sample is exclusively Malaysian hotels. Future research could extend to sample to other locations to improve the generalisability and relevance of the results. The 22 websites features are by no means comprehensive future research could add more features to reflect evolving website use. Finally, the website age provided by the WM belongs to current website and would not reflect changes in website ownership.

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Evaluation of a Web-based and Mobile Ski Touring Application for GPS-enabled Smartphones

Elisabeth Haid[a],Günter Kiechle[a],Nicolas Göll[a], and Martin Soutschek [b]

[a] Austrian Network for eTourism (ANET) Salzburg
c/o Salzburg Research Forschungsgesellschaft, Austria
elisabeth.haid, guenter.kiechle, nicolas.goell@salzburgresearch.at

[b] Alpstein GmbH, Germany
martin.soutschek@alpstein.de

Abstract

In the project "TourGuide", an integrated web and mobile information system for hiking tours and ski tours was developed and evaluated with a group of test users. The web portal provides detailed information about tours and offers functionality to search, explore and discover tours that suit a user's individual needs. While the web portal enables users to plan a trip from home, the mobile client application offers a range of dedicated location based services and navigation instructions that support users while on the move. The mobile client application was developed for Java based smartphones and includes a map-viewer component that displays a user's current location, the selected tour, as well as multimedia information about objects of interest along the route. Besides gaining valuable information about how the usability of the system may be improved, the results of the evaluation show that integrated solutions can lead to a high level of user satisfaction.

Keywords: route planning, GPS, outdoor navigation, mobile service.

1 Introduction

The tourism and sport industries feature considerable potential for the use of new mobile technologies, simply because mobility and movement are inherent characteristics of tourists and sportsmen. The convergence of different specialised devices to one multi-functional, personalised mobile device is a continuous trend. Increasing storage space, sophisticated graphical displays, integrated GPS sensors, and many other features contribute to the pervasion of mobile devices in everyday life. These features, and upcoming technical improvements, will provide a whole new range of possibilities for advanced location-based services for outdoor activities. GPS outdoor navigation systems in particular are playing a more and more important role in tourism and leisure and provide new possibilities to people undertaking outdoor activities. For example, in an interview with McKinsey in July 2007, Nokia senior vice president Keith Pardy stated that navigation and context-relevant services are the next big inflection point in mobile services (McKinsey, 2007). However, currently systems providing mobile applications for outdoor GPS navigation are widely characterised by proprietary standards (e.g. TomTom, Garmin). Other map-based

mobile services like GPSWatch (www.i10n.com [Aug. 30, 2007]), AFTrack (http://aftrack.softonic.de/symbian [Aug. 30, 2007]), TrekBuddy (www.trekbuddy.net [Aug. 30, 2007]), MobileGMAPS (www.mgmaps.com [Aug. 30, 2007]) are basically map applications with no additional features (e.g. rotating the map) and no specific navigation functionality. Thus, within the TourGuide project, a complementary approach was developed which will be introduced in this work.

In addition to mobile applications, which only support users who are on tour, the goal of the TourGuide project was to develop an integrated web and mobile solution that takes the whole tour planning process into account. Therefore, a web platform was developed that provides sophisticated search, multimedia information and community features. The web platform can be used to comfortably plan a trip from home and then download information to be used by the mobile application. In order to gain a better understanding about the functional requirements for such a solution, academic research projects (e.g. Nischelwitzer & Almer, 2000, Frech & Koch, 2003, Paepen, 2007), and state of the art commercial and non-profit web platforms (e.g. Alpintouren.at, Tourentipp.de or Basislager.ch) directed at hiking and ski touring, were investigated in an early phase of the project. The goal was to achieve a more complete picture of the kinds of information provided to the hiking and ski touring community, and the technical solutions to present this information.

The remainder of this paper is organised as follows: Section 2 introduces the TourGuide system, including the web portal, the data model and the mobile client application. The methodology and results of the usability evaluation undertaken in this research are presented in Section 3. Finally, section 4 summarises this work, and outlines key aspects for further research.

2 The TourGuide system

The ANET Salzburg project "TourGuide for Web and Mobile Devices" dealt with the development of a mobile tour planning and guiding service for outdoor sports activities. For this purpose, a web portal prototype for tour planning and a mobile location-based service were developed. Both provide real-time information and map-based multimedia content for hikers and ski-hikers (see Fig. **1**). Map-based information can be delivered and presented appropriately to mobile devices in pull and push mode. The mobile user is guided by satellite-based localisation and navigation, and can access additional information about Objects of Interest (OOIs).

The following subsections introduce the different components of the TourGuide system: the web portal, the tour database and the mobile client application.

2.1 Web portal

For many people, the Internet has become a major source and channel of information to find out about recreational activities. As part of this research project, a web portal,

targeted at the ski touring community, was developed to provide a wealth of information about ski tours, and to offer a platform to search, view, explore and share ski touring experiences.

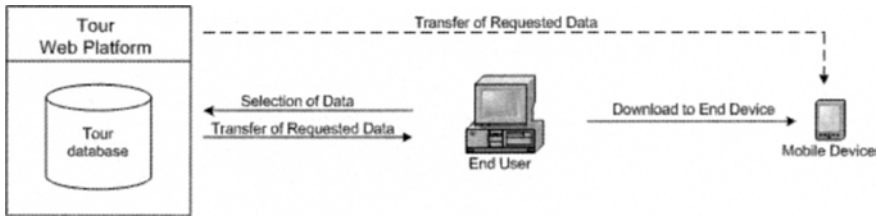

Fig. 1. TourGuide System Overview

People who want to go on a ski tour have extensive information needs. In order to better prepare themselves for an enjoyable day in the snow, people need a broad range of information. The latest avalanche conditions and an up to date weather forecast are critical to plan for a save route. Besides, people with different levels of skills and fitness can be supported to more easily find the tour that best suits their experience. Qualitative multimedia information such as photographs or 360° panoramas enable people to choose tours based on individual scenic preferences. Furthermore, ratings for the level of difficulty, the technical skill required, and the scenic value are given. Together with maps, descriptive information and comments from other people, this information helps to provide a better sense of the actual experience of a tour. For each tour, the web portal provides a .kml file that can be downloaded and opened in Google Earth to interactively explore a ski tour in 3D. Once users have decided on specific tours, they can download tour information together with an up-to-date version of the mobile client application for GPS-enabled smartphones.

As a result, users of the web portal can make more informed decisions about which tour to go on and the web portal helps them to better plan and prepare for their trip. Klein (1998) has argued that more informed decision making can increase the chances of a high degree of satisfaction. Fig. **2** shows a screenshot of the web platform, which is based on an interactive AJAX map module and a tour planner module. Users can search for ski tours on the map or they can use the tour planner to select tours based on specific search criteria such as elevation gain, difficulty or duration.

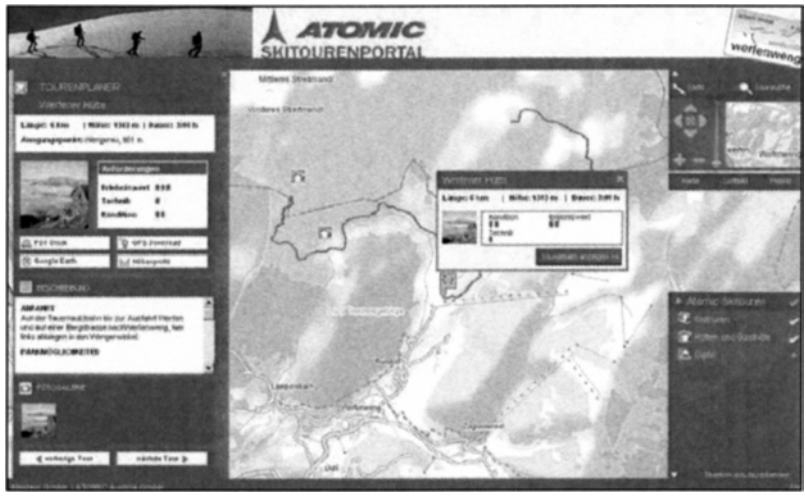

Fig. 2. The TourGuide Web Platform

2.2 Tour database

The TourGuide system is based on a generic data model which provides the geographic location and geotagged multimedia descriptions of miscellaneous OOIs. Besides restaurants or hotels, which are point-based objects, line-based objects such as tours are also defined as OOIs in the data model. Furthermore, the principle of linear referencing for point and line events was implemented in the data model to allow for easy referencing of OOIs to geographical points and lines. Moreover, for each OOI, time events and temporal sequences can be assigned. Additionally, the data model allows the saving of OOI descriptions, as well as meta data, in any language. This results in a semantically searchable database. Detailed information about the data model can be found in Haid, Kiechle & Bretz (2007).

2.3 Mobile application

The mobile part of the TourGuide system is a map based Java application that is tailored to be operated on smartphones with an integrated GPS-receiver.

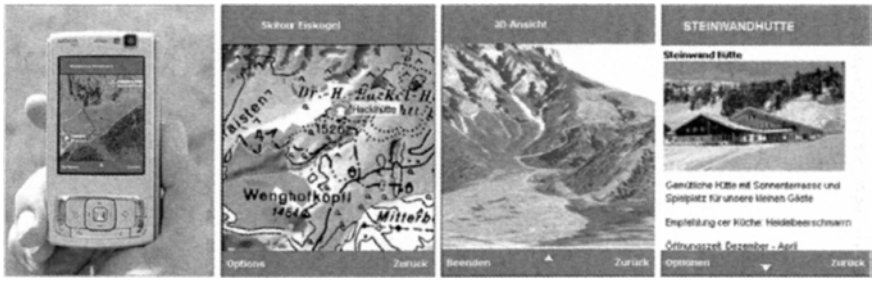

Fig. 3. Mobile TourGuide application running on smartphone Nokia N95

After a tour has been chosen with the help of the web portal, it can be transferred to the mobile device via Bluetooth or USB cable. Once started, the mobile application acts like an electronic buddy that uses text, audio and visual navigation instructions to guide the user to the chosen destination. Additionally, the mobile application provides useful data like OOI-information, elevation profiles, 3D-views, etc. while on tour. Furthermore, the following security services are at the user's disposal:

- Up-to-date weather and avalanche reports
- Automatic warnings of changing weather conditions via SMS
- Maps, highlighting areas of great avalanche danger
- Emergency call via SMS to the mountain rescue service that is automatically augmented with the current GPS position

The mobile client is implemented using the Java Micro Edition (J2ME) technology. In this way, the application can be run on a wide range of mobile phones. Figure 4 shows the conceptual architecture of the mobile application. It is made up of several layers of functional components, ranging from hardware–oriented modules at the bottom to application-specific components at the top. Complex components use services of simpler components situated in lower layers to implement more elaborate functionality. The interaction between them is carried out through well defined APIs.

3 Evaluation

The objective of the evaluation was to provide an in-depth analysis of the developed TourGuide system, including the web portal as well as the mobile application. This was considered to be particularly important, as the potential of mobile applications is difficult to assess *a priori*, and new services often do not generate the turnover expected by service providers. Moreover, mobile software has a short time-to-market period that is limited to a few months (Bortenschlager & Kiechle, 2006). Consequently, limited time resources have to be used as efficiently as possible with regard to client- and market orientation of the intended (mobile) application. Ideally it should include an evaluation phase with appropriate resources.

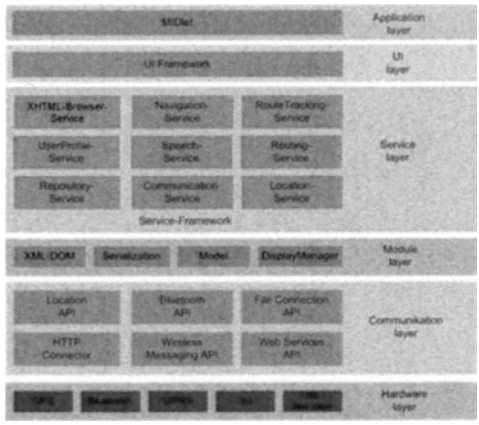

Fig. 4. Conceptual Architecture

In the TourGuide project, the web portal, which allows the user to search and plan tours, and the mobile application, which accompanies users on tours, were tested separately on two consecutive days. The testing of the web portal requires an Internet connection and was therefore carried out in the laboratory on the day before the mobile application was tested.

3.1 Number of test users

The number of usability problems found in a usability test with n users is $N(1-(1-L)^n)$ as Nielsen & Landauer (1993) showed in earlier research. N is the total number of usability problems in the design and L is the proportion of usability problems discovered while testing a single user. Several projects studied by Nielsen and Landauer showed that the typical value of L is 31%, leading to graph in 5.

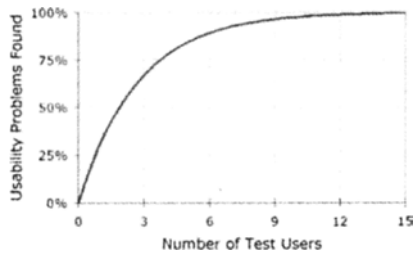

Fig. 5. Number of test users (Nielsen, 2000)

The curve shows that the first user already discovers almost a third of all usability problems (Nielsen, 2000). In order to reach useful results concerning usability issues, the number of test persons for the evaluation of the TourGuide system was limited to

five for testing the web portal (average age: 29.8) and six (who were the same as for the web portal plus one new person) for evaluating the mobile application (average age: 30.8). All test persons were experienced ski hikers, who were also familiar with mobile devices.

3.2 Evaluation part 1: Web portal

The first part of the evaluation took place in a laboratory environment. Five test persons with experiences in ski-hiking tested the developed web portal. The main objectives of the usability test of the web portal were to analyse if users find relevant information in an appropriate time; if the navigation of the user interface is intuitive and clear; if users' tasks are supported in an optimal way (this covers actions from searching suitable tours to downloading a specific tour onto a mobile device, or printing out the tour description on paper); and what overall impression users have of the web portal.

Methodology. The testing of the web portal was structured into four steps. First, test users had to solve three pre-defined tasks following the thinking-aloud-method. A screen and audio recording software was used to record screen actions and verbalised comments, made by test persons. As a next step, test persons had the possibility to freely explore the portal and to test different features. The observation person took notes, continuously motivated test persons to think aloud, and also discussed certain aspects with test users. Afterwards, all test users were interviewed and the interview was recorded by a camcorder. The interview included pre-defined questions concerning the web portal. Finally, test persons filled in a standardised questionnaire, including general questions concerning web portals for ski touring.

Evaluation results. The central component of the TourGuide web portal is a map module providing two types of map views (see Fig. 6). The evaluation showed that the orthophoto view was accepted best. Contrarily, the winter map was perceived as "too blue" or "too white". Obviously, test persons were more familiar with maps in green tone, and were therefore confused about the colours. The navigation within the map was perceived as intuitive. Although all maps in the TourGuide system are headed to north, the test users did not complain about it and no problems arose. Despite this, heading the map to the user's current direction was discussed with the users and decided to be a useful additional functionality. Furthermore, test persons criticised that the function to zoom in and zoom out with the mouse wheel was not implemented. This is due to the fact that almost all GIS applications on the web integrate this function, and users accordingly already expect this to be a standard feature.

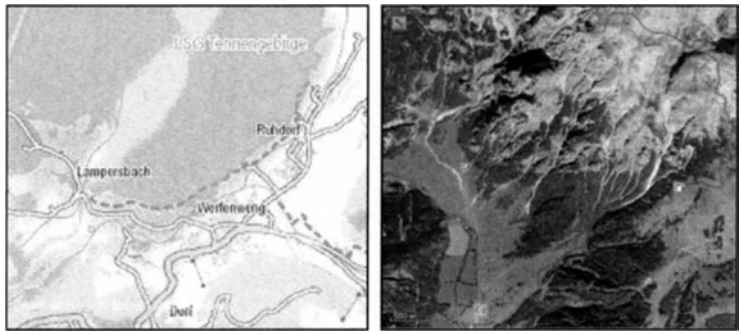

Fig. 6. Examples: winter map and orthophoto

Additionally, the map module offers a measuring tool, which allows measuring the straight line distance from one point to another. The evaluation of the tool showed that it would be more helpful for tour planning if it measured the actual walking or skiing distance, or the difference in altitude between two points.

Test persons were also asked to display tours on the map and retrieve additional information about the tour. At this point, the problem arose that the portal uses the abbreviation "POI". Most test users did not know that POI stands for Point of Interest. This finding shows that no domain-specific abbreviations should be used. Furthermore, tour descriptions include a short overview of the main tour characteristics by means of graphical scales. Here, test users claimed that the range of the scale was unclear, because the maximum of the scale was unknown. Furthermore, tour descriptions also include detailed information regarding access, directions, parking possibilities, viewpoints along the tour, avalanche reports, photo galleries, etc. Test users found all the information relevant for them when planning a tour. They pointed out the well elaborated content in contrast to other tour portals on the web – although the current portal does not provide OOI information adjusted to the user's preferences - specifically mentioning the photo gallery. However, users also noted that the elevation profile, which is also provided with tour descriptions, should be zoomable to get a more detailed view.

In general, all test users were very satisfied with the tested web portal and would recommend it to friends. They would also use the portal because of the sophisticated and detailed content, and the additionally implemented features, which are not part of conventional tour portals.

3.3 Evaluation part 2: Mobile application

The evaluation of the mobile application was carried out as a field test and took place in Mühlbach am Hochkönig in the Austrian province of Salzburg. Six test persons tested the developed mobile service. The objective of the field test of the mobile application was to analyse if the mobile application is intuitive and easy to use; if the

navigation functionality meets expectations and is helpful during the tour; how well the additional information provided by the mobile application is accepted; and what overall impression users have of the mobile application.

Methodology. For testing the mobile application, test users were equipped with a helmet camera connected to a camcorder, which was placed in the backpack. With this setup, impressions of the ski tour, as well as comments of test users and discussions with companions during the tour, could be recorded. As a next step, test users chose, where to fix the smartphone during the tour (forearm, upper arm, strap of the backpack, etc.) (see also Fig. 7). Subsequently, the test persons went on tour, each with a companion. During the tour, test users had to solve a few tasks (e.g. retrieving information about OOIs, sending messages to the TourGuide server, etc.). How the users solved the different tasks was documented by the recordings of the helmet camera. Furthermore, audio information, accuracy of the GPS position, quality of the OOI information provided by the system, etc. were tested precisely and evaluated by test users. When the test persons returned from the tour after about an hour, they were interviewed about their experiences with the mobile client. The interview was standardised for all test persons, and again, recorded with a camcorder. Finally, test users were requested to fill in a pre-defined questionnaire, including general questions about mobile services for outdoor activities.

Fig. 7. Mobile Phone Case fixed at the forearm

Evaluation results. The field test showed that after a short introduction to the mobile application, the service could be used autonomously by test persons, although these persons were not advanced users of mobile services. It is therefore argued that the user requirement to develop a simple and easy-to-use mobile application was fulfilled.

During the ski tour, test users were assisted in their navigation by audio instructions and textual information. Concerning the audio instructions, all test users had the possibility to use head phones (at least for one ear). However, each test person chose the alternative of the mobile phone's loudspeaker because earphones were rated as annoying during the tour. A result of the field test was that the audio output from the loudspeakers was too low, although the volume of the smartphone's loudspeaker was at maximum. The reason was the high background noise from movement (e.g. sound

of cracking snow crust). This problem was observed only when the smartphone was fixed on the forearm – no problems occurred when it was fixed on a strap of the backpack. Thus, only smartphones equipped with high-quality loudspeakers are appropriate for audio-based outdoor navigation. In general, all test persons were satisfied by being navigated through audio instructions. The main reason for satisfaction was that users were not distracted from the tour by looking on the display of the mobile device. Moreover, there was no need for the test persons to push buttons on the mobile while being on tour, except for retrieving OOI-information. So, they did not have to put on and doff their gloves all the time. Furthermore, ski-hikers prefer orthophotos map views for supporting orientation during tours to conventional map views. The main argument was that it appeared to be easier for test users to recognise features in the real world and to make a connection between the real world and a map by referring to an orthophoto map view.

The test persons were also asked if the perception of safety increased during the tour when they were using the mobile application. None of the test persons knew the ski tour that was selected for the evaluation beforehand. All persons affirmed this question. They felt more safe during the tour, because of the accurate navigation instructions as well as the possibility to use the emergency call function. This function allows the automatic logging of GPS-coordinates of the ski-hiker's position in pre-defined time intervals. The coordinates are transmitted to the TourGuide server, where a log of the user's positions is kept. Also, in case an emergency call is placed via SMS, the GPS-coordinates of the user's current position are automatically transmitted as well. Nevertheless, the predominant majority of test users stated that they would only use the navigation features, when being on an unknown tour. In any way they would take the TourGuide with them and use the emergency call function if a dangerous situation occurred (e.g. bad weather). They would also use the mobile application for other kinds of sports, such as hiking, cross-country skiing and running.

Concerning additional OOI information during the tour, e.g. information about viewpoints, huts, etc., test users stated that this kind of information is not absolutely necessary. In any case it should be possible for users to decide whether they want to activate or deactivate a mode that can automatically display push messages and alerts including such information.

4 Conclusion & Outlook

The project "TourGuide for web and mobile devices" shows an integrated solution from tour planning to outdoor navigation, combining the latest web and mobile technologies. Information about ski hiking tours on the web portal can be filtered according to the user's profile, and then be downloaded to the personal mobile device for tour navigation.

Although the evaluation presented in this paper aimed to test the developed application with real users in a real situation, it still has to be considered as a test

under laboratory conditions to some degree. People were equipped with cameras on their helmets, and they were accompanied by a researcher. These factors may have influenced when and how users have interacted with the application. The evaluation verified the assumption that location-based services, which receive location- and context-aware information while on the move, are becoming more and more accepted by users. However, the importance of the decision making and planning processes before going on tour should not be underestimated. People require an extensive amount of information, which helps them to reduce risks and uncertainty (Cho et al. 2002). Therefore, systems like "TourGuide", which are not limited to an application for mobile phones, but also provide web-based information systems, linked to the mobile service, will add significant value for people undertaking outdoor tours.

Future enhancements of the TourGuide system will include the development of additional components for the web portal, such as a MyTourguide community area and a module for the creation of individual hiking and ski touring routes. Concerning the mobile application, further work may be directed at improving the user interface as well as adapting the application for further mobile devices.

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Mobile Devices as Substitute or Supplement to Traditional Information Sources: City Tourists, Mobile Guides and GPS navigation

Ingvar Tjostheim[ab] and Daniel R. Fesenmaier[a]

[a]National Laboratory for Tourism & *e*Commerce, School of Tourism & Hospitality Management. Temple University
drfez@temple.edu

[b]Norwegian Computing Center (NR)
ingvar@nr.no

Abstract

New mobile phones and navigation devices are very powerful. In this paper an ethnographic approach is used to gain insight in how one of these devices, a multimedia-phone with GPS, maps and a mobile guide is used by visitors to the city of Philadelphia. An interesting finding is that some of the visitors seem to substitute traditional information sources with the navigation and map-tool on the mobile device. Also, the study documents point of capture archiving of personal experiences by use of a mobile multimedia device.

Keywords: mobile guides, narratives, tourist experience, location based services, city tourism.

1 Introduction

Mobile phone penetration will be close to or exceed 100% in Western Europe by the end of 2007. In the US, the penetration of wireless phones is approaching saturation. Travellers are carrying their mobile phones on vacation and even though the use is dominated by phone calls and text-messaging, more and more people have at least some experience with other applications or services. Still, the use of the mobile Internet is quite small. More and more mobile content is available and now some of the phone makers include a map or navigation software in the phone. From the travel and tourism industry, new opportunities and challenges are just emerging. Should they provide content for mobile guides, for location based services, navigation and or map services? These questions are not easy to answer.

The purpose of this paper is to present findings from a study of city tourists and how they used a new mobile device in assisting their tourism experiences. The paper addresses the following research themes:

- The use of information sources and tools by visitors' in-situ, mobile applications as supplement or substitute; and

- Point of capture archiving and sharing of personal experiences from a mobile device.

The paper is organized as follows. First the methodological approach is discussed; then, the tourist experiences as expressed through narratives are discussed, followed by the narratives reported by the observer. Analyses examining the use of traditional information sources vs. the new tools are reported followed by concluding remarks.

2. Methodological approach – ethnography and surveys

In 2007, visitors to Philadelphia were invited to participate in a study of how they experienced the city; as part of this study, the visitors were asked to use a Nokia N95 with camera, GPS, voice recorder, maps and navigation services. The participants were given the task to take photos and videos, and to use the voice recorder when answering questions about emotions, colours, smells, and sounds they experienced. The participants were informed about the navigation and map applications as well as the mobile guide of Philadelphia on the phone, but they were not given the task to use these features or applications. As part of the hourly interview they were also asked what they had experienced, what tools had used and what their plans were for the day. The visitors were asked to answer the questions on cards and talk about their experiences on a hourly basis. The photos were uploaded with the ShoZu-application to a Flick'r website by the interviewer. The URL of the website is www.flickr.com/photos/temple-samsung. After the trip, the participants were asked to provide titles and descriptions for their photos on Flick'r. Some, but not all of the photos were geo-tagged.

From the researchers' point of view, the mobile phone was an advanced data-collecting device that could log spatial behaviour (GPS-tracking) and record narratives and answers to questionnaires. Even though the Nokia N95 is one of the most advanced multimedia devices currently in the marketplace, it is relevant to mention that battery-life was a problem. In many cases the battery only lasted three to four hours. On some occasions, the interviewer met the participants and replaced the battery, and on some occasions the participants carried two batteries. August 2007 Nokia announced that they will upgrade the N95 and replace the battery.

In all, 47 persons participated in the study. The data-collection started in May and ended in August 2007. The majority of the participants were American citizens, some were international students in the US and four of the participants were international visitors to Philadelphia. Of the participants, 49% were men and 51% women, 30% less than 20 years old, 54% 20 – 29 years old, 13% 30 – 39 years old and 2% 40 years or older. When data are collected before, during (hourly) and after a trip, the data can be addressed and analysed from a number of different angles. In this paper the focus is on the mobile guide and navigation vs. traditional information sources and tools. All the participants answered a set of questionnaire together with self-reports. An ethnographic observational method (Silverman, 2004) was used with some of the

participants in addition to the traditional pre- and post trip questionnaires. Some of the participants were shadowed by an interviewer in order to gain a deeper insight in how they used information sources, did or did not use the mobile device and experienced the city. The observer took field notes and photos as part of the data collection. Following Jovchelovitch and Bauer (2000), the underlying argument of this study is that the visitor perspective is best revealed in stories where the informant is using his or her own language in the narration of events. Two of these observations are used in this paper in order to illustrate how observations add to and are different from traditional survey methods. The first author of the paper did the two observations. Kjeldskov et al. (2005) discuss the advantages of combining different method when evaluating a mobile guide and map application.

2.1. Narratives by the traveller

Humans tell stories as a way of sharing experiences. The listeners interpret both the stories and the person, what's important to him, his identity (Noy, 2002), while the story tells the listeners something about the person telling the story. Polkinghorne (1998) writes that "*Narrative is a form of "meaning making." . . . (and it) recognizes the meaningfulness of individual experiences by noting how they function as parts of the whole. Its particular subject matter is human actions and events that affect human beings, which it configures into wholes according to the roles these actions and events play in bringing about a conclusion* (p.36). It is important to notice the terms "meaning making" and what it leads to, that it 'configures into a whole". A life story is one example.

In a tourism context, the tourist experience (Uriely, 2005) is a key concept. McCabe & Foster (2006, p. 195) argue that:

> "the natural attitude of touristic experience is a narrativistic attitude, that an account of touristic experience requires the development of a story, to define, describe and give reasons for touristic events. As such stories are intrinsic to the development of touristic accounts, and understandings of touristic experience must take account of the story-telling quality and narrative structure of accounts in order to fully understand what tourists do when they talk about the experiences."

Furthermore, the authors' argue that tourist experiences are essential stories about events and circumstances, places and people, and experiences that take place outside of a person's normal community.

The data collection method that was used in this study, the combination of questionnaire, self-reports and observations, allows the research to explore and analyze tourist on-site behaviour in a number of different ways, including tourist movements, information search, use of the mobile device and sharing activities between the visitors. Moreover, the question of what type of experience characterises the trip, is there a theme (like exploring culture heritage), and what is the meaning to

the visitor can be addressed based on the collected data. On an hourly basis, the participants reported what they had been doing, with whom, the plans for the next hour, to describe their experience since their last report, and answer questions about emotions, colors, sounds and smells. The stories reported can be characterized as small stories (Bamberg, 2004), fragmented and not necessarily containing traditional narrative elements, the elements of a narrative schema (Labov & Waletsky, 1967, Jovchelovitch, & Bauer, 2000, Escalas 2004).

2.2. Narratives by the observer

For seven of the participants, an ethnography approach (Silverman, 2004) was used. An observer followed the visitors, took photos and field-notes describing what the visitor did. Moreover, the observer listened to what the visitor wanted to tell about the trip, about himself, and what else he wanted to talk about. The observer did not start any of the conversations. The only exception was when having lunch together. During the day, the observer did ask questions to clarify, but played the role as the listener. Two of these observations are used in this paper.

3. The tourist experience and the narratives

In the exit survey, the visitors were asked to discuss the most interesting experiences they had that day in Philadelphia. Philadelphia is known for its rich heritage and historical role. For instance, Liberty Bell is a symbol of freedom and the Independence Hall is called "the birthplace of our nation." Hence, it was no surprise that experiences that could be labeled heritage, came out as number one with 28%. The next was museums with 19% and then shopping with 17%. Still, when taken into account the young age-groups that the participant belonged to, this result might be somewhat surprising. Young travelers are normally not as cultural oriented as older travelers.

The visitors were also asked to give a recommendation: *Based on your experience, what would you recommend for others about Philadelphia?* The majority of the participant just listed places they recommended and that they enjoyed walking around in the city. The longest recommendation was this:

> *"Philadelphia is a great city with many historical sites. It is compact, diverse, and a decent town for all kinds of people with varied interests. It is in Philly where one can see people enjoying life while they are at the heart of working and making a living. People here seems open minded but also mindful of their subcultures and ethnic expressions."*

In the hourly activity the participants were also asked about the experiences since your last report? The questions were: *What have you been doing since your last report? How would you describe your experience since your last report?* This is an example from visitor #33, from the voice recording:

I have been walking mainly to the historical section of the city now that I finally reach the national constitution center and I guess this is my first stop for my own tour. I've also been at the City Hall, I've seen love park and number of other monuments, Fairmount park also. My experience has been ok, it's pretty interesting, I guess there's room for improvement but other than that it's fine.

(One hour later). Since my last report I've got a lot of information about the historical site of Philadelphia, I have walked around seen many sights, I am currently at the Liberty Bell center, I have seen the national constitution center I have looked in to the US mint, the independence visitor center, and... that's it. I'm at the liberty bell center right now. Overall it's pretty interesting, very nice.

(One hour later) I have gone to the food court here I've eaten I finished watching... I finished the self tour of the liberty bell that was very interesting and right now I'm at Liberty Hall... so that's it. My experience has been gone really well I've been seeing this parade its very interesting I'm even enjoying it a lot more now.

This report shows a typical pattern. The visitor is telling where he or she has been, what she did (sightseeing, eating, shopping), and whether or nor it was a positive experience or not. There are examples of visitors emphasizing more the social aspect, who they are with and the interaction with others. In general, the reports reflect fragmented narratives or small stories (Bamberg, 2004). Moreover, it is hard to find examples of visitors telling about a unique experience, an interesting incident something, a story that the listener can tell to others. This is one of the reasons why it is relevant to look at the visitors experience from the observers' point of view.

4. The narratives reported by the observer

The two observations took place May 16 and May 21, 2007. Visitor # 8 was a male international visitor from Austria, while visitor #12 was a male American that is living in the state of Pennsylvania, but not in the city of Philadelphia. Both are approximately 30 years old.

4.1. The International Visitor

The visitor says:

"Today I just want to walk around and to go to the historic district (because) I prefer old buildings to the newer buildings.... I am primarily interested in old stuff, old buildings and I compare (what I see) two my home-country, Austria since "I am a European" and Vienna has a beautiful old buildings....

> The visitors points at the Austrian flags and he talks about how USA is different from Austria...*I know most of the flags, I learned all the flags as a kid.* He talks about his childhood and when having lunch he commented: *People from Japan, the Japanese, they talk photos of food, the meals, it is different from what I do*.....At Elfreths Alley, a street in the historical district he says. *I am disappointed; it is not like in Europe. It is this mixture of old and new, both nice and ugly. It is not as I expected probably because I had Europe and Vienna in mind...*
>
> (When the trip is over, the interviewer asks) *In your view, what could be the title of the day, the visit to the city of Philadelphia?* He answers*: Maybe a mixture of old and new. To me, a lot of the areas (oft the city) are of no interest to me. Today, I look at the city from a distance I think."*

What is the story this visitor is telling? This visitor compares what he sees with his home-country and the country he was a student. The story is as much about another place as it is about Philadelphia. It is about context and about himself, how he see, gazes and make comparisons.

4.2. An American visitor

This visitor also talked about himself while walking in the city.

> He said" *I am very interested in American history and I will start graduate school a PhD program, fall 2007. .....I like the older buildings in Philly.* He points at City Hall and explains that: *in the early 1900, the buildings had to be shorter than City Hall. It had a good effect; the city is much nicer than many other cities in the US.*
>
> He then continues to talk about the city planning of Philadelphia and other cities like New York. Later, inside the Free Library he commented that *the new section of the library looks great, it is designed by an Israeli architect from Boston (and) On this old map of Philadelphia we can see* .... When visiting the section with rare book collections in the Free Libary, he tells the curator *I am going to start grad school in history...* The curator is an historian and he shares his experience as student, they continue discussing American history. When leaving the Free Library, he says *It was a good conversation, I might choose (he mentions a topic) for my dissertation* (the ethnographer can see that he is excited. He says. *I want to become a professor.*

What is the story he is telling while visiting the city of Philadelphia? He is telling a life-story, a story about his future, his goal of getting a PhD and be a professor. In the voice recording there is nothing about studying history and his goals, but he makes a comment that the visit to the Free Library was nice. The only comment that addresses history was this "(I) have (today) been thinking about the general connection to Philadelphia what made Philadelphia to the city it is."

The stories of the two visitors were very different. Both visitors carried the same multimedia device. One of them was not interesting in using the device besides for the explicit tasks give to him. The other visitor used the Nokia N95 and the mobile applications available for him.

Table 1 – The comments about the mobile multimedia device

#2	*The camera/internet/phone all in one made for having to carry a lot less, very useful*
#3	*This device allowed to take pictures, access info, and communicate with others all with one device. Saves on pocket space and the need to access different medium*
#4	*the trip recommendations & internet are useful. Its easy get overwhelmed and lost, this device provide useful information*
#5	*the mobile phone provided access to website in case we need information while touring. Also it took great photos*
#10	*The phone allowed for me to take lots of pictures. The GPS would have been helpful had it been working since I am unfamiliar with the city. The phone was also equipped with the web which would have interesting to explore more about the history of Philla. the phone was more than just a calling phone, it made it possible to take photos and record reactions without having to carry a lot of equipment*
#11	*wireless internet, directions to bonte*
#12	*mobile phones give access to a lot of information that previously you had to get ahead of time, like addresses, maps, and details about attractions*
#14	*accessibility and can obtain information as and when required*
#15	*easy to use, not as conspicuous as a regular map camera*
#18	*I think the most important features besides calling are access to maps, internet and camera*
#19	*was helpful to get exact addresses for places, didn't get lost finding obscure places, helped eliminate places that sounded interesting but were closed on Sunday*
#22	*mobile phone make it easy to record and quickly share experiences with other*
#23	*now that mobile phones have more capabilities you can use them for more interactive things, i.e. photos, videos, GPS*
#26	*When exploring, I would not want to be using a phone all the time to search, I would rather ask locals to have an experiences finding good spots. Locals are more trustworthy*
#32	*allowed me to see what others were doing, take pictures of interesting things I'd seen, find my way with GPS*
#33	*from photo and videos to navigation a mobile device has a lot to offer. But as I said before there are still problems with the operating system*
#34	*while my dad tried to figure out where we were on the paper map, the phone told my exact location*
#35	*internet wi-fi, video, maps*
#36	*it helped a lot because you can find things out like where to go if you're lost and find directions to places you might want to go*
#38	*GPS, maps*
#41	*for directions and information about the attractions*
#43	*I had access (whether used or not) to online maps, the internet, and help for travel, if needed*
#47	*taking pictures*

5. Traditional information sources vs. the new tools

An important task asked of the participants was to use the voice recording to describe their experiences using the mobile devise. Table 1 summarizes a selection of the comments given by the visitors regarding the use of the Nokia N95. Interestingly, the majority of comments refer to the camera and making phone-calls.

In general, it appears that the users' experiences with the Nokia N95 were positive. Even though some did report problems, many of the visitors commented about potential use or opportunities in the area of mobile content and navigation. Comments from 22 of the visitors are reported in Table 1. Moreover, only 11 answered that they did use the mobile guide of Philadelphia, a guide set as the start page on the Opera Mini browser on the phone. It is important to notice that the visitors did not have to use the mobile guide. Hence, it can be hypothesised that only the visitors that were really interested in exploring what they could do with the new multimedia phone, took the time to use the mobile guide of Philadelphia. On the other hand, since they were not asked to use the mobile guide, it is interesting to see that 11 of 47 visitors used the mobile guide. Moreover, the Nokia N95 was not their own device, a device that they know well. Travellers appear to understand (as the survey result shows) the potential this kind of new multimedia devices has for travellers. However, behavioural changes, how and when travellers start using the application available to them on their mobile phone, might take some time. However, the reports from respondents #10, #23, #32, #34 and #38 emphasizing GPS suggests that navigation and way-finding is an important issue for city-tourists.

5.1.Multiple use of information sources and tools

A second important question asked during the study focused on the information sources and other informational tools they used to assist their visit to Philadelphia. Table 2 shows that traditional information sources/tools are used more frequently. Secondly, Table 2 shows multiple usages - most of the visitors used more than one tool or information source. It is important to notice that some of the visitors did use the mobile guide and the navigation service.

Participant #28 reported the following" *we're trying to use the mobile and stuff which is a little bit confusing so... you know I don't feel like it's that necessary so I didn't bother to just sitting down and figure it out but rather see more things."* This is an example of either a lack of interest in the mobile tool, or a usability problem.

Participant #34 reported *"I've used a few maps and the GPS system on this phone and I've spoken to people and people that working in the subway to find out where I'm going* (on the next hourly report:) *I finally figure out how to use this GPS thing on the phone and that's been helping because we were running on the train and stuff, we asked couple more people, buses and cabs."* It might take some time to figure out how

to use the application and services embedded in a mobile device like the Nokia N95. One the other hand, some will argue why not ask people; it is fast and easy.

Thirdly, and maybe most interestingly, the use of a mobile navigation system and guide (the last two columns in Table 2) can be viewed as a substitute and not only a supplement to the traditional information sources (column 3 and 4 in table 2). For some of the visitors to Philadelphia this was the case. A comparison of columns 2 and 3 with columns 5 and 6 shows that there is a group of visitors that reported that they did use the new mobile application, but not the traditional once such as street signs, posters, and printed maps. Of the 18 (in column 5 and 6), 10 also used the traditional information sources (reported in column 3 and 4) but 8 of the visitors reported that they had used the mobile systems to assisted them or search for information.

Table 2 Tools used to assist the visitor during the trip
(Self-reports, the # indicate a person)

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Nothing	Asking people	Observing (street) signs and posters	Map (including maps in guidebooks)	Navigation system (GPS, car or m-phone)	Guide on m-phone (map) Mobile guide
1 3	6 7	2 7	7 8 9	4 5 7	4 9
18	13 15 19	14 17	10 11 13 15 17 19	12	11 12 15
25	21 22 24 27	20 24 27 28 29	20 21 22 23 27	22	28 29
	34 38	30 31 32 33 36	31 33 34 35	33 34 37	32 35 38
42	40 45 46	40 41 43 44 45 46	41 44 47	(44)	44 47

5.2. Point of capture archiving and sharing of personal experiences

The visitors were asked to use the voice recorder to tell to capture (point of capture) what they experienced, to take photos and videos to and to upload photos to Flick'r. Some of the visitors did share their experiences while being in Philadelphia. However, most of the respondent just made phone-calls and very few used the other services on the phone.

After the visitor, the tourist added their comments (hence, not at point of capture) to their photos for the purpose of sharing and re-experiencing the visit. Some of the visitors were asked to upload at point of capture, but in order to avoid spending money on up-loading, the interviewer uploaded the photos by using the *ShoZu service* on behalf of the visitor. The mobile devices that Wu et al (2007) used for the *mProducer* did not have the same capabilities as the Nokia N95. In particular, the storage capabilities were not sufficient for the archiving. The Nokia n95 had a 1 GB memory card in addition to the built in memory. The GPS and the map applications were embedded in the phone. Hence, the system challenges that Wu et al list in their paper, has been overcome. Bamford et al (2007) also reported that the fact that the GPS was not embedded in the mobile phone was a barrier to the use of the *LocoBlog* system. Devices such as the Nokia N95 and systems providers for uploading and sharing multimedia content online or directly to the mobile device of other users are now available in the market place. There are challenges related to the user interface, small screen etc as discussed by Wu et al (2007). It is easier to edit a photo album, a text a diary on a PC interface than a mobile phone interface. When re-experiencing a visit, the PC environment has some advantages to the mobile environment. However, for the capturing, in particular with regard to photos and videos, the visitor has to do it *in situ*. The findings from this project show that the new devices are fully capable of doing this, the capturing and online uploading.

6. Concluding remarks

Bamford et al (2007) writes that "*after years of hype, location based services are at least becoming feasible due to improvements in technology, data provision, and user understanding.*" The *LocoBlog*, the space-time photo travel-blogging reported by Bamford et al (2007) demonstrated how a separate GPS unit was used together with a mobile phone via Bluetooth. This study, however, describes and documents how a new mobile device with GPS was used by visitors to the city of Philadelphia. The device, the Nokia N95 received a positive feedback by the user. The main weakness was the battery life of the phone. The majority of the visitors did not use or explore all the capabilities and features of the device besides the explicit task given to them. Besides make phone calls very few shared their experiences with others while visiting Philadelphia. However, some did use the mobile guide and the GPS based navigation application on their own initiative. A segment of the visitors did substitute traditional information sources with new information sources available on the mobile technology.

This finding was documented by the comments by the visitor themselves as well as in the observations from the ethnographer.

Currently microblogging; the services or platforms such as *Twitter, Jaiku* and *Pownce*, are growing. The microblogs are used to share daily experiences, opinions and commentaries (Java et al., 2007). Microblogging, as most blogging on the web, takes place within a personal and social network, and not in tourism domain. An important question in this regard is if and how this type of instant sharing will move into the tourism domain. Is it going to be integrated with mobile guides and other location based services or will microblogging continue to be a phenomenon in the private domain, to sharing within a closed group? The Nokia N95, as this study has shown, is an example of a single mobile device that can facilitate capturing, uploading, sharing, navigation and other location based services. Not all of the capabilities were used and some might only reach a small audience. However, the developments in mobile technology will continue. This creates new possibilities for research as well as providers of new services.

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Passages to Medieval Archipelago: From Mobile Information Technology to Mobile Archaeological Information

Isto Huvila[1], Kari Uotila[2], Jari-Pekka Paalassalo[3]. Jesse Huurre[3] and Sonja Veräjänkorva[3]

[1] Åbo Akademi University, Turku, Finland.
isto.huvila@abo.fi
[2] Muuritutkimus ky, Kaarina, Finland
kuotila@muuritutkimus.com
[3] Turku University of Applied Sciences, Turku, Finland

Abstract

While a considerable number of mobile computing applications for cultural and archaeological heritage presentation have been developed, the characteristics of archaeological information and processes of transferring it to the mobile context have received considerably little attention. The question of how the archaeological data makes information suitable for the touristic and other general public audiences is discussed in the context of two R&D projects set in south western Finland. This information process is examined by discussing some fundamental characteristics of archaeological data, and the information aimed for the general public. On the basis of these characteristics and suggested functions of the information, a framework for a flexible data model is introduced to increase the efficiency of the process to produce and leverage relevant and usable information for the needs of tourism. The data model addresses especially the problems of parallel information, management of changing interpretations and flexible updates.

Keywords: mobile computing, information management, information process, archaeological record, popular information.

1 Introduction

Advances in mobile computing technology since the mid-1990's have entailed a profusion of academic and commercial projects aiming at producing and deploying handheld guiding and presentation systems for cultural heritage sites. Even if the work done so far has concerned many important issues of mobile technology, presentation and user experience design in a mobile environment, the majority of efforts have focussed on developing working technology prototypes rather than systems with sustainable maintenance models and a long life-cycle of operation. As already recognised in the sense of ubiquitous computing, mobile information systems are not only technical frameworks incorporating location awareness and a user friendly interface for presentation of data using a portable computer. (e.g. Cheverst et al. 2000, Marty et al. 2003, Grinter et al. 2002) The steps taken this far have been important ones, but not quite enough for exploiting the possibilities of the mobility of *information*. A coming major concern in making an effective and efficient mobile information system is the mobile information and its social dimensions rather than the

technical system (Subramanya 2006). Novel technology may function as an attraction and incentive to use a system for a short period of time. In the long run, however, the clear strategic direction, reliability, usability and the accuracy (i.e. that the system provides those services it is expected to provide) do have a significant impact on whether a system is meaningful and successful or not (Whyte et al. 1997).

Schwinger et al. (2006) argue that the principal weaknesses of present tourism information systems are that they often adhere to a heavy-weight approach. New systems do not build on existing systems, use standard data access and employ a thick client. The systems tend to be relatively heavy and isolated and thus difficult to operate on different devices, costly to maintain and update. To improve the present systems, an emphasis should be placed on cross-platform operability of the information contents, efficiency of processing original 'raw' information resources into a form that suits the end-user needs, and on maintaining the coherence and traceability of the entire process in order to avoid the presence of obsolete information in the systems. The aim of this article is to discuss an approach to construct a data repository that could be used to provide timely, traceable, coherent and thus dependable information to the general public using a flexible array of mobile clients and thus avoid the pitfalls of the typical heavy-weight approaches.

The findings and insights are based on two projects that focus on archaeological information. This article addresses the issue of how the archaeological heritage information could be delivered with maximum impact in a mobile information environment and more specifically how this delivery could be done in a way that is feasible for information providers (i.e. archaeologists), organisations (museums, cultural heritage administration, tourism enterprises) and end-users (the general public, tourists) (Skeates 2000). The emphasis of the presented approach is in the optimising the process of delivering suitably situated and contextualised (i.e. accurate) information for the general public instead of barely making existing data (e.g. from books) available. An important premise of the process is that the presented information should be based as largely as possible on the information produced during the first phases of a research project in order to be able to present as timely and new information to the public as possible (Thomas 1991).

The present paper introduces a prototype of a data model that has been developed to enhance the process of managing, storing and accessing heterogeneous data with a special emphasis on the mobility of devices and information use. The span of the information process starts from the gathering of original data and ranges to data storage through scientific and administrative uses. The emphasis is on how the production of popular end-user information can be integrated in this information process.

2 Methodology

The methodological basis of the discussed projects has been action research (Checkland & Holwell 1998). The researchers have been engaged in developing

working prototypes and systems throughout the projects in collaboration with the partners from heritage and tourism institutions. The approach was estimated in the beginning to be the only applicable alternative due to the in progress nature of mobile practises of cultural heritage tourism and related information management research. Traditional life-cycle based development would have been far too inflexible to meet the transient user needs and preferences, dynamic contexts of use, changing requirements and evolution of technologies. The approach has worked relatively well in both projects albeit the frequent practical reconfigurations of the involved project group and the extent of changes made to the technology platform.

3 Naantali - project

The work for a mobile digital guide began within the framework of a project aiming at developing a mobile multimedia information system for the Town museum of Naantali, in south western Finland in 2002 and 2003. The project group developed a working prototype of an information system, which offered school pupils and tourists an opportunity to visit excavated sites by using a tablet-PC device as a travel guide. The system was based on a traditional thick client approach due to lack of fast and reliable modestly priced wireless networking technologies capable of covering large areas of urban milieu with a limited amount of hotspots.

There are generally no visible remains on the excavated areas of central Naantali. The GPS-based, tablet-PC driven, multimedia application provided a way to visualise archaeological remains on their actual sites. When a pupil or tourist arrived at an excavated site, the application provided relevant information using text, video, images and drawings (Uotila et al. 2003; Vatanen & Uotila 2003). The software was developed by the university partner while an archaeological SME partner was responsible for the content production.

4 Medieval Archipelago -project

The Medieval Archipelago project started as cooperation between Muuritutkimus, an archaeological research company, and Turku University of Applied Sciences. For the part of Muuritutkimus, the information and concept design of the project was consulted by the first author of this paper from the department of Information Studies at Åbo Akademi University. The development of the software was conducted by the Turku University of Applied Sciences Department of Telecommunication and E-Business. Muuritutkimus was responsible for the design of the basic concept and archaeological expertise. The project was funded by the European Social Fund and the government of the province of Western Finland.

The aim of the Medieval Archipelago project was to produce a pilot of a mobile multimedia information system about the history and archaeology of the Archipelago Sea in Finnish, Swedish and English. The principal target audience of the information system were boaters and sailors, but the system serves also the needs of local tourism, culture, and the direct needs of the local population.

An important aspect of the project was to test the applicability of a GPS-based multimedia presentation in a yacht. The concept of the system was based on the earlier experiences gathered during the Naantali project applied to the specific needs of the yachters. The contents of the multimedia were prepared so that it would be easy to familiarise with the sites from the sea. The basic idea was that the system uses GPS information to identify interesting sites nearby, alert its user and present information in form of maps, text, illustrations, images and three dimensional models. The data storage of the Medieval Archipelago applications was based on a relative simple flat file design, which allowed minimal complexity in the design of the application. The individual media objects were linked together by their relation to a geographical area.

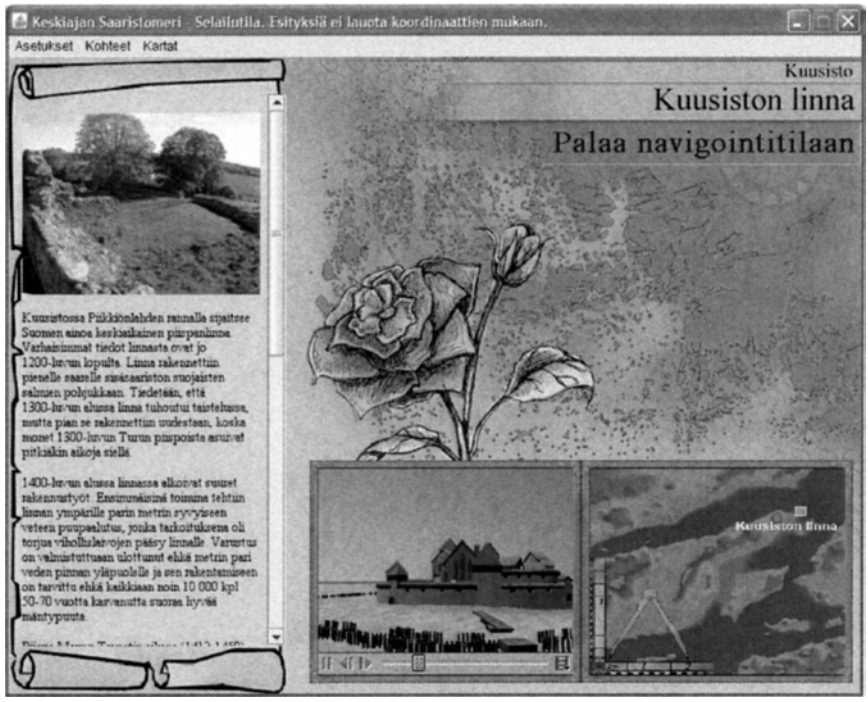

Fig. 1. The Medieval Archipelago application on a Windows PC

The system operates both on a computer-GPS combination and as a Java midlet on Symbian platform. The pilot version of the PC application is available at the project web site (http://saaristomeri.natureit.net/).

Unlike in Naantali where the information system was intended to be used by school groups walking in the old town area, the Medieval Archipelago system was targeted for a significantly different kind of audience. In the case of Naantali, a portable device with a large display was a priority. In the case of boaters it was assumed on the basis of a pre-study that most of the users would have already either a laptop computer and

a fixed GPS navigator on their yacht or a GPS attached mobile phone. Unlike in the Naantali application, which was intended to be used on a standardised hardware platform, compatibility with a range of hardware was a priority in the Medieval Archipelago case.

5 From data to information

The Naantali application was based on a closed architecture, where the new software and content versions were planned to be installed on individual devices in a semi-automated manner. A new version of software and data would have been updated by replacing the older versions of application and data. The content modules (e.g. presentations of individual buildings, objects or historical phenomena) were planned to be tailored for the system. An analysis of the application domain and the potential uses of the system revealed, however, a large number of potential content providers, a need for relatively frequent updates of the content and a need to bring the accumulating research data from on-going excavations and investigations more rapidly into the system than the chosen approach allowed. At the same time, local resources for servicing the system were estimated to be relatively low.

While the work began with the Medieval Archipelago project, the major change in the context was that the application would be unmanaged and maintained by the users themselves. The basic data structure for storing the end-user information was designed to be simple to keep the client software as robust and straightforward to realise and operate as possible, and still expandable for updates and inclusion of future services and information. The content modules were based on geographical locations. A module (i.e. a logical location) comprises hypertext, video, image and audio tracks. The current prototype version is based on an assumption of non-colliding modules, but the strategy of implementing a management for several overlapping locations was taken into consideration in the design.

All of the observations called for a better coordinated approach of managing the contents. Fortunately it was made possible by the decreasing prices of obtaining and providing wireless networking connectivity. The earlier model of content production (where the data was provided in packages together with the software) did not fit in to the new configuration of the system. The individual software versions and content modules were no more independent of each other. There was a clear need of coordinating the linking between the different content modules. Besides the interlinking of the modules, also the linking of the original materials and the content modules became a priority, because a modification in a content module could induce a need to rework other modules. A rapid process of reworking was possible only if all the original material were available.

The initial challenge of enhancing the process of presenting relevant information is in identifying critical differences between initial data and end-user information. Studies on information needs in different groups such as among social scientists (Line 1969), journalists (Nicholas and Martin 1997) and humanists (Wiberley 2003) have shown

both the variety of information needs, but also the variation of how the information is used. From an information management point of view, the inherent problem with archaeological and other cultural information is the subjectivity and highly contextual nature of the premises of how (often quantitative) source data is used to construct qualitative information (Jones 2002). Typically any piece of evidence acquired during a single excavation results only consequentially (together with evidence from other excavations) as information on the past cultures. The same notion applies to any quantitative research. The exception is that an archaeologist is only seldom able to rely on acquiring complementary data on the same site or about the same phenomenon. This underlines the significance of ensuring the throughput of information process in the context of archaeological research.

As the purpose of this paper is not to provide a full account of archaeological information processes (for a more comprehensive account see Huvila 2006), we concentrate on some of the most crucial factors, which affect the efficiency of the information process of making archaeological information available to the general public. Within the scope of this article the most interesting characteristics of the information artefacts are those that reflect the amount of processing needed before a piece of information fits the purpose of an end-user. Therefore the closer examination of the content is focussed on the two ends of the information process. These are the two phases where human actors (archaeologists and the general public) process the data in the most comprehensive manner while trying to make sense of it in their personal contexts.

During an archaeological fieldwork project (whether an excavation or a survey) the gathered material is a result of collecting a sample of the original and available data. The corpus of excavation data is not complete, stable or incremental, and only conditionally representative of the culture, which generated the remains. (Schiffer 1987, Patrik 1985) The site and information about the site become more and more fragmented both physically and on the level of interpretations after the excavation.(Jones 2002). A site has to be documented within certain temporal constraints according to a determined policy of what should be done and of what is possible to be done. Even though fieldwork incorporates a lot of interpretations and choices, answers to any specific questions are formulated only afterwards. This notion underlines the eventual instability of the initial, but also of the subsequent, information structures.

Another important aspect of the initial data is that it is collected only partially to an extremely precise and explicitly expressed direct scientific or scholarly need. In fact, the nature of archaeology prevents it. Pure research excavations do naturally have more clearly expressed and far-reaching scientific and scholarly goals, but as an inevitable aim of all rescue operations has to be the preservation and documentation of all archaeological heritage within a given area, the more or less definite information need formulates as an attempt to find out as much relevant information about the site as possible. Even if an excavation is launched because of an explicit, or implicit, information need or interest, the data gathered during the actual project is more or less constrained by the imperatives of documenting, whether digital or

manual, everything in acceptable detail, and of that the archaeologist has to take what is to be found in spite of any predefined intentions (Richards & Robinson 2002). In practise most of the interests and needs develop only during the actual work. Further it is often impossible to extend the field project as far and as deep it would be for purely scholarly purposes resulting that even an explicit need becomes only partially answered during a single project.

The third aspect (in addition to representativeness and the available information – information needs ratio of the data) discussed in the projects is the direct usefulness of data from an individual end-user point of view. Even if an archaeology professional is able to interpret excavation documentation relatively well, the basic data is likely to be highly relevant only to the specialists who are well acquainted with the given material. A tourist is only seldom interested in the specifics of local pottery types and even more seldom is able to contextualise and understand scholarly archaeological data. The raw data is not suitable for the general public. Popular information needs to be an aggregate, which is based on several complementary types and sources of information, it is supposed provide a general picture of the past society, it should reflect the estimated interests of visitors and the possible educational goals of the professionals. In spite of the differences the scholarly archaeological information shares some qualities with popular information. The most profound differences relate to the scale of information, amount of needed context, and the degree of interpretations (Nolan 1976, Gursoya 2004). The principal difference is in the function of information: whether it is means to educate, inform scientific research of satisfy touristic needs of satisfaction and entertainment.

6 Functions of information

Thinking only of the characteristics of information in the two ends of the information process indicates that the main issue in the management of necessary re-working of content. How this should be done is another question, which can be elaborated further by consideration of the functions of the two categories of information.

The immediate primary goal of the data acquired during an archaeological field work expedition is to secure material for research and to document archaeological sites and artefacts to document and conserve them (Richards & Robinson 2002). Goals of information presented to the public audience in a museum display or at an archaeological site are rather different. The popular information does have similarly immediate functions comparable to research and management, but also more difficult to determine longer term educational and societal functions.

The functionality of archaeological data depends on an accurate documentation of the initial conditions of discovery. On the contrary, information that meets the functions essential to the general public are constructed during the information process. From the archaeological perspective, the priority is to satisfy the immediate (archaeological and cultural heritage management) needs first and to use the information to address touristic goals next. Opposite to the traditional argument suggesting that a major

benefit of new technologies in the delivery of cultural heritage information is the possibility to present large amounts of additional text (Roles 1995). Our findings from trials suggest that the benefit is instead in presenting the same amount content to a larger public in a more meaningful manner.

The heuristic evaluation and trials of the both systems (in Naantali and on the Archipelago Sea) revealed several factors that enhance the understanding of the process of delivering information about an archaeological site to the general public. From a practical point of view the information process should produce end-user information that meet the mentioned primary functions efficiently. It would be also desirable that the process is as cumulative as possible, allows extraction of the initial data from the aggregates, results in as little unused information as possible, produces intermediate aggregates that may be used as a basis for further information, and provides flexible support for content and ontology level reinterpretations.

Reflecting the ideal state of conditions with the state of affairs during the excavations in Naantali and the investigations in the area of the Archipelago Sea, the acquired spatial information was possible to process in a manner that follows relatively closely the requirements for both scientific and popular needs. In Naantali, the excavation site was measured completely with a total station. The data was passed to AutoCAD for post-processing, to MapInfo for analysis and to 3ds max for modelling and preparation of visualisations. The information from the Archipelago Sea area was based on GPS measurements and on the cartographic data acquired from the Finnish National Land Survey. Both processes resulted in only minimal non-used information and the data could be retained in a convertible format throughout the process. The same notions apply to photographs, illustrations and video films, requiring mostly rather simple editing and enhancing.

However, the problem of passing meaningful information is not in presenting different media artefacts, but in communicating their meaning. Therefore a more universal approach for storing the data was required. The suggestion proposed, based on experiences from the both projects, is to introduce a data model consisting of individual spatially oriented information objects with loose semantic linking.

6 Data model

The data model developed is based on a network of individual, spatially oriented data objects used for describing different artefacts, structures, spaces, periods and phenomena. Each object has a unique identifier, general descriptor fields, links to media repositories containing e.g. images, video and hypertext. The client applications operating on different platforms may choose appropriate repositories on the basis of available network bandwidth, audio and video capabilities of the interface device or of the preferences of users. More simple data structures such as the flat file used in the Archipelago Sea case can be easily derived from the central storage. The important feature of the data objects is that the data, which is attached to an object, is kept in original format and therefore the contents may be edited on fly without affecting the integrity of the objects. The number of different versions of individual

media artefacts is not limited. By describing the differences between individual versions all the old, new, more and less precise or research oriented information may be kept attached to the information object.

The suggested data model (see Figure 2) offers a number of benefits for the archaeological information process. The repository of data is cumulative and the previous versions are always available making backwards reasoning easier. The model also makes it possible to present alternative interpretations, versions for different audiences and client devices based on multiple variables. Modular approach with versioning supports collaborative work even at distance and storing all the data structured with a common framework does simplify the overall process. Furthermore, the common framework simplifies data integration and remote retrieval and harvesting of the data using standard XML-RPC calls and e.g. OAI-compliant metadata harvesters.

The practical implementation of the data model is a media object based data repository distributed on each individual client terminal and maintained on a server responsible for serving the mobile client terminals with updates and upgrades on the software application and the data repository and security services for the network. A fully network based approach without stored local data on the clients was considered, but rejected because of the considerable bandwidth demands on a growing number of devices on the network and the eventual inability to guarantee network and positioning functionality all the time around the town (for instance inside larger stone buildings such as the church).

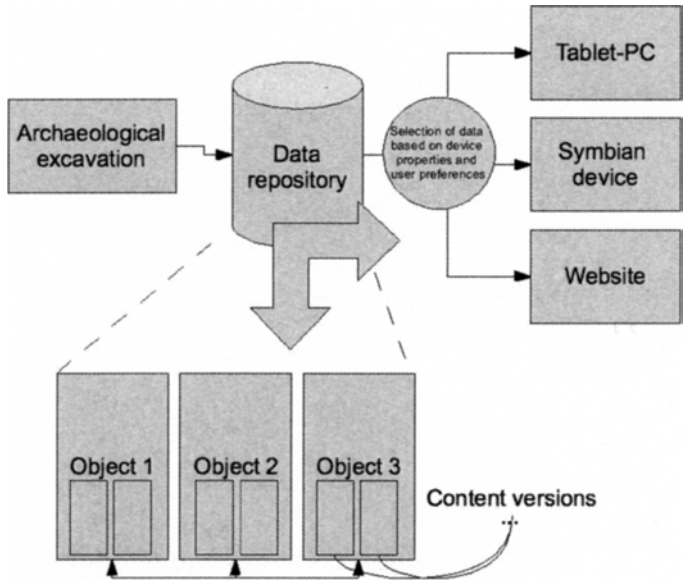

Fig. 2. The data model and information process.

7 Conclusions

The findings of the present study indicated that limited knowledge about information and its characteristics in the digital workflow form a significant barrier to developing mobile information infrastructures serving both archaeological research and public presentation of data. By rethinking the work process and focussing on the premises of creating and using information artefacts, it is possible to find new ways to store and manage archaeological information in a more 'information-oriented' manner, which takes more precisely into account the behaviour of information producers and the various types of consumers.

In case of an information system with regularly updated contents, the content production process is not a one-way endeavour. New scholarly information on an archaeological site necessitates changes in the information presented to the public audience, but the necessary changes are equally dependent on the existing popular information. Therefore, in order to improve the economics of information production, the links between the original scholarly information and the public presentation need to be retained in an explicit and workable manner. On the basis of our findings we propose an object oriented data model that retains the link between the original information sources and the end-user information, and allows flexible provision of information on multiple mobile and stationary platforms from mobile phones to kiosks and a web site. This existence of a unified framework improves the possibilities to manage data, speeds up the process of producing new information for public audience, makes the entire information process more economical and increases the reliability and coherence of the popular presentation.

For touristic presentations, the primary implications of the data model are a possibility to provide more reliable and up to date information, to react more rapidly to the changes in the scholarly knowledge on archaeological sites and to make the process of updating and maintaining presentations more economic, efficient and effective in the long run. The increased reliability and currency of information contributes both to the maintenance of credibility of the touristic attraction, the quality of experience and eventually to the visitor satisfaction.

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Technological Innovations in the Passenger Process of the Airline Industry: A Hypotheses Generating Explorative Study

Patrick S. Merten[a] and
Stephanie Teufel[b]

international institute of management in technology, iimt
University of Fribourg, Switzerland
[a] patrick.merten@unifr.ch
[b] stephanie.teufel@unifr.ch

Abstract

The field of research "technological innovations in the passenger process of the airline industry" is introduced in this paper. Based on a literature review and a market analysis, the need for research is shown and the research question is formulated. Subsequently, the field of research and its research question are explored in more detail in a qualitative workshop. As a result, basic hypotheses are generated, which form the basis for further research. For this, a research framework is proposed, which incorporates theoretical constructs and empirical studies in order to derive practical recommendations for action for airlines and airports.

Keywords: technological innovations, passenger process, airlines, airports, research framework.

1 Introduction

This paper aims to analyse the eligibility of the research question: "How do technological innovations change the passenger process in the airline industry?" It further aims to postulate basic hypotheses regarding this field of research.

First, the relevant field of research is introduced. Based on a deductive literature review and an analysis of the historical and current impact of technological innovations on the airline industry, the research question is derived. The subsequent part of this paper then features the results from an explorative qualitative workshop, which has been conducted in order to confirm the relevance of the field of research and the research question, theoretically derived from part one. Based on the key findings of this workshop, the final part of this work aims to postulate basic hypotheses and proposes a framework for further research.

2 Introducing the field of research

In this first part, the field of research "technological innovations in the passenger process of the airline industry" is introduced by making use of a literature review and by conducting a market analysis of the status quo.

2.1 State of research in "technological innovations in the airline industry"

Throughout the last decades, technological innovations have reshaped global society and economy. "In particular, the airline market environment has experienced significant changes in the recent decades, induced by the different generations of information and communication technology." (Merten, 2007, p.77) In fact, the proliferation of the airline industry and air travel in the post-World War II prosperity has made it indispensable for airlines to introduce information and communication technologies (ICT) and information systems (IS) in order to cope with the challenges of, for example, the rising complexity in distribution. Namely, these have first been computer reservation systems (CRS), followed by global distribution systems (GDS). The evolution of these first-generation airline reservation and distribution systems has been subject to numerous research projects and publications, such as, for example, Merten (2007), Buhalis (2003), Buhalis & Laws (2001), O'Connor (1999), Werthner & Klein (1999), Sheldon (1997), Inkpen (1994) and Copeland & McKenney (1988). More recent publications also include the impact of new technologies such as, for example, the Internet.

As illustrated by Merten & Teufel (2006), the adoption and diffusion of new ICT / IS have transformed the field of airline distribution into a multi-channel distribution environment. In this, customers have the choice of contacting online or offline travel intermediaries or even the airlines themselves. In all cases, the distribution information relies on information systems, which are directly connected to today's airline core system environments. This basic structure is illustrated in more detail in Figure 1.

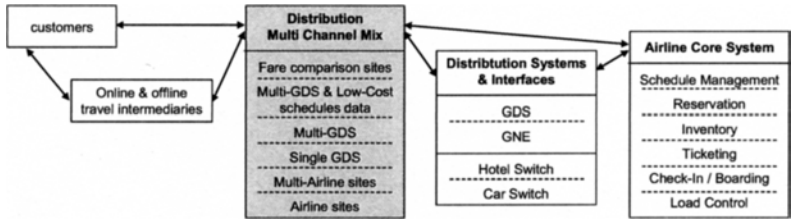

Fig. 1. Multi-channel distribution system environment (Merten & Teufel, 2006)

It becomes obvious, that, when analysing the airline industry in terms of technological innovations, the primary focus in theory and practice has traditionally been set on the application of ICT and IS in the distribution environment. More recently, airlines have also paid increasing attention to the airlines' core system environments, as old

legacy systems had to be replaced. Therefore, an intra-organisational perspective has also been subject to previous research.

On the contrary, the use and influence of new technological solutions in the processes and interactions with the passenger (beyond distribution) have so far not been researched exhaustingly. For the remainder of this work, therefore, the focus is set on air travel itself, which is the passenger process. The study aims to clarify the impact of technological innovations on the passenger process, the passengers and the companies involved (i.e. primarily airlines and airports). A special focus is set on the relevance of mobile solutions (technologies, systems, applications and services), as mobile technologies have more recently matured and an increasing impact of mobile solutions on processes in the airline industry can be observed.

2.2 Status quo of technological innovations in the passenger process

The following sections provide an overview of the status quo of current technological innovations in the passenger process, structured according to the phases in Figure 2.

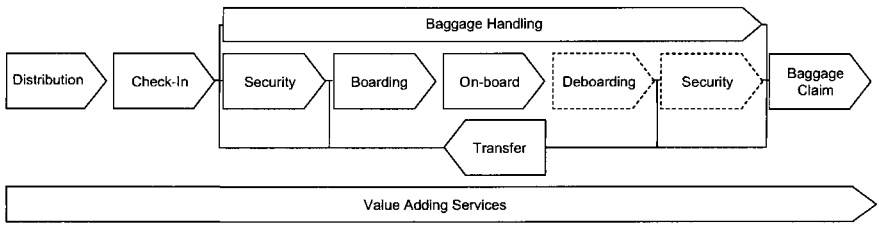

Fig. 2. Phases of the passenger process

Distribution phase. In the distribution environment described before, a trend towards direct and Internet bookings has been observed in recent years. Based on this general trend towards online bookings, the IATA has launched an initiative for "100 % e-ticketing by the end of 2007". This development is on track, with more than 70% penetration worldwide having been achieved by the end of 2006 according to the IATA e-ticketing penetration tracker. In fact, e-ticketing is one of the most significant opportunities to reduce costs as it eases ticket processing charges and eliminates the need for ticket paper, which saves an average of US $ 9 per ticket and up to US $ 3 billion for the industry annually (IATA, 2007). E-ticketing solutions are in fact enabler for all electronic online distribution channels. With these solutions, greater flexibility and faster service for travel agencies and customer can be achieved. The so called interline e-ticket increases the transition of e-ticketing, as it enables passengers to travel on multiple airlines using just a single e-ticket. As of September 2006, 519 interline e-ticketing agreements existed between 115 airlines. Airlines estimate, that 2,000 more agreements will be implemented before the end of 2007 (IATA, 2007).

However, e-ticketing does not mean paperless or ticketless for passengers. It only implies that airlines process coupon status in their information systems instead of physical tickets. During the passenger process at the airport this status can be set to open for use, checked-in, flown. This fact indicates the opportunities for mobile ticketing. Some airlines have already introduced mobile booking platforms and turned their attention towards booking information and ticketing on mobile devices.

Check-in phase. In today's check-in environment, more and more Common User Self Service (CUSS) kiosks are available. These systems enable passengers to check-in independently and without waiting at a check-in counter. According to IATA (2007), check-in becomes 30% faster, which most certainly increases passenger satisfaction. These systems not only reduce waiting time, but also reduce costs and staffing requirements, resulting in savings of up to US $ 2.50 on each check-in in airline operations. Furthermore, the CUSS kiosks allow multiple airlines to incorporate their brandings as well as to provide general and specific information. Optional services offered in some CUSS projects are passport scanners, biometric identification, baggage tag printers and finally wireless connection possibilities for mobiles. By the end of 2006, 49 airports worldwide offered CUSS compliant kiosks, with 26 are located in Europe. Figure 3 shows the IATA CUSS implementation forecast. However, the perception, attitude towards usage, usage experience and acceptance of such solutions by passengers is yet uncertain.

Taking into account the diffusion of online distribution, e-ticketing and the trend towards m-ticketing, the opportunity and necessity for web and mobile interfaces becomes obvious. Besides desk and kiosk check-in, web check-in or even mobile check-in is offered increasingly. This trend, in turn, implies the propagation of e- and m-boarding passes.

Security & boarding phase. Both traditional ticketing or e-ticketing, and check-in counters or kiosks are based on some kind of system to authenticate the passenger. Traditionally, passports are used in this process as well as in the subsequent border, security and boarding controls. As biometric information has to be stored more and more in passports, all these security checks are of course subject to continuous adoption.

The subsequent boarding process is traditionally supported by IT systems. More recent passenger boarding applications have online connections with the Departure Control System (DCS) and provide all relevant boarding information (flight-number, airline code, gates and all kind of passenger details). So far, the corresponding boarding passes rely on magnetic stripes (ATB2), which are much more limited in functionality compared to 2D bar code, which has been introduced recently (IATA resolution 792). The first advantage of 2D Bar Coded Boarding Passes (BCBP) is that passengers can print them at home, which directly correlates with the web check-in mentioned before. Furthermore, in case of mobile check-in a 2D bar code could also be stored directly on the mobile. In this case, the customer benefits from an early off-

airport check-in and easy passage through the airport. As for the interline e-ticket, this boarding document also supports multiple flight journeys. For airlines and airports, on the other hand, home printed BCBP reduce the need and cost for check-in desks and CUSS kiosks. At the same time, it also increases the throughput in the airport capacity constrained environment. As part of the IATA initiative "Simplify the Business", by 2008, airlines must be BCBP capable by 2010, and all boarding passes must be BCBP. A BCBP forecast is given in Figure 3.

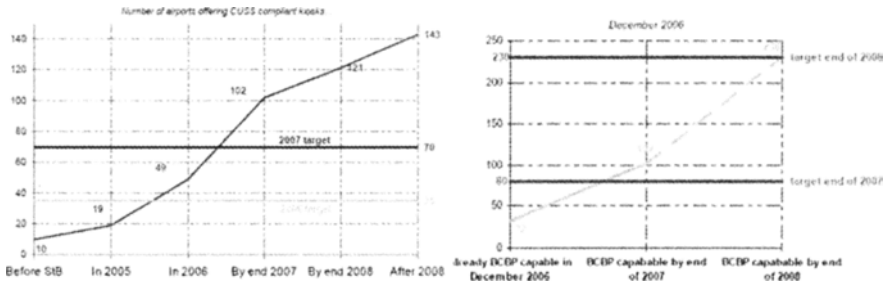

Fig.3. CUSS and BCBP implementation forecasts (IATA, 2007)

Baggage handling. Apart from the direct passenger process, the baggage handling is also executed at the airport in the pre-boarding phase. So far, baggage is checked-in and attached with a baggage tag at the counter or kiosk, containing a 1D bar code and basic passenger information in clear text. The manual allocation of baggage to corresponding flights and re-allocation or separation of no-show passenger baggage and transfer baggage could be reduced by using the RFID technology. This technology is a possible instrument of change for all baggage related processes if included on the baggage tags. First trials have been very successful and ongoing activities by IATA and cooperating airlines and airports are promising. In detail, the read rate in trials of the last two years ranged from 94 to 100 %, which dramatically outperforms the bar code (80 to 90% read rate). Due to RFID baggage tags, fewer delays due to no-show passengers and fewer mishandled bags have been achieved. Therefore the RFID environment not only improves logistics management processes, but also generated industry savings of US $100 per mishandled bag delivered correctly. However, the introduction of RFID baggage tags induces a complete change of airport infrastructure. Therefore, the success of RFID tags in the baggage handling process will rely on whether airlines and airports agree on a common worldwide investment strategy.

On-board phase. On-board entertainment and communication offerings have undergone fundamental changes in recent years. Traditionally, in-flight entertainment systems have been completely independent from the aircrafts network infrastructure. In addition, the range of communication facilities has been very limited (e.g. satellite phone). Suppliers of these traditional systems have been Matsushita, Thales, Rockwell Collins as well as General Dynamics and Delta-Beta. With the introduction

of in-seat displays, the individualisation of the entertainment program began and further functionalities and applications were added (games, flight information services, etc.).

Nevertheless, passengers were in most cases still disconnected from their normal communications infrastructure. For this reason, Airbus and Boeing developed innovative in-flight entertainment and communication systems (IECS) – namely OnAir and Connexion. Both projects aimed at full on-board mobile connectivity. Although these systems have already been integrated in numerous aircrafts, in some ways business models have not been successful yet.

Conclusion: Formulation of a research question. The preceding evaluations have illustrated, that in fact, technological innovations currently change the passenger process in the airline industry. This suggests the (research) question is thus: "*How* do technological innovations change the passenger process in the airline industry?" In order to get a first impression of possible results on this question, an explorative qualitative workshop was conducted in order to confirm the relevance of the research question and to derive basic hypotheses on the topic for further quantitative research.

3 Results from an explorative qualitative workshop

Based on the assumption that ongoing technological innovations will have further impact on the passenger process, an academic workshop has been conducted on this topic. On this occasion, 18 international experts from the airline and ICT industry met in Schadau Castle, Thun (Switzerland). The aim of the workshop was to shed some light on how (mobile) technologies will change air travel. The workshop explored this new field of research and aimed to provide a basis for further research. In addition, trends and scenarios were identified as to how the airline industry, air travel and mobile society might develop.

All details regarding the methodology and a complete presentation of the findings of all four sessions of the workshop are part of a separate publication which is currently under review. For this paper, only a short review of the research design is given, as the key findings (presented subsequently) are presented in order to confirm the relevance of the research question and derive basic hypotheses.

3.1 Research design of the workshop

For the workshop, a distinctive qualitative research design was chosen. In general, the idea of group discussions and the Delphi method have been incorporated in the workshop approach. Based on this general idea, the moderated workshop was divided into four consecutive sessions with different methodologies, tasks and (predefined) group compositions.

In session one, the experts were asked to create a vision of the future of air travel as a result of new (mobile) technologies. In heterogeneous group composition, the participants had to suppress their business background and accumulate single ideas or aspects which go beyond current developments (for this workshop, "future" has been defined as lying ahead more than 5 years). The seven most important aspects of the *customer vision* of each group were presented to the entire panel and discussed afterwards.

In session two, the experts had to develop and agree on an actual *status quo for their respective industry sector*, in terms of technological solutions in air travel. For this, possible variances between single company positions had to be dispelled, and initiated and foreseeable developments had also been taken into account. The results of this session have also been incorporated in the status quo analysis of this paper presented in section 2.2.

Session three concentrated on the *identification of future factors of influence* on the development of mobile business in air travel. Four categories for the factors have been provided to the panel: (i) mobile technologies, (ii) services and applications, (iii) intra- and inter-Organisational aspects as well as (iv) social, cultural and legal aspects. The factors identified in all four dimensions had to be stated with their most likely value. Based on the principles of the scenario analysis and the morphological box, all experts had the possibility to perform a rating of these factors. In combination with the status quo (session two) and the customer vision (session 1) these factors values enabled the experts to identify actual management challenges in the fourth session.

Consequently, in the last session four, the experts were asked to identify *critical success factors and management challenges* for the respective industry sector at each step of the passenger process.

3.2 Key findings of the workshop

Based on the key findings of the workshop, the following major trends could have been identified. Based on these findings, the hypotheses will be generated in the final part of this paper.

Trend 1: One-stop process with mobile devices as enabler. The first and probably most fundamental trend is based on the question "Why do we need the traditional check-in?" This process was originally introduced by airlines, as it suited their internal processes in these days. However, due to modern ICT, background processes have been altered, but the idea of a check-in has remained unchanged. Furthermore, passengers have to go through three to four major procedures at airports (check-in, security and passport control, boarding), which are so far independent and therefore limited in synchronisation. From the customers' perspective, experts from all four industry sectors came up with a vision of a "no-stop (ground) travel" and a complete reorganisation of the passenger process.

In detail, this means an elimination of the check-in desks and procedure. In consequence, boarding passes will only be available online. Customers receive their booking confirmation preferably in an electronic way (e-mail) and all further information (gate, boarding time, delay, etc.) via their mobile end device. As there will always be passengers without a mobile device (lost, not working, uncharged, etc.), rental devices will also be available at airports (incl. special devices for elderly people). All these aspects have been stated within the presentations of the first session and further evaluated throughout the workshop.

The elimination of the check-in, in combination with the use of mobile devices as enablers requires an adaption of security, passport and boarding controls, as there will be no physical boarding passes any more. It has been proposed to create an "open airport environment" and to decentralise and move all controls to the boarding area. At this point, a passport control first identifies the passenger as the person he or she is supposed to be and subsequently as a passenger for the specific flight. Thereafter the passenger passes the security check and enters the zoned boarding area for his or her flight. So far one point remained unsolved: baggage handling.

Trend 2: Door-to-door baggage handling. Passengers do not want to care about their baggage or carry it all the way to or from the airport to their final destination. In consequence, a door-to-door baggage handling solution has been proposed, which includes a baggage pick-up service or central baggage drop-off point located in central places and drop-off services at destinations. As present barcode baggage tags will probably be replaced by RFID tags (see 2.2 "baggage handling" for more details), an optimisation of baggage allocation is now possible even without the check-in procedure. Therefore, this trend is an optimal complement to trend one.

Trend 3: Individualisation. In strong interaction with the first two trends, an increasing demand for individual services has been clearly identified. Not only direct flight connections, but also automated adaptable bookings based on passenger profiles are increasingly requested. This services range from automatic selection and adoption of the flight and seat selection, to individual mobile travel information to and at the airport and mobile coaches with personal trouble-shooting.

These future trends exemplify the importance of individually adapted information services in combination with mobile devices. The three key trends are furthermore completed by other aspects presented at the workshop, such as, for example, airport and in-flight connectivity or individual entertainment programs.

Conclusion: Passenger flow management. Assuming the presented trends and developments in the passenger process will turn in the expected direction, a new kind of passenger flow management will emerge in future years. Taking into account the ratings of factors performed by the experts, this will most probably mean that an airport external check-in will be the most common solution in the future, utilising the web or mobile solutions and based on 2D bar coded boarding passes. The

development of the ensuing process at the airport will be distinguished by the merger of controls and the introduction of a digital identity. In conclusion, for the entire process electronic documents are the key to a change in passenger processes. Adventitious, the standardisation efforts have to be finally highlighted.

4 Deriving basic hypotheses and a research framework

Based on the key findings of the workshop presented in the trends of section 3.2, the following basic hypotheses can be postulated for the future of the passenger process.

H_1: Passengers will commonly use their mobile devices to receive air travel related information and services (airport, flight and travel information).

H_2: Tickets will primarily be stored on mobile devices (mobile ticketing).

H_3: Check-in and baggage drop-off will be two different procedures in the passenger process.

$H_{3.1}$: Check-in will primarily be carried out through websites and through mobile interfaces.

$H_{3.2}$: Baggage drop-off will commonly be possible at central urban places and with home/company pick-up.

H_4: Baggage handling will primarily be performed by the use of RFID based baggage tags.

H_5: 2D bar coded boarding passes will primarily be printed at home or stored on mobile devices.

H_6: Electronic passports and the storage of biometrical data will lead to a complete redesign of border and security controls.

H_7: There will commonly be an open airport environment due to the fact that security and border controls will be decentralised to the airport gates.

H_8: Airline and airport management will focus on the passenger flow management.

H_9: In future, passengers will experience a no-stop passenger process at airports, based on the use of a mobile device with m-ticket for check-in and m-boarding pass for boarding.

In order to investigate these hypotheses two studies are proposed:

The first study should empirically analyse the airlines and airport strategies regarding the adoption and diffusion of new technological innovations in the passenger process. For this, a two-step survey seems to be appropriate, whereby, in a first step, airline and airport responsibles are surveyed using a quantitative standardised questionnaire. Subsequently, airline and airport experts are qualitatively questioned on the basis of a Delphi method to gain further insights.

The second study should focus on passenger perceptions, attitudes towards usage, usage experiences and acceptance of these technological innovations. In order to get a most representative passenger portfolio, the quantitative survey should preferably be conducted at different airports.

Based on these considerations, the following research framework for investigating the technological innovations in the passenger process of the airline industry is proposed (see Figure 4).

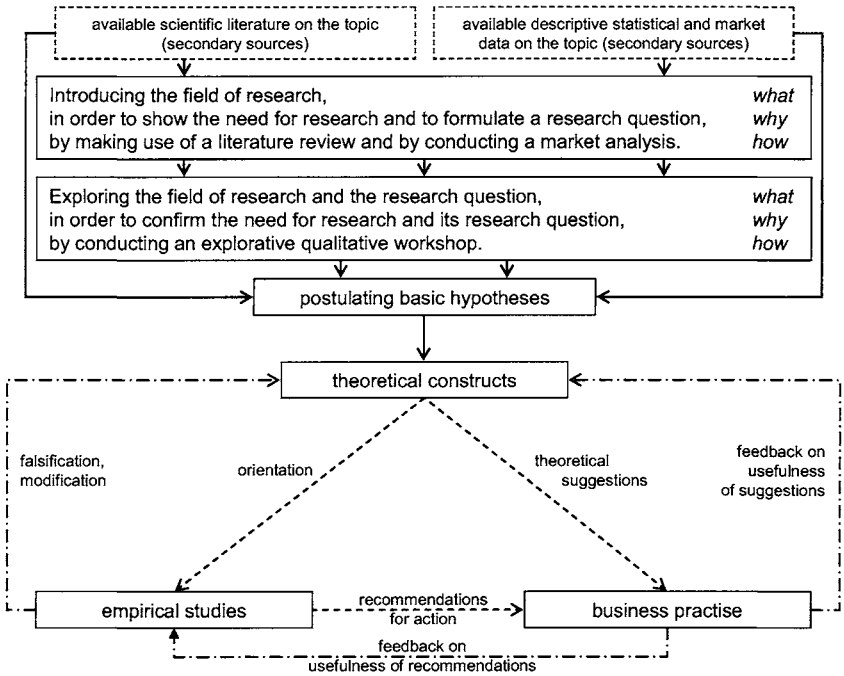

Fig.4. Proposed research framework

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New Distribution Channels and Business Strategies for Location-based Travel Agencies

Anita Zehrer[a],
Peter Möschl[b]

[a] School of Tourism and Leisure
Management Center Innsbruck (MCI), Austria
anita.zehrer@mci.edu

[b] Raiffeisen Tours
RT-Reisen GmbH, Germany
peter.moeschl@rt-reisen.de

Abstract

The international travel market is characterized by uncertainties. Due to rapid changes in terms of new technologies, changing consumption patterns of customers and global economic changes, the travel sector has to redefine its business strategies in order to remain competitive. Location-based travel agencies are in the state of a metamorphosis (Poon 1993). Modern information and communication technologies enable the majority of travellers to gather information on their own. On search of the 'best deal' for flights and hotels, customers often avoid the classic way of booking at the location-based travel agency and prefer to book via the internet (Gretzel et al. 2006). In the future, solely resistant customers will use location-based distribution. The internet and changing customer behaviour are the new drivers leading to new distribution channels and business strategies for travel agencies. The paper reports a qualitative study among travel agency managers and presents potential future strategies for travel agencies.

Keywords: location-based travel agencies, distribution channels, business strategies.

1 Introduction

Tourism demand will triple by 2020 (Cooper & Lewis 2001). The distribution of tourism services increasingly occurs via the internet and the number of location-based travel agencies constantly decreases. The advantage of this so-called disintermediation basically lies in the reduction of the problems related to the interface among the different levels of the value chain (Egger 2005). The concept of disintermediation, i.e. the elimination of the intermediary or middlemen by using the internet, is heavily debated by researchers. Arguments against the disintermediation for instance deal with the role of travel agencies as professional travel advisers (Buhalis 2003). Some researchers (Barnett & Standing 2001, Buhalis 1998) state that the accessibility of online travel sites minimizes the significance of travel agencies. Palmer and McCole (1999) on the other hand claim that the key strength of travel agencies lies in the personal information and advice they provide. But, service providers may save commission costs via direct distribution and tour operators and airlines do get direct access to customer data.

Table 1. Selected arguments for and against disintermediation of travel agencies (Buhalis 2003, 1998)

Arguments for disintermediation	Arguments against disintermediation
Travel agencies....	
... currently add value to the tourism product, as they primarily act as booking offices.	... are professional travel advisers and offer valuable services and advice.
... merely manage information and undertake reservations.	... use expertise to save time for consumers.
... are biased, in favour of principals who offer override commissions and in-house partners.	... offer free counselling. services and add value by giving advice.
... do have less knowledge than experienced travellers.	... find technology difficult to use and expensive to acquire for individuals.

The customer has changed and is characterized by more flexibility and more travel experience. Tourists increasingly ask for more specialized trips combined with demanding and increasing expectations in terms of convenience, quality, value and customization. Many studies have indicated that the 'new tourist' demands high-quality vacation in terms of services, products, information gathering and value for money (Law et al. 2004). Booking vacations via a location-based travel agency is no longer a value added for the tourist, as he is more and more used to internet booking. "The traveller who was once forced to rely on a travel agent can now enquire about airfares directly on the Internet. He/she can even make firm reservations directly with the airlines" (Baines 1998 p161). The internet provides all necessary information needed and customers increasingly prefer the information diversity of the internet to the location-based service provider (Gretzel et al. 2006). Hence, technology signifies a serious problem to the economic survival of travel agencies as direct access to information, booking and electronic payments constantly increases. Location-based travel agencies will have to put much effort to convince customers of the value added they can contribute.

The paper reports a qualitative survey among nine travel agency managers which were interviewed during June and July 2006. The aim of the study is to answer the following research question: What kind of business strategies and distribution channels should be applied by location-based travel agencies in order to react to disintermediation and to remain competitive.

2 Theoretical Background

Before 1945 people were not used to travel. From this time on, income growth led to a more travel-friendly society; infrastructure and transportation (e.g. jet aircraft, cable cars) developed; and demand for tourism products grew (Buck 2007, Vasudavan & Standing 1999, Hall 1995). Tourism started to establish itself as an industry and travel

demand was steadily growing and flourishing. From the 1980s onwards, the market shifted from a seller's to a buyer's market, i.e. supply was bigger than demand. Travel agencies in their very beginning were responsible for planning vacations; for selling products from travel suppliers; and for advicing tourists in destination information (Dickman 1989). The market for holidays and travel started to become more complex and dynamic. During this time, airlines made use of intermediaries as an inexpensive way of distributing their products to the market. "Airlines soon came to rely heavily on them for distribution, often as an extension of their own office, for airline reservations, ticketing, transactions, travel advice, market coverage, market presence and packaging" (Vasudavan & Standing 1999 p214; Alamdari, 2002, Yale 1995). According to WTC the number of international arrivals amounted to 441 million in 1990 and 680 million in 2000. WTO Tourism 2020 Vision forecasts more than one billion international tourism arrivals. Also, the European online travel market also grew by more than 50% from 2003-2006 (WTO 2001). However, during the ongoing transformation of distribution channels via the internet (e.g. Expedia, Opodo), many traditional travel intermediaries are likely to get stuck in the middle (Buck 2007, Tacke & Fichtner 2007, Yale 1995).

2.1 Travel agencies

Travel agencies are largely seen as the main distributors of tourism product and services (Buhalis 2003). "Travel agencies are intermediaries between the end users and the suppliers, the principals, wholesalers and the consolidators" (Gharavi & Sor 2006 p108). Basically, travel agencies perform three tasks (Wynne et al. 2001, Lewis et al. 1998):

- Information brokers: travel agencies pass information from buyers to suppliers and vice versa
- Transaction executors: travel agencies undertake travel transactions
- Travel advisers: travel agencies offer travel advice

Based on these tasks, travel agencies have long been able to justify their position on the market (Lewis et al. 1998). "The travel agents were true agents in that they each represented a small number of non-competing major players. The travel agents were mostly small independent business people, very dependent on their principals. The traditional travel market is based on a relatively simple distribution model (see fig. 1). As indicated, service providers make use of intermediaries, who sell the products in the name of the service providers" (Gharavi & Sor 2006, 104f). Herein, travel agencies do play an essential role, as they process the majority of bookings. Their main task is it to offer products and services at the convenience of the tourists.

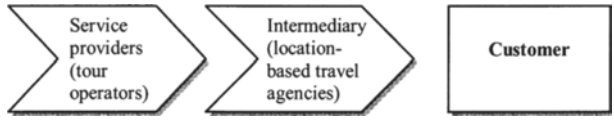

Fig. 1. Traditional distribution model in the tourism industry (Sharma & Carson 2004, 558)

The technology induced changes on the travel agencies (Gharavi & Sor 2006):

- Industry-wide distribution: communication has started to occur on a wide range resulting in the offering of customer-tailored products.
- Internal customer-centric supplier systems: customer interaction has become more profitable. New technologies have impacted the distribution of tourism products and services.
- Customer-centric decision support: travel agencies have introduced decision-support systems.

Law et al. (2004) speak about a shift from the traditional channel of location-based travel agencies at present to a big increase of the internet as a new channel of distribution in the future. Buhalis acknowledges that ICT provides a wide range of tools for travel agencies. O'Brien (1998) also admits that due to internet growth, travel agencies were forced to change their way of doing business. Bloch and Segev (1996, 5) describe the role of future travel agents as "transaction processors (ticketing and settlement) and suppliers of raw unprocessed, product information".

The online travel development has led to more business competition among travel agencies. Inevitably, the traditional intermediary role of the travel agencies has changed (Buhalis 1998). Some researchers (Buhalis 1998, Sheldon 1997) argue that traditional distribution systems are threatened and might even been replaced by electronic systems. Inkpen (1998) even accuses the internet as THE activator for disintermediation. Palmer and McCole (1999) state that the volume of online travel sales might increase, yet travellers might still rely on travel agents due to the personal touch and individual advice on services. According to Law et al. (2004) both channels, the internet and location-based travel agencies, will supplement each other in the future in order to fulfil the customer's wishes at its best. To sum up, it can be stated that technology has largely shaped the future nature of traditional travel agencies with intermediary functions being largely eliminated due to the internet and its applications.

2.2 The value system and the need for intermediation

Porter (1985 p38) defines value as "the amount buyers are willing to pay for what a firm provides". The value chain therefore displays total value, value activities and its

margin. Every firm's value chain is composed of nine generic activities (primary and secondary activities). Porter's extension of the value chain is referred to as a 'value system' and embeds the value chain of an individual firm into a larger stream of activities (see figure 2). The tourism industry disposes of a complex value chain by integrating a wide range of service providers into the destination system. In its simplest form, the value chain is composed of the destination and final service providers (including hotel and B&B operators, restaurants, museums, bus operators, airlines, etc.), the inbound tour operators (which are considered the first intermediary in the value chain), the outbound tour operators (which are considered the second intermediary), reservation systems (a relatively new intermediary), and the location-based travel agency (which are geographically close to the tourist).

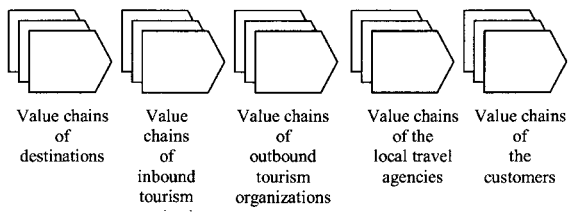

Fig. 2. Value chain of the tourism industry (Wynne et al. 2001, 422)

3 Methodology

The survey reports a qualitative study among travel agency managers on the future of location-based travel agencies and potential competitive strategies by means of a personal interviews (n=9). All experts were first contacted via e-mail and informed about the objective of the study. The interviews took place from June till July 2006. A list of eight open questions was developed and divided into three major parts: part one dealt with the structural analysis of the travel agency market. The second part consisted of questions directly connected to the potential business models which might be applied by location-based travel agencies. The last part of the questionnaire addressed the new distribution channels for travel agencies. The interviews lasted between 35 and 60 minutes, were recorded and then analyzed according to Mayring's qualitative content analysis, which was developed in the 1980s. The main objective of the content analysis is "to preserve the advantages of quantitative content analysis as developed within communication science and to transfer and further develop them to qualitative-interpretative steps of analysis" (Mayring 2000 p2).

4 Results

By means of expert interviews, the travel agency market is analyzed. Experts are especially asked about the changing conditions for travel agencies, new distribution channels and potentially new business models which might be adopted for them.

4.1 Structure analysis of the travel agency market

All experts (n=9) regard the rivalry within the travel agency market only as a marginal threat postulating that the competition within the branch is relatively solid and structured.

When it comes to changing consumption patterns and behaviours, experts see an increasing claim towards consultation services. It becomes more and more difficult to convince consumers of a vacation trip. Intermediaries see themselves within a process of transformation in the sense of a vacation designer or a provider of ideas for customers' vacation. As far as new market entrants are concerned, experts do not comply in their views. While some forecast threats by substitutes in terms of distribution channels such as internet platforms, and mobile devices, others think of new competitors, e.g. network carriers, low cost carriers, and tour operators. Among service providers, experts are concerned about the changing environment of airlines.

Agents, the traditional sales unit for tour operators, receive commissions. Yet, commissions are constantly under attack from tour operators, service providers and travel agents, reflecting the pressure under which the tourism industry lies. As a result, commissions are being cut back to zero and, with the direct distribution of airlines, the partnership among travel agencies and airlines is on the edge (Tacke & Fichtner 2007). Location-based travel agencies have it hard to make the argument to customers to continue buying their tickets at the travel agency in spite of higher rates. A similar picture becomes apparent for tour operators where commissions are going down and direct distribution increases. The structure of the travel agency market is depicted by the experts as follows.

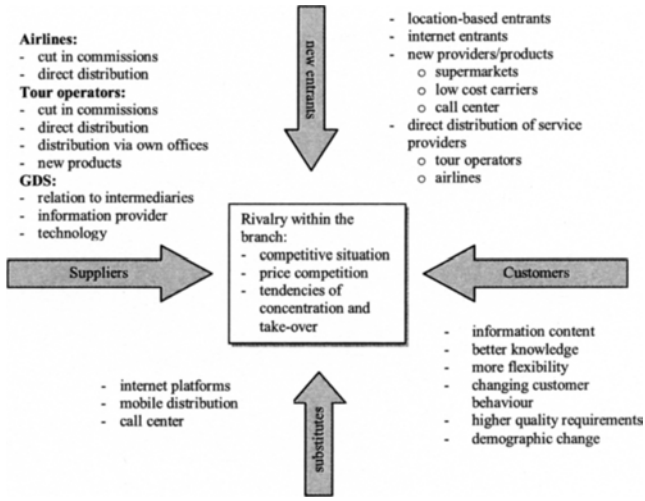

Fig. 3. Structural analysis of the travel agency market (cp. Porter 1985)

4.2 Potential business models of the travel agency market

Experts were interviewed about the already established business models and their importance for the future according a 5-point Likert scale with 1=important, 2=rather important, 3=neither important nor unimportant, 4=rather unimportant, and 5=unimportant.

Horizontal integration is a consolidation of companies at the same level of distribution (Cooper & Lewis 2001, Holloway 1983). "Horizontal integration takes place when firms at the same stage of production (e.g. airlines) come together" (Poon 1993 p218). The biggest advantage lies in the more effective and efficient distribution of the company's products with ICT playing an important role. Vertical integration is consolidation of companies from different production levels succeeding on top of each other, i.e. an inter-company cooperation of different service providers within the value chain. Big tour operators in Great Britain and Germany applied this model extensively during the last years. The goal of the strategy lies in the quality control of the products and in the profit maximization by synergies (Buhalis 2003, Poon 1993). The sales model strategy implies that the role of the location-based service provider more and more develops from the position of a sales agent to a producer. Increasing demand for individualized products shifts the package function from the tour operator to the intermediary.

The importance of the horizontal integration with the main focus lying on cooperation will increase according to experts from 1.6 today to 1.2 tomorrow. The main reason for this increase lies in the increasing bargaining power compared to service providers. Vertical integration is seen as 'rather important' by the experts with its

relevance today at 2.2 and 2.0 tomorrow. The reason lies in the fact that experts define vertical integration e.g. when a location-based agency distributes its own products and in doing so acts as a tour operator. As far as the sales model is concerned, experts state that travel agencies increasingly aim at determining their products independently from the traditional service providers. Therefore, the model (today 2.1) is seen to become increasingly important in the future (mean value of 1.7).

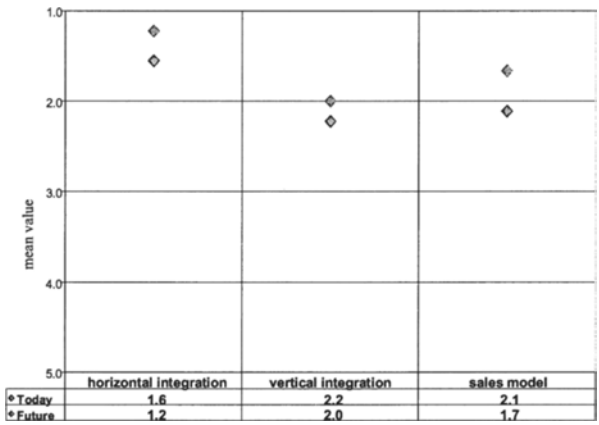

Fig. 4. Importance of business models today and in the future

4.3 Distribution channels

Some time ago, in 1958, Alderson stated the importance of distribution. Stern and El-Ansary (1988, p46) define a distribution channel as "a sets of independent organizations involved in the process of making a product or service available for use or consumption". Therefore, the purpose of a distribution channel is "to make the right quantities of the right product or service available at the right place, at the right time" (Wynne et al. 2001, 425). While in the past distribution of services and products was mainly undertaken via location-based agencies, modern ICTs change these channels completely. Experts are asked to rate the importance of distribution channels today and tomorrow according a 5-point Likert scale ranging 1=important, 2=rather important, 3=neither important nor unimportant, 4=rather unimportant, to 5=unimportant.

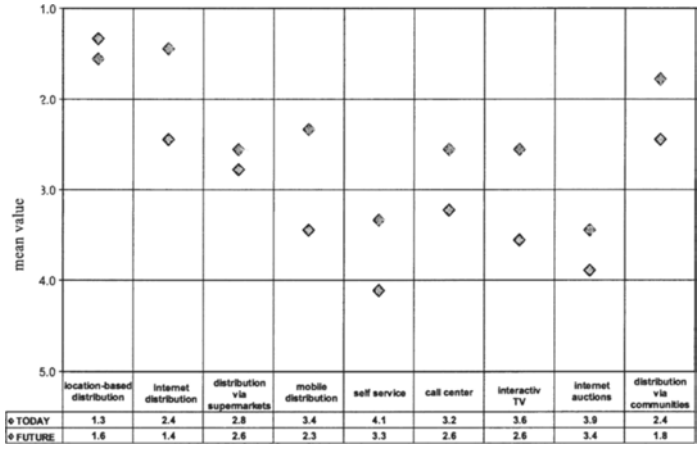

Fig. 5. Importance of distribution channels today and in the future

Location-based distribution as the traditional distribution channel is regarded as important by experts with an importance of 1.3 attributed today. Although experts attach importance to location-based distribution in the future, it decreases to 1.6. In comparison, the internet-based distribution considerably becomes important in the eyes of the experts with 2.4 today and 1.4 tomorrow. Basically, the distribution of single products via supermarkets will also increase according to experts (2.8 today and 2.6 tomorrow), although experts do not fear that this distribution channel will have considerable impact on the location-based agencies. Mobile distribution, i.e. consultants and agents who directly distribute the products at the customer's house, will become more important in the future, i.e. experts rate this channel as rather unimportant today (3.4) and rather important in the future (2.3). The majority of the experts (n=7) cannot picture a considerable benefit of self service machines for their travel agency with 4.1 today and 3.3 in the future. The importance of call centres for location-based distribution naturally keeps within a limit with an importance of 3.2 today and 2.6 tomorrow. Interactive TV as a means of distribution for location-based travel agencies is rated 'rather unimportant' today (3.6) and 'rather important' in the future (2.6), i.e. experts do not see a noteworthy importance of this channel for location-based travel agencies. The last two distribution channels which experts rated are internet auctions and distribution via online communities. Internet auctions were rated to be 'rather unimportant' today (3.9) and neither important nor unimportant tomorrow (3.4). To distribute ones services and products via online communities is regarded to be quite interesting by the majority of experts rating it with 2.4 today and 1.8 in the future.

5 Conclusions and further research

The tourism industry has become inherently global. The internet is an important new channel for commerce in a wide range of industries, especially in the tourism

industry. The paper theoretically and empirically dealt with the influence of the internet on location-based travel agencies and their future perspective. However, the authors must admit that the biggest shortcoming of the study is the number of interviewees. An increase in interviewees might have led to more meaningful results.

Table 1. Potential strategies for travel agencies

	Potential strategies
competition within the branch	• Concentration on niches • Offering own products for selected customer segments • Differentiation through high service quality in consulting activity
changing consumer behaviour	• Improvement of customer care • Improvement of customer relationship management • Improvement of accessibility by means of multi-channel distribution • Offering of dynamic products • Focus on employee qualification for achieving maximum customer satisfaction and benefit
new competitors/ market entrants	• Concentration on niches • Offering own products for selected customer segments • Alternative distribution channels. (multi-channel distribution)
suppliers	• Reduction of dependence through new business models such as the sales model • Offering of dynamic products of alternative suppliers • Cooperating to increase bargaining power • Providing information by means of modern ICTs
substitutes	• Concentration on niches • Offering own products for selected customer segments • Alternative distribution channels. (multi-channel distribution)

While opportunities afforded by this phenomenon seem really apparent (e.g. bypassing others in the value chain), there is still much debate and speculation on exactly how the use of the internet affects established industries. Especially location-based travel agencies see themselves confronted with strategic challenges. Modern information and communication technologies enable the majority of travellers to gather information on their own. Location-based travel agencies do have to rethink their strategies in terms of business models and distribution channels. The study revealed the following basic strategies location-based travel agencies may apply in the future (see Table 1).

This research provides some opportunities for further research, listed below.

- A field study with a bigger number of interview partners in order to complete the overall picture.
- A survey about the critical key success factors for implementing multi-channel strategies for location-based services.
- An analysis of customer benefits and the effects of customer relationship management tools for location-based agencies.
- An analysis of the legal consequences resulting from the change from the role of an intermediary to a seller.
- A feasibility study about the use of dynamic packaging in location-based travel agencies.

Moreover, the research aims at stimulating others to carry out research on related issues.

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New Zealand Travel Agents in the Internet Era: Spatial Differences in ICT Impact, Adoption and Perception

V. Garkavenko[a], and
S. Milne[b]

[a]School of Business and Tourism,
Waiariki Institute of Technology, New Zealand
Vladimir.Garkavenko@waiariki.ac.nz

[b]New Zealand Tourism Research Institute,
Auckland University of Technology, New Zealand
Simon.Milne@aut.ac.nz

Abstract

This study empirically investigates the perception, adoption and impact of Information and Communication Technologies (ICTs) by travel agencies in New Zealand. In particular we examine the difference that location makes in influencing these themes. Our work is based on an on-line national survey of travel agent businesses. We review the current pressures facing travel agents, emphasizing the pivotal role played by ICT. A notable finding of the national on-line survey is the marked heterogeneity of the New Zealand travel agent sector in terms of pressure factors on their businesses, attitudes towards technology, relationships with the consumer, and business successes. Major spatial differences exist between travel agents (TAs) located in Auckland and other major cities and those in smaller, more rural, towns. TAs from the Auckland region are early internet and ICT adopters who are orientated towards quality customer service and niche markets in contrast to rural travel agents who are not prepared to invest in ICT and do not perceive customer –orientated services as an advantage.

Keywords: travel agents, information and communication technologies adoption and perception, disintermediation, spatial differences, Auckland, New Zealand.

1 Introduction

The impact of ICT, and the internet in particular, is a dominant issue in the tourism industry today. The growing accessibility of travel and tourism-related information on the internet is leading to a restructuring of traditional distribution channels (Buhalis, 2000; Milne, Mason & Hasse, 2004). Arguably, the most important change brought about by the internet is "disintermediation", whereby principals such as airlines, hotels and rental car chains bypass intermediaries and sell directly to consumers. Travel agents (TAs) have long been identified as being vulnerable to the growth of the internet as a tool for e-business and information dissemination (Bloch & Segev, 1996, Poon, 2001).

The New Zealand tourism market is certainly not immune to these changes. The Travel Agents' Association of New Zealand (TAANZ) has stated that never before has the industry experienced a period of such turbulence and change (TAANZ, 2001).

Shifts in airline ownership, the disappearance of some carriers from the New Zealand market, commission cuts, the growth of internet use, and evolving consumer demand and expectations are fundamentally altering the ways in which New Zealand TAs conduct business (TAANZ, 2001).

Research into the travel agency sector by academics has largely focused on the need for TA to adopt strategies and embrace technology that will enable them to compete in an ever-changing technological environment. These developments have been studied in Canada (Loverseed, 1999; Bedard, 2000), Australia (O'Brien & Dunn, 1998), the United States of America (Yesawhich, 1996; Lewis, Semeijin, & Talalayevsky, 1998), and Europe (Marcussen, 1999; van der Pijl, 2000; Bogdanovych et al., 2006), amongst other nations and regions.

In New Zealand, there has been little academic research focusing on the TA sector and its evolution in the internet era (Oppermann, 1998; Garkavenko, Bremner & Milne, 2003; Garkavenko & Milne, 2007; Pearce & Schott, 2005; Cheyne, Downes & Legg, 2006). In our previous works we have identified the evolving issues facing the New Zealand travel agent sector (Garkavenko, Bremner & Milne, 2003). However, that research was restricted to the Auckland region's travel agents. Although more than one-third of New Zealand's population lives within its boundaries, and it is New Zealand's major entry and departure point, it was vital to look beyond solely Auckland. We were interested to find whether TA behaviour in the largest urban area is quite different from rural areas that are less ready to adopt ICT. This study extends the research to the national scale and applies quantitative methods to test our previous findings relating to pressure factors facing TAs and TAs' attitude towards, and perceptions of, ICT.

An investigation of the impact associated with ICT introduction on the New Zealand TA sector is the main focus of this study. The specific emphases of the study are on:

- Identification of the main factors impacting upon the modern TA business environment and the responses of TAs to these factors
- ICT adoption and perceptions of ICT use by TA businesses
- Impact of location of enterprise behaviour

2 Methods

A fully-structured on-line questionnaire was designed and implemented.
The questionnaire consisted of several sections:

1. Collection of data on the background of the firm such as the location of the business, ownership structure, size of the business, specific markets, experience, and range of services provided. This section also contained questions on the current business situation as compared with the situation three years ago.

2. Identification of the major pressure factors facing New Zealand TA. Respondents were asked to rate the importance of changes in the TA market for their businesses.

3. Examining ICT use by TAs, including digital data transfer, processing and distribution technologies such as the internet, and CRS/GDS software or services. Respondents were asked to identify what they used the internet for and the function of their web site. They were also asked to rate the importance of different internet functions for their business such as e-mail, research on travel destinations, booking travel, and financial transactions, and that of different web sites functions such as information dissemination, interaction with customers, and on-line bookings. This section was also aimed at identifying the respondent's attitude towards new technology, and they were asked to rate the importance of ICT for their businesses.

The survey (and relational database) was designed to ensure confidentiality and to make the process of completing the questions as easy as possible. The on-line survey opened with background information on the research and standard ethics review disclaimers. For the purposes of this study, the definition of small and medium size enterprise (SME) by the New Zealand Ministry of Economic Development was used. They define small enterprises as "those employing 0-5 full-time employees (FTEs)" and medium-sized enterprises as "those employing 6-9 FTEs" (Ministry of Economic Development, 2001). Seven hundred survey invitations were sent to prospective respondents. A total of 109 responses (15%) to the survey were received. The quantitative data obtained were analysed using SPSS for Windows.

3 Results

3.1 Organisational characteristics of respondents

Of the 109 responses received, 71% were from the North Island and 29% from the South Island. Around 37% were received from the Auckland region. Approximately 43% of respondents were independent/family businesses, 40.7% belonged to franchises/chains, 3.7% belonged to networks, and 7.3% were classified as "others". This distribution reflects data provided by Net Readiness Statistics and Research on New Zealand tourism businesses (Ministry of Economic Development, 2001) which indicates that about 49% of tourism businesses in New Zealand are family/independent businesses. Furthermore, over 77% of respondents to this survey had less then 10 employees. Thus, the respondents' businesses can be described as mainly small- or medium-sized with a preponderance of family/independent TAs and franchises/chains.

Respondents were asked to rate the status/performance of their businesses on a 5-point Likert scale from 'much worse' through to 'much better' as compared with the status three years ago. The majority of respondents were either "neither better nor

worse" in terms of their current business status as compared with three years ago (30%), or perceived their situation as "better" (26.6%) (the mean value on the 5-point scale was 3.59.

3.2 Major pressure factors influencing TAs

One of the aims of the survey was to identify major pressure factors on New Zealand TA. Respondents were asked to rate the impact of various factors identified in earlier research (Garkavenko, Bremner & Milne, 2003; Garkavenko & Milne, 2004) on their businesses using 5-point Likert scales. The list of the factors included: commission cuts by airlines, hotels and car rental firms; the emergence of more informed consumers; competition with other TAs; competition with suppliers selling on-line and on-line TAs; lack of government support; lack of skilled staff; consumer use of the internet; health concerns (e.g. SARS); terrorism; and other factors.

The majority of respondents (31%) indicated that commission cuts by airlines had a considerable impact on their businesses, with a mean response value of 3.59. Consumers buying on the internet (23%), health concerns (41%), terrorism (37%), and suppliers selling directly to consumers (34%) were also considered major impacts on TA businesses, with mean response values of 3.38, 3.45, 3.39, and 3.55 respectively. The mean response value for the impact of commission cuts by hotels and car rental firms was 2.98, which corresponds to a perception of "some impact". The emergence of sophisticated consumers, competition with other TAs, competition with on-line TAs, lack of government support, and lack of skilled staff were also perceived as having "some impact" with mean response values of 2.84, 2.66, 2.83, 2.47 and 2.77, respectively. Among other factors that had some impact on TA businesses were "exchange rates" and "cheap internet prices". Similar findings regarding pressure factors facing TAs were reported by Dilts & Prough in the USA (2001), by Garkavenko et al in New Zealand (2004), and by Bogdanovych et al. in Europe (2006). These authors identified supplier pressures, changing technology and habits, and customer decisions as some of the factors that have caused the travel industry to become so turbulent and uncertain.

The data shows that New Zealand TAs perceive commission cuts by airlines, more informed consumers, health concerns (e.g. SARS), terrorism, suppliers selling on-line, the internet, and competition with other TA as the main pressure factors for their businesses. This is in good accord with previous results (Garkavenko et al., 2003) - it confirms the finding that the major factors impacting onto the New Zealand TA market are ICT-related. However, it also reveals the impact of other factors such as health concerns and terrorism. The differences can be explained by an impact of the survey timing – the ever-changing TA business environment continually brings new pressure factors (Garkavenko & Milne, 2004).

3.3 ICT Perception and adoption

A review of previous research on small tourism and hospitality businesses has pointed to a growing interest in internet marketing (Milne, 1996; Milne, Bremner & Carter, 2001; Doolin, Burgess & Cooper, 2002; Landvogt, 2004). On one hand, some researchers suggest that because entry barriers are low, it is cost-effective for small businesses to set up an internet presence, which helps level the playing field between small and large firms (Hoffman & Novak, 1996; Lituchy & Rail, 2000). However, other researchers suggest that e-commerce is not being adopted as readily by small tourism and hospitality businesses as might be expected (Leong, 2000; Van Beveren & Thomson, 2002, Lassnig, 2006; Duffy, 2006). This can be explained by the lack of required skills (Leong, 2000; Van Beveren & Thomson, 2002), perceptions of consumers as technophobics (Law, Law & Wai, 2001), high initial cost, and reliability problems (Landvogt, 2004).

Our previous studies showed that although New Zealand TAs have adopted ICT, and the internet in particular, in their businesses, they do not perceive it as a strategic tool (Garkavenko et al., 2003; Garkavenko, 2007). An explanation of the term "strategic tool" can be found in works by Buhalis (2003) who indicates that *strategic information systems* (SIS) are aimed at improving competitiveness by changing the nature or conduct of businesses; they are used to achieve organisational strategic objectives, to enhance performance, and to coordinate activities across businesses, as well as to support interactions with external entities in pursuit of a competitive advantage. Thus, SIS are primarily used to support the competitive strategy of the organisation and its ability to gain and maintain a competitive advantage.

Survey respondents were asked in the on-line survey to identify what kind of ICT they are using. Around 78% stated that they were using computerised reservation systems or global distributions systems (CRS/GDS), 85% were using e-mail, and 84% were using the internet for information searching. These figures for internet and e-mail usage were lower than had been established for accommodation businesses having a computer with e-mail and internet access, and nearly the same percentage have some form of web presence (Statistics New Zealand, 2006).

According to a tourism industry survey (New Zealand Government Electronic Commerce, 2004) the proportion of the tourism industry organisations with a web site is 91%. The on-line survey showed that 84% of respondents have a web site, and most have done so for 2 to 4 years (46%). Other ICTs in use included database software, on-line booking systems, mobile telephones, and VPNs (Virtual Private Networks) for after hours access.

The New Zealand Electronic Commerce study, (NZGEC 2004) revealed that the use and functionality of tourism related web sites are quite variable: about 79% of web sites provide generic promotions, 71% have links to alliance partners, 72% receive customer orders, 38% provide secure transactions, and 28% receive payments on-line. The majority of TA responding to our survey stated that they used the internet for

researching travel destinations (84.4%) followed by e-mail (78.9%), on-line bookings (72.5%), and financial transactions (57.8%). In response to a question asking them to rank the importance of different internet functions for their businesses on a 5-point scale, 82% of respondents identified e-mail as very important for their businesses and the mean response value for this usage was 4.85. Researching destinations, on-line bookings and financial transactions were also identified as important, with mean response values of 3.91, 3.62, 3.33 respectively.

Respondents were also asked to state the main reason for having a web site. Around 57% of respondents answered that they have a web sites for promotion, marketing and information purposes; 12.4% have a web site as a part of their franchise or chain; and 5% use their web site to contact their customers. Only 3.4% used their web sites for on-line selling and booking. About 17% of respondents don't have a web site. Nearly two-thirds of respondents (65%) indicated that their web sites had been designed by ICT professionals, while 12% stated that they used a franchise web site. Only 5.5% of respondents indicated that it was a mutual effort of ICT professionals and tourism business specialists.

Taylor & Murphy (2004) have identified several stages in ICT adoption by small businesses, starting with simple adoption of e-mail as a tool for internal and external communication. Stage two is the adoption of a web site that opens a window to a broader global set of opportunities. Stage three involves the adoption of e-commerce with an ability to order and make payments on-line and increased accessibility and speed. E-business is the next step with improved integration of the supply chain and enhanced linkage into tourism distribution channels. In the final stage of this model, small businesses become 'transformed' organisations with open systems providing information for customers, suppliers and partners (Millan & Esteban, 2004). Following this classification, ICT adoption by New Zealand TAs can currently be categorised as being in the first or second stage.

Only 22% of participants in the national on-line survey answered that they are going to invest in new ICT. Four respondents stated that they did not know what ICT is, though the questionnaire gave an explicit explanation of the term. Obviously, some participants did not perceive that investment in ICT would give them an advantage.

In the present study, respondents were asked to rate on a 5-point scale their attitude towards ICT as a basis for a sustainable competitive advantage (ICT as a strategic tool): 44% answered that they were neither agreed nor disagreed about the statement. The mean response value was 3.45, which indicates that central tendency was from "neither agreed nor disagreed" to "agree". Similarly, respondents were asked to rate on the same scale the statement that "TAs should develop computer search skills": 51% agreed with the statement, with a mean response value of 4.0.

3.4 Associations between variables

Cross tabulation was performed to check the associations between different variables. The aim of this analysis was to identify how business performance, attitudes towards ICT and relationships with customers depend on firm's size, ownership (franchises/chains vs independent), "age" of the business, targeting specific market and business location. Cross tabulation revealed that for New Zealand TAs, only business location (urban vs rural) gives a strong association ($p<0.05$) between firm's performance, attitude towards ICT and relationship with customers. Business locations were coded as shown below, with definitions of urban, town and rural based on those used in standard statistical analyses of New Zealand (Kirkpatrick, 1999):

- "Auckland versus Other Cities (Wellington, Christchurch, Hamilton) vs Towns" (37%, 22%, 41% respectively)
- "Urban (Auckland, Wellington, Christchurch, Hamilton) vs Rural" (59% vs. 41%)

Chi-square tests of association between "business location" and other variables were performed. The location of TAs was found to have a strong association ($p<0.05$) with the following themes:

- How does your business situation compare with the situation 3 years ago?
- Is ICT a strategic tool?
- How has the customer changed?
- What are the major factors impacting TA businesses?
- Are you going to invest in new ICT?
- What do you think your business advantages are compared with competitors?
- Are you targeting a specific market?

Auckland TAs and other urban TAs (combined) generally rated their business prospects better, or much better, than three years ago (59.6% of respondents) and only 5.3% considered that they were worse. In comparison, 29.7% of non-urbanTAs considered that their business prospects were worse, 32% were neither worse nor better, and 37.8% considered that their businesses were better or much better ($p < 0.05$).

Auckland TA businesses tend to be ahead of their colleagues from other cities in their perception of ICT as a strategic tool. Approximately 56% of Auckland TAs considered that ICT is the basis for a sustained competitive advantage for TA, as compared with 50% of TAs in other cities and 32.1% in towns. They were also more inclined to think that their customers are better informed and have greater awareness of travel products and services: 69.2% of respondents versus 34.5% in towns and 46.2% in other cities. At the same time, however, 48.5% of town TAs believed that customers have become more internet literate as compared with 23.1% of TAs in Auckland and 7.7% in other cities (two-sided asymptotic significance < 0.1) This could be explained by the fact that rural populations are now getting the internet access that urban areas have had some time.

In terms of the major pressure factors, there was a significant difference between urban and rural TAs with regard to use of the internet by consumers. Only 8.6% of urban, but 42.5% of rural TAs, considered that use of the internet by consumers has a "major impact" on their businesses. The sum of "major impact" and "considerable impact" categories for urban areas was 40.4% as compared with 60% in rural areas ($p < 0.05$). Auckland TAs in particular perceived ICT as a strategic tool and their attitude towards ICT is more positive than their colleagues in other cities and towns. Furthermore, they perceived customer use of the internet as less of a concern. TAs in Auckland were more likely to feel that customers are more sophisticated and more informed regarding travel products.

Although TAs from rural areas considered that use of the internet by consumers has a significant impact on their businesses, they still were less prepared to invest in ICT than their urban counterparts: 15.4% of respondents from rural areas answered that they were going to invest in new technologies versus 46.5% in urban areas ($p = 0.009$). Answers to the question about what TAs consider their business advantages compared to their competitors were analysed for association with location. The "customer service-related" category appeared in 64.7% of answers from Auckland and 59.5% from towns but only in 33.3% of responses from other cities (two-sided asymptotic significance < 0.09).

There was also an interesting difference between Auckland and other cities regarding targeting specific markets (for instance, niche market of ethnic groups). The majority of Auckland respondents (>80%) agreed that they were targeting a niche market, but TAs in other cities were less likely to do so. In this regard, rural TAs were closer to Auckland TAs – more than 50% agreed that they were targeting a specific market. Only 40.9% in other cities answered positively to the same question, $p = 0.01$ (see Table 1).

Table 1. ICT adoption and perception: spatial differences.

	Auckland area	Other cities	Rural
ICT adoption	CRS, GDS, e-mail, internet, web site, early adoption	Are going to invest in ICT; >70% have web sites	CRS, GDS Are not going to invest in ICT; >90% have web sites
ICT perception	Enabling, competitive advantage, strategic tool	Enabling/pressure factor, competitive advantage, not a strategic tool	Pressure factor, not a strategic tool and not a competitive advantage
Market	High-yield	No specific market	Specific (niche) market
Product	Air fare, personalised services	Not specified	Not specified
Perception of the consumer as a pressure factor	More informed, more demanding, not a threat, not a pressure factor	No different, not internet-orientated, not a threat	More informed, more demanding, a threat, a major pressure factor
Customer service	Customer-centred	Not specified	The customer service is not an advantage
Business situation	Better or much better (combined for the urban area)	Better or much better (combined for the urban area)	Neither better nor worse

4 Conclusions

The introduction of the internet has opened new possibilities for travel agents. However, the internet is not just available to TAs. The internet is also available for principals as a tool for direct product marketing and also to their customers as an information search tool and as a tool for booking and even purchasing of tourism product on-line. This inevitably results in disintermediation (or rather, partial disintermediation) and strong pressure on TA businesses. It is argued that to survive TA have to embrace the ICT and incorporate it in their strategy to sustain competitive advantage (Bogdanovych, 2006, O'Brian, 1998).

The presented study shows that major pressure factors identified by New Zealand travel agents are commission cuts by airlines, more informed consumers, suppliers selling on-line, and the rise of the internet in general. Most feel their competitive advantage lies in customer-orientated services. The study has shown that not all New Zealand TAs are using technology to maximise their competitive advantages. It was found that TAs mainly use the internet for researching travel destinations and for e-mailing. The main reason for having a web site was stated to be promotion and marketing, and there was no mention of specific software either for managing customer relationships or for helping in searching. Only 5.5% of respondents to the on-line survey indicated that their web site was designed by both computer and tourism specialists, and most appeared more interested in a web presence than in web site functionality. According to the literature on this subject, this suggests that New Zealand TAs are in the very early stages of ICT adoption.

A notable finding of the study was the marked heterogeneity of New Zealand TAs in terms of pressure factors on their businesses, attitudes towards technology, relationships with consumers, and business successes. Major differences exist between TAs located in Auckland, other major cities, and in small towns. Auckland TAs exhibit very distinctive features: they adopt ICT at earlier stages and perceive ICT as a strategic tool that will give the advantages to their businesses. They also are more prepared to invest in ICT. As a result of early ICT adoption, Auckland TAs do not perceive the emergence of the "internet savvy" consumer as having an important impact on their businesses, unlike TAs in other cities and rural TAs. Another distinctive feature of Auckland TAs is consumer orientation. They realise that consumers are changing – they are better informed, have greater awareness of travel products and services, and are more internet literate. Auckland TAs indicated that their main survival strategy is consumer orientation and they are also more niche market orientated.

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The Impact of WiMAX on Tourist Destinations

Dimitrios Buhalis [a]
Luca Pistidda [a]

[a] International Centre for Tourism and Hospitality Research (ICTHR),
School of Services Management, Bournemouth University
dbuhalis@bournemouth.ac.uk and lpistidda@bournemouth.ac.uk

Abstract

The rapid advancements in Information and Communication Technologies (ICTs) that have taken place over the last 20 years have had a tremendous impact on the travel and tourism industry. The wireless revolution experienced in the marketplace is predicted to further revolutionise the industry. This study examines the possible influence of new wireless technologies, such as WiMAX, and their implications for location-based services, on tourist destinations. WiMAX stands for Worldwide Interoperability for Microwave Access and offers long range wireless Internet connectivity. From the undertaken survey, it emerges that tourism and technology firms perceive WiMAX as a great tool for promotion and information provision. They estimate that WiMAX will support location-based applications and will offer effective mechanisms for communicating with travellers. Technical factors such as standards, user-friendliness of the system, and the quality of information provided to customers, are perceived to be the main success factors for the implementation and delivery of these applications.

Keywords: WiMAX, Destinations, Location-Based Services.

1 Introduction

Wireless technologies are gradually coming to the core of tourism suppliers' strategies, as tools to enhance their competitiveness by maximising productivity and saving costs. Airlines and accommodation providers, for instance, already make use of wireless technologies (Buhalis, 2003) to improve their operational efficiency, to provide new services to customers, and to find new, effective, distribution channels (Buhalis & Flouri, 2004). Location-based services have also been provided by some cellular phone networks, although they still have to get off the ground in a tourism context. Travellers are getting increasingly sophisticated, and they are continuously developing new needs. New wireless technologies and applications such as WiMAX and location-based services are emerging and can offer innovative tools to meet these needs.

The purpose of this paper is to identify possible applications of WiMAX in tourism, to explore the possible impact of the WiMAX technology on tourist destinations, and specifically the provision of location-based applications based on the WiMAX infrastructure. The research objectives therefore include the exploration of WiMAX concept as well as the identifications of suitable applications for tourism. The research also aims to identify suitable Location Based Services and to investigate what the impact of WiMAX will be for destination regions.

2 Background

2.1 Tourism destinations and ICTs

A tourism destination can be defined as *"a location that travellers choose to visit and where they spend time, no matter what their motivations, needs and expectations. [...] It can be as small as a single building or as large as an entire continent"* (Howell, 1993, p.192). Managing destinations is a challenging task, as a multitude of stakeholders with different values and needs competing for finite resources, are often involved (Buhalis & Costa, 2006). A stakeholder may be defined as "any person, group or organization that is affected by the causes or consequences of an issue" (Bryson and Crosby, 1992, p. 65). Key stakeholders involved in destination management may include national, provincial or regional governments, tourist providers such as accommodation, transport, or attraction providers, local communities, environmental groups and so on. Increasingly, destinations are placing ICTs at the core of their strategies for destination management and marketing. ICTs have largely influenced the daily operations of DMOs (Destination Management Organizations). Not only have they empowered their internal coordination, marketing and promotion, but they have also propelled the process of disintermediation through the operation of destination portals which allowed direct communication between tourist providers and customers (E-Business W@tch, 2006). DMSs (Destination Management Systems) have been developed by destinations, as new effective distribution channels (Buhalis, 1997). Naturally wireless technologies offer a range of opportunities for DMOs to explore effective ways of promoting and managing their regions. Wireless technologies include both cellular technologies based on mobile telephone systems that use radio waves to provide coverage in certain geographic areas (or cells) and wireless computer networks.

2.2 Cellular technologies

Cellular technologies are distinguished between two different standards around the globe (Laudon & Laudon, 2006): GSM (Global System for Mobile Communication), which is the standard commonly used in Europe and much of the rest of the world, and the CDMA (Code Division Multiple Access), the most widely used standard in the United States. Mobile networks and services may be divided into three different generations (Bannister, Mather & Coope, 2004):

- First generation (1G): this category includes the first analogue mobile systems that appeared in the 80s, like the AMPS (Advanced Mobile Phone System) and NMT (Nordic Mobile Telephony)
- Second generation (2G): introduced in the late 80s, this generation marked the shift towards a digital solution, allowing the transmission of non-voice data services
- Third generation (3G): this generation combines the developments in cellular technologies with developments in fixed-line networks and the Internet, thus providing a much more comprehensive network, flexible enough to provide and support access to voice, data and video services regardless of location.

2.3 Wireless computer networks

Wireless broadband technologies can provide ubiquitous broadband access to wireless users, offering the same services made available for wired users (Kuran & Tugcu, 2007). There are numerous types of wireless computer networks including:

- **WPANs (Wireless Personal Area Networks)**. A WPAN may be defined as "a network of wireless devices that are located within a short distance of each other, typically 3-10 meters" (Salkintzis & Passas, 2005, p. 169). The adoption of Bluetooth - the popular name referring to the IEEE 802.15 wireless networking standard - gives the ability to link up to eight devices within a range of 10 meters
- **WLANs (Wireless Local Area Networks)**. WLANs (Wireless Local Area Networks) are computer networks which allow a user to have access to Internet connectivity without the need for a wired infrastructure. For wireless LANs, the IEEE set of standards developed is the 802.11 family, which is also known as Wi-Fi, an acronym which stands for Wireless Fidelity (Laudon & Laudon, 2006)
- **WMANs (Wireless Metropolitan Area Networks)**. WMANs (Wireless Metropolitan Area Networks) cover areas as large as entire cities by integrating large numbers of WLANs (Kuran & Tugcu, 2007)
- **WWANs (Wireless Wide Area Networks)**. WWANs give users the opportunity to have access to Internet connectivity around a town/city or a broader area such as a country (Minoli, 2003). They can interconnect different WMANs, thus offering ubiquitous connectivity to mobile users (Kuran & Tugcu, 2007)

2.4 WiMAX

WiMAX, which stands for Worldwide Interoperability for Microwave Access, seems to represent the future of wireless communications. WiMAX is expected to offer the highest possible coverage, up to 30 miles (Odinma, Oborkale & Kah, 2007). WiMAX will gradually be employed and made available for the mass market,for positioning systems and location-based applications (Alcatel, 2005). The technology is predicted to have its largest impact in areas such as developed countries or rural, remote locations characterised by low population density in which an adequate wired infrastructure has not been developed or cannot be developed for economical reasons (WiMAX Forum, 2004). WiMAX is cheaper, simpler, smaller and more convenient to install and to use than both fixed broadband and Wi-Fi making it a really "disruptive" technology for some of the existing providers such as telephone companies (Ohrtman, 2005). This is because WiMAX can be used for carrying intensive data applications like Voice over Internet Protocol (VoiP) (Techworld, 2007). Table 1 summarises the features of the most advanced, broadband wireless existing and emerging technologies. It is evident that WiMAX will be competing with advanced 3G and 4G technologies in the near future.

Table 1: Comparison of wireless broadband technologies

	Designed	Implemented	Throughput	Frequency	Usage	Coverage
Wi-Fi	1997	2002	<= 54 Mbps	2.4 & 5 GHz	WLAN	<= 300 ft
Wi MAX	2002	2006	<= 75 Mbps	2 & 11 GHz	WMAN	<= 30 miles
3G / 3.xG *	1990/ 2001	2002/ 2005	>= 2 Mbps	900, 1800, 1900, and 2100 MHz	WWAN	Up to 6 miles
4G	2000	2010	<= 200 Mbps	2 – 8 GHz	WWAN	>= 30 miles

* 3.xG = 3G enhancements
Source: adapted from Odinma, Oborkale, and Kah (2007)

2.5 Location-based services

LBSs (Location-Based Services) are services delivered to consumers, customised according to their specific location. A number of studies have identified a range of possible LBS applications in tourism, such as source of information in protected areas like National Parks (Krug, Abderhalden & Haller, 2003); mobile tourist guides (Umlauft, Pospischil, Niklfeld & Michlmayr, 2003; Schmidt-Belz, Laamanen, Poslad & Zipf, 2003); and location-aware multimedia guides in museums (Alfaro, Nardon, Pianesi, Stock & Zancanaro, 2005). Consumers gradually realise the added benefits provided by systems which offer location-based services, as compared to more traditional information sources (Schmidt-Belz et al., 2003) and are generally willing to pay in order to benefit from this kind of services. This is particularly the case as their familiarity with the visited destination decreases (Edwards et al., 2006). Social implications of LBSs may include issues of security and privacy; the commoditisation of location-based information and the possible desire of users to guard against intrusion or the possibility of not being aware of location information being disclosed to others (Hawking et al., 2005). Location-based services based on a Wi-Fi or 3G infrastructure have already been developed in a limited scale. Due to the short access range of WiFi and the expensive data connectivity costs of 3G, these are still in their infancy. However, the fast pace of development in ICTs suggests that once WiMAX is widespread it could be deployed as a platform for delivering location-aware services. Covering a large geographical area and offering seamless connectivity will be critical for supporting such applications.

3 Methodology

To meet the objectives of this study, both secondary and primary data were collected. Secondary data were collected from a number of sources: textbooks, journal articles, conference papers, white papers, technical articles from various organizations and online articles from a range of different websites. Other documents were collected from secondary sources including conference papers, 'white papers' produced by equipment vendors such as Alvarion (www.alvarion.com), or chipmakers like Fujitsu (www.fujitsu.com). Reports from organizations such as the World Tourism Organization (www.world-tourism.org), the E-Business Watch (www.ebusiness-

watch.org) or the WiMAX Forum (www.wimaxforum.org) were also used. Finally online articles were collected from a range of different websites and wireless Internet Service Providers such as the Thames Online (www.thamesonline.com), from broadcasters such as USA Today (www.usatoday.com) or from organizations such as the WiMAX Spectrum Owners Alliance (www.wisoa.com).

Primary data were also collected over the months of June-July 2007. As no specific study has ever been carried out on WiMAX and its impact on tourist destinations, an exploratory, qualitative research methodology was adopted. A case study approach was initially adopted to explore the use of WiMAX or extensive WiFi networks in tourist destinations. The Brighton Metranet was thus selected as an example of a successful Wireless Metropolitan Area Network. In addition, the researchers aimed to capture the knowledge of key stakeholders and to explore potential opportunities for WiMAX applications in destinations. A number of key stakeholders were selected through a non-probability, purposive judgmental sampling design. Three main categories of respondents were targeted, namely: academics, professionals from technology firms, and professionals coming from other backgrounds, such as tourism or business consultancy. A mail questionnaire was used to collect the data needed and using a set of predetermined, open questions about WiMAX, LBS and their applications. The questionnaire structure also included two questions formulated in a closed format. The first 3 questionnaires administered were effectively treated as a pilot to pre-test the survey instrument. The questionnaire structure was found to be appropriate for the research purpose. In order to reach an adequate number of respondents it was decided to administer the questionnaire electronically. An invitation letter with the questionnaire structure attached was emailed to ICT and tourism professionals from participants to the Wireless Event held in London on 23-24 May 200; members of the ETC (European Travel Commission) New Media Group (www.etc-corporate.org); members of the IFITT (International Federation for IT and Travel & Tourism) and members of TRINET (Tourism Research Information Network). The questionnaire was also posted on the blog of Travolution, an organization which provides news for the online travel market (www.travolution.co.uk).

The invitation letter offered the possibility to choose how to complete the questionnaire: personal interview, over the phone or by e-mail. Although the vast majority of the respondents replied to the questionnaire by email, two respondents preferred a telephone interview. Overall, 16 questionnaires were completed, 14 of them administered by email, and 2 carried out over the phone. 11 respondents came from an academic background; 3 had a business or tourism consultancy background, and 2 came from a technical background. The method selected to analyse the data collected was content analysis (Patton, 2002). The technique adopted to carry the content analysis on the data collected involved three main steps: first of all, 'words' were chosen as sampling units to be classified; secondly, words with similar meanings or connotations were grouped under relevant categories; thirdly, the number of times categories recurred in the texts were counted. This way, it was possible to obtain a number of core meanings or patterns.

4 Analysis of findings

The findings from the analysis of the Brighton Metranet case study, the wireless network implemented by the City of Brighton, as well as the analysis of the primary data collected are illustrated within two main thematic areas:

1. Planning and developing WiMAX based LBS
2. Destination marketing and promotion

4.1 Case Study: Brighton Metranet

The City of Brighton was one of the first regions in Europe to implement a Wireless Metropolitan Area Network throughout 90% of the City. The project aimed to connect council offices, schools and universities. The project is the result of the collaborative efforts of the Brighton & Hove City Council, the University of Sussex and Metranet Communications, a wireless Internet service provider which operates in the City of Brighton & Hove. The Brighton & Hove's Council took the lead for the realisation of the project and approached a local Wi-Fi provider, running free hotspots in local bars. The Council proposed the idea of a "Metranet", sort of "Metropolitan Intranet" (http://www.metranet.co.uk/), a wireless broadband network throughout the City. The technology chosen for the realization of this project was WiMAX, as it was deemed to outperform Wi-Fi in terms of coverage range, capacity and speed of data transmission. A company named Metranet Communication was then set up by Loose Connection to work with the Council of Brighton. The network carries therefore public sector, commercial and educational traffic. Apart from the delivery of data to schools and staff of the Council, other applications supported by the Metranet network included services such as VoIP, or delivering data to social workers, doctors and traffic wardens, as well as alarm systems for the elderly and city-wide translation services. The potential offered by the new technology for the tourism industry of a destination such as Brighton is clearly enormous, although it is still not fully explored.

4.2 Planning and developing WiMAX based LBS

Planning includes a very wide range of issues concerning the aspects that include both technical and business aspects related to:

- Spread and commercialization of WiMAX
- Importance of WiMAX for location-based applications
- Stakeholders of WiMAX location-based applications
- Critical success factors for WiMAX location-based applications
- Possible differences between Wi-Fi and WiMAX location-based applications
- Possible business models for WiMAX location-based applications

Respondents welcomed the great opportunities that WiMAX offers and were optimistic about the provision of an infrastructure that will offer always-on

connectivity. They recognised that WiMAX, as a broadband wireless technology needs to be rolled out and get diffused before WiMAX-empowered location-based applications can be developed and delivered. The large majority of respondents agreed on the fact that WiMAX will be widespread. Only one respondent argues that WiMAX might end up in just one of the many half-standards developed so far. The most likely period of time when a fully developed WiMAX is expected to be operational at a global level is from the next 5 years (38% of respondents) to 10 years (20% of respondents). However, mobile WiMAX is expected to be widespread at a later stage than the fixed WiMAX, within 5 years for the former, as against 2-3 years for the latter.

With regards to the commercialisation of WiMAX, the two main predictions, in percentage terms (26% for both), concern seeing this happen in either 2-3, or 8-10 years' time. Thus, it might be argued that a reasonable prediction could lie in the middle, as indicated by the third group of respondents (12%) that sees the commercialisation of WiMAX starting in 5 years time. Much is expected to depend on telephone companies and their ability to block third-party development of WiMAX. The new technology is in fact bound to face fierce competition from mobile phone networks. This is because it directly threatens both their voice and data traffic while it competes directly with their 3G offering, on which they have spent millions of Euros to build and acquire licences to operate. This is the reason why WiMAX is mainly backed by giants of the computer industry, such as Intel, Motorola or Fujitsu, who aspire to break into wireless technology (Economist.com, 2007). Nonetheless, as explained by one respondent, the experience of Metranet, which has been referred to in the case study, suggests that WiMAX can already be commercially viable, even without any external funding.

Table 2: Stakeholders for WiMAX location-based applications

Main stakeholders		Stakeholders who should take the lead	
Private sector	51%	Private sector	28%
Public sector	34%	Public sector	24%
Other	12%	Public-private partnership	18%
		Other	30%

WiMAX is expected to contribute significantly to the development of location-based applications (Alcatel, 2002). This is confirmed by respondents' answers. Most tourism related respondents could identify a wide range of applications and scenarios that could be supported by WiMAX and were optimistic that this technology will further support opportunities for destination marketing. Cost of use, content, quality and safety are factors which might be decisive for the use of WiMAX for location-based applications. In addition, several respondents identified that it is critical for both the private and public sector to come together to develop suitable products and services to be delivered. An understanding of who might be the main stakeholder involved in the development and delivery of WiMAX location-based applications is important at this stage. Table 2 demonstrates who the respondents thought that should be the main and the leading stakeholder in WiMAX at the destination.

The private sector is perceived to be the main stakeholder involved (51% of respondents) in the development and delivery of WiMAX location-based applications. Private sector stakeholders may be divided into two different sub-groups: technology and tourism/hospitality related organizations. The first group includes those organizations that operate in the technology area, such as information development companies and mobile network operators. Chipmakers such as Intel, and vendors such as Alvarion, who have been early players and are still strong players in the marketplace, are perceived to be among the main stakeholders. The other group of stakeholders, being part of the private sector, includes those firms that operate in the tourism/hospitality sector, such as accommodation providers, incoming travel agencies or tour operators. The public sector, including stakeholders such as local governments (especially tourism or environment related), conservation authorities and tourist offices/National Tourism Organisations and Destination Management Organisations, is regarded as the second most important stakeholder (34% of respondents). The respondents perceive that providing location-based services on the WiMAX would be the natural progression of tourism marketing for destination organisations. Therefore it is evident that DMO run Tourism Information Centres (TICs) will be able to offer customisable advice on the location and a 24/7 basis.

However, respondents appreciated that the public sector often lacks the initiative to take the lead in technological developments. Equally, respondents regard the private sector as the key stakeholder that should take the lead in the implementation and provision of WiMAX location-based applications.. The private sector, according to the respondents' views, should be the project leader. However, as shown in Table 2, the difference between the first two percentages is minimal (28% against 24%). This means that both the private and public sector's roles are regarded as central and critical for the success of the project. The preference for the private sector is mainly due to the traditional slowness and relative inefficiency of the public sector, in undertaking new studies and projects. This is particular the case in technology where a number of respondents identified inefficient Destination Management Systems projects that failed to deliver what they originally promised despite going over budget. However the private sector may be reluctant to provide any kind of initial investment, as it can expect little return on investment. In addition, if the private sector invests heavily, it would seek to promote only lucrative products and services rather than the entire destination. This may exclude smaller companies or regions/destinations that cannot afford the investment.

A number of critical success factors emerged from the respondents' views regarding the implementation and delivery of WiMAX location-based services as indicated in Table 3. Technical factors (34%), such as user-friendliness of the software, or security and reliability of the system, are perceived to be the most important ones. In addition, the cost of the service (23%) and quality of information/content (19%) were also regarded as significant success factors. With regards to the differences between WiFi and WiMAX, the majority of respondents (32%) identified the wider range as the main characteristic which could make the difference between Wi-Fi and WiMAX

location-based applications. However, a very similar percentage of respondents (31%) felt that there will not be any real difference between the two applications, while a 25% of the respondents stated that they did not have any idea on this issue.

Table 3: Main results – Critical success factors for WiMAX and differences between Wi-Fi and WiMAX location-based applications

WiMAX Critical success factors		Wi-Fi vs. WiMAX location-based applications	
Technical factors (system user-friendliness, reliability etc.)	34%	Wider range for WiMAX location-based applications	32%
Cost of the service	23%	No real difference	31%
Quality of content	19%	No idea	25%
Other	24%	Other	12%

With regards to business modelling, there is a wider understanding that in order for WiMAX location based services to be successful there must be a robust business model. Respondents suggested that finding a suitable business model for WiMAX location-based application is not easy, as the technology is still in its infancy and the potential for it still has to be explored. That is why the majority of respondents were unable to suggest a possible business model. However, although previous research proves that customers seem to be willing to pay for location-based services, 26% of the respondents think that providers should offer WiMAX location-based applications at no or very low cost, generating revenues in other ways such as through advertising.

4.3 Destination marketing and promotion

Marketing and promotion are important components of destination management and WiMAX is expected to change those dramatically. Table 4 illustrates that respondents agreed that providing information to tourists is expected to be the main WiMAX location-based application in tourist destinations. This was mentioned by 59% of the respondents and they felt that information delivered through this channel can be immediate, relevant and up-to-date. Respondents suggested that M-commerce is another application which is going to emerge, as an opportunity for tourist destinations (17%). Tourist suppliers are expected to take great advantage of WiMAX to deliver commercial services and sell their products and services. On the other hand, tourists will be able, by accessing electronic commerce on their hand-held devices, to buy products and services on the spot, such as buying tickets or paying for parking.

Both business and leisure travellers will benefit from WiMAX location-based applications, to the same extent, according to respondents (82%). They all need information, although different kinds of information. Hence, informational effectiveness (28%) is the main benefit expected for destinations followed by promotional effectiveness (21%). Although destinations deliver information through both traditional (such as TICs) and new channels (electronic), a likely scenario is that TICs could become hubs for electronic communication and transactions, where visitors might be able to access information electronically. Promotional effectiveness (21%) represents the ability of tourists to purchase products and services. Information

about tourism demand and profile may also be obtained more easily, thus supporting marketing and customer relationship management. Moreover, promotion can be greatly enhanced by the increased opportunity to tap into tourists' virtual networks. Respondents also suggested that WiMAX can support product innovation and enhance the tourist experience (14%). This could lead to visitors staying longer, as they might have the opportunity to mix business and leisure and gain more interest in a destination. The enhancement of visitors' satisfaction may also lead to repeating visits and recommendations to friends and relatives. As a result, economic benefits are expected for local communities by virtue of the increased opportunities deriving from wireless commerce (14%) whilst cooperation and collaboration among different stakeholders will be enhanvced through access to the networks (14%). Educational effectiveness, by enhancing preservation of cultural and natural sites through the educational tools available on wireless, was also mentioned (7%). Finally search and rescue (3%) was identified as a benefit of the WiMAX infrastructure for destinations where the risk of having missing people is quite high, as they can locate the user, thus making it possible for emergency services to be put into action.

Table 4: Main WiMAX location-based applications and benefits

Main WiMAX location-based applications at destinations		**Main benefits from WiMAX location-based applications**	
Information source	59%	Informational effectiveness	28%
M-commerce	17%	Promotional effectiveness	21%
Social networking/ Discussion forums	8%	Product innovation/Enhanced tourist experience	14%
Other	16%	Enhanced cooperation between stakeholders	14%
		Economic benefits	14%
		Educational effectiveness through enhanced preservation	7%
		Search and rescue	3%
		Other	23%

5 Conclusions

WiMAX is gradually emerging as a major communication infrastructure. The successful experience of Metranet in Brighton suggests that destinations should already start considering including the technology in their strategic and tactical operations. Once the infrastructure is in place, a number of WiMAX solutions can be developed offering location-based applications that will support tourism organisations and destinations to promote and sell their products locally. For the successful implementation and delivery of WiMAX location-based applications, a large partnership involving key stakeholders from both the public and the private sector is essential. Ideally, the public sector should act as the coordinator and ensure the necessary support for the initial investment to the project and also act as a catalyst for ensuring that the service is inclusive and according to the destination marketing strategy, as well as promoting synergies between all players involved. The case study

of Brighton Metranet shows that governments, provided that they realize the potential offered by the technology and give strong economic and regulatory support, can successfully act as leaders in the implementation of these projects.

Equally, the private sector should play a critical role and should ensure that the service is innovative, competitive and relevant to consumer needs. Stakeholders with apparently conflicting interests, such as chipmakers and vendors on the one side, and mobile network operators on the other side, should work together, in collaboration with destination managers in order to set up destination-wide networks and services. Costs for investments should be shared between all stakeholders. The increased speed and capacity of data transmission make WiMAX ideal for delivering high-quality, location-based information, timely and relevant to the end-user. High-quality, customer-centred content is the value added that should be offered to customers. Some form of subscription might be offered to customers for the use of these services. However, WiMAX services should provide real value for users and should be provided at low or no cost at all, while revenues could come from suppliers' commissions and revenue sharing or advertising. A kind of trade-off might be arranged between suppliers and customers, such as the provision of free services, especially to low-medium income users, against the delivery of advertising messages. Of paramount importance will be promotion of the technology in order to accelerate its uptake by consumers. Perhaps, a larger effort may be spent on promoting the new technology and applications among business travellers at the beginning, as they are in fact expected to make larger use, initially at least, of the new applications and technologies. It is already evident that WiMAX will challenge a number of industries and tourism will be one of those. Innovative destinations that formulate dynamic value chains to deliver value added at the local level will be able to maximise their benefits and strengthen their competitiveness.

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Designing Interactions in Tourism Mediascape – Identification of Patterns for Mobile 2.0 Platform

Iis P. Tussyadiah[a],
Daniel R. Fesenmaier[a,b], and
Youngjin Yoo[b]

[a] National Laboratory for Tourism & *e*Commerce, School of Tourism & Hospitality Management
[b] Department of Management Information System, Fox School of Business
Temple University, USA
{iist,drfez,youngjin.yoo}@temple.edu

Abstract

This study uses pattern language theory in order to identify patterns of tourists' interactions within their social networks while they are experiencing tourism destinations. The patterns were conceptualized from sequences of tourists' stories and observers' field notes through narrative analysis. The identified patterns were then organized into a typical scenario of tourism experiences. The Mobile 2.0 platform is then characterized as an interactive mediascape that mediates tourists *in situ*.

Keywords: tourism experience; technology-assisted mediator; mediascape; mobile 2.0; pattern language.

1 Introduction

People around the world exhibit an unprecedented degree of attachment to mobile phones. The device is virtually ubiquitous in the urban life, making it the one of the most personal technology artefacts of our times. As people are increasingly mobile driven by both work and leisure-related purposes, the use of mobile phones by travellers on the move are increasingly important to explore. Recent research shows that people often use computer and mobile mediated communications to replace social groups with social networks (Sproull & Faraj 1995). The new mobile media enables people to enact and experience differentiated segments of networks within different settings. When a tourist uses a mobile phone while touring a foreign destination, for example, she can experience the mobile-mediated interactions with a selected network of remote others while simultaneously experiencing the physical landscape and socioscape of the destination. Furthermore, the emergence of new collaborative media generally described as "Web 2.0" is being rapidly integrated with various types of mobile devices, changing the way tourists retrieve, communicate, and share information with others while on the move.

Recently, there has been a considerable discussion of "Mobile 2.0" within the travel industry. However, the conceptual and practical foundation of the applications using

Mobile 2.0 technologies has not been widely explored. Adjusting the existing Web 2.0 sites to fit mobile phone screens, however, is not sufficient for creating a Mobile 2.0 platform. As an illustration, reading a lengthy blog or consumer review on a mobile phone is highly inconvenient for tourists *in situ*. This leads to a design problem in Mobile 2.0 development. This study attempts to provide a better understanding of tourists' mobile-mediated interactions while they are on tour in order to gain new insights for designing potential applications.

2 Theoretical Foundation

2.1 Mediation of Tourist Experience

It is argued that tourism experiences are becoming increasingly mediated (Jansson, 2002; Jennings & Weiler, 2005; Beeton, Bowen, & Almeida Santos, 2005). According to Jansson (2002), tourism becomes more mediated as it becomes more organized. Jennings and Weiler (2005) argue that tourists often engage with others, i.e., personal and non-personal elements, who and which serve to mediate their tourism experiences in the process of constructing their knowledge. Among personal mediators are tourists (i.e., who help mediate other tourists), service providers, governments, and local communities; non-personal mediators include signage, street furniture, design, and settings. Thus, personal and non-personal elements, the *mediators*, establish an essential framework for creating and delivering quality tourism experiences.

Today, there has been a growing interest in the development of technology-based mediators including the Internet, mobile phones, and digital cameras. These technologies enable people to use a variety of multimedia features that enhance their tourism experiences not only at the experiential phase (i.e., on-site), but also at the anticipatory (i.e., planning) and the reflective (i.e., recollection) phases (Tussyadiah, 2007). Recently, the emergence of consumer-generated media (CGM) has created several mediation mechanisms enabling tourists to share their experiences with others while they are experiencing on-site activities, thereby accelerating and enriching the mediation process.

2.2 Conceptualizing Mobile 2.0

The term "Mobile 2.0" in this paper refers to the Web 2.0 platform in a mobile device. Many people still argue about the exact definition of Web 2.0. However, it is often referred to as *the participatory web* and associated with CGM. Below is an attempt to define the term:

> "Web 2.0 is the network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources,

> including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an "architecture of participation," and going beyond the page metaphor of Web 1.0 to deliver rich user experiences." (Tim O'Reilly, *radar.oreilly.com* [August 28, 2007])

Following O'Reilly's definition, the most important aspect of the Mobile 2.0 platform is its participatory architecture, which enables users to easily add contents and participate in the online community. Another important aspect of Web 2.0 is its ability to *associate* different contents through tagging in much the same way human actors form social networks. The result is a computing platform that supports the emergence of dynamic and complex contents based on dynamic associations among various elements of CGM. Therefore, it is argued that the Mobile 2.0 platform can enhance the mediation process as tourists on the move can share their gained knowledge instantly to help mediate others tourists who travel at the same time but in different places (i.e., space gap), or who travel to the same place at different times (i.e., time gap).

2.3 Pattern Language

The concept of Pattern Language was introduced by Christopher Alexander in his book on architecture design patterns (see Alexander et al, 1977). A single pattern is a textual entity which describes an invariant solution to a problem within a context (Dearden & Finlay, 2006; Kotzé et al, 2006). Patterns can be connected with other patterns in order to establish a hierarchy of patterns. The term "pattern language" is comparable to human natural language, and is used to describe the network of multiple interconnected patterns as a constructive guide through an entire design process. Pattern language, then, can be described as a collection of patterns that can solve all the problems in a particular domain (Casaday, 1997). Dearden and Finlay (2006) and Kotzé et al (2006) describe the key characteristics of patterns as follows:

- A pattern implies an artefact; patterns suggest a solution to a problem.
- A pattern includes its rationale.
- A pattern is grounded in a domain.
- A pattern is part of a pattern language; individual patterns are connected to other patterns so that the reader of the language can be guided to go through a series of related design decisions.
- A pattern bridges many different levels of abstraction, including descriptions and examples.

Alexander (1977) suggests the representation of patterns in a specific textual and typographical format which consists of the following elements:

- Name: A name for the pattern.
- Context: A context for the design problem.
- Forces: Forces which require resolution.
- Problem: A problem growing from the forces.
- Solution: A known solution, proven in practice.

van Welie and van der Veer (2003) posits that the long-term goal of pattern research is to put together the single pieces of puzzle in order to "unfold" the entire body of knowledge. Pattern theory has been used not only in architecture and urban design but more recently has been applied in the field of software engineering and human-computer interaction (Tidwell, 1999; Dearden, Finlay, Allgar, & McManus, 2002; van Welie & van der Veer, 2003; Smith, Stewart, & Turner, 2004). Tidwell (1999) argues that patterns "...provide design solutions that are concrete enough to immediately put into practice, with good results, and yet are sufficiently abstract to apply to countless situations" (p. n/a). This study analyzes tourist narrative patterns, which represent sequences of experience, with their contexts, problems, solutions, and connections with other patterns, to recognize the pattern language in order to design tourism mediascape with a Mobile 2.0 platform.

3 Methodology

3.1 Data Collection

This study utilizes a multi-method approach of data collection including interview, observation, time-interval survey, and questionnaires. The participants were tourists visiting Philadelphia who were 16-39 years of age. It was required that all participants are familiar with the basic features of a mobile phone and a digital camera. The participants were solicited through direct recruitment at the Independence Visitor Center, as well as indirect recruitment through announcements posted on different blogs related to the City of Philadelphia and *e*Newsletter sent out by the Greater Philadelphia Tourism Marketing Corporation (GPTMC) to potential travellers.

Participants were asked to use Nokia's N95 multimedia phone while they were touring downtown Philadelphia for several hours. The N95 device was used because it offers a variety of data services useful for tourist on-the-move including navigation services, internet browsing, high quality digital camera, 3G and Wi-Fi radios, in addition to other typical mobile services. The participants were encouraged to explore different features of the phone while touring and were required to do two general tasks: telling stories and capturing images. For the first task, the participants were asked to report their experiences every hour using the voice recorder feature on the phone. They were given a set of cards containing a list of questions as guidelines for them to describe their experiences. For the second task, they were asked to capture images that they perceive as representations of their experiences; they were also encouraged to share the captured images to their contacts and upload them for public viewing. ShoZu™ service was added onto the phones to enable the process of geotagging for all pictures taken by the participants. The pictures were then uploaded to Flickr™ website and each geotagged picture is located on a digital map of Philadelphia. Participants were also asked to provide descriptions for their uploaded pictures. For ethnographic studies, in addition to the tasks performed by the participants, observers were asked to prepare field notes based on their examination. To date, a total of 49 participants have completed the tour; 41 participated in the time-

interval survey, and eight tourists participated in the ethnographic study. The 49 participants were either individual or group travellers; only one member of a group was allowed to participate in the study. All participants were given a gift card worth $200 upon completion of the tasks.

3.2 Analysis Procedure

The time-interval survey and ethnographic study resulted in rich descriptions about tourists' activities related to time and space and their perceptions toward their own experiences, including the use of mobile phones. The descriptions from the sound files of tourists' reports were transcribed into textual documents. The contents of these documents and the observers' field notes were transformed into meaningful stories and then were deconstructed into story episodes. From the point of view of narrative analysis, the method utilized in this study can be categorized as plot analysis (Boje, 2001); antenarratives were deconstructed in order to find the sequences, episodes, and schema of the narratives. The story episodes were then analyzed and coded in the context of tourists' activities and interactions using ATLAS.ti software. The typical codes represent tourists' activities, problems, solutions, and contexts. Identified codes were then interpreted to determine the nature of relationships among the codes within the topological network.

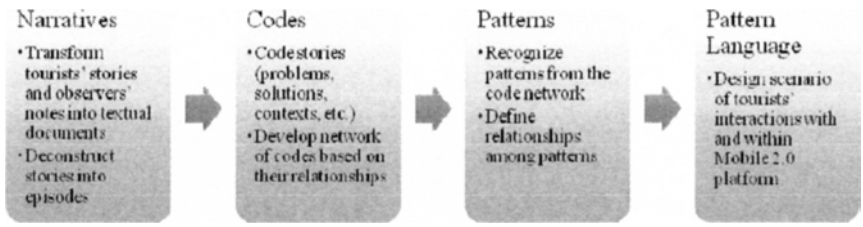


Fig. 1. Analysis Procedure

Based on the relationships among the codes from the narrative analysis, initial patterns of potential tourists-Mobile 2.0 interactions were identified and their relationships were analyzed. The interrelated patterns were then organized to create a narrative of pattern language. Based on the pattern language, typical scenarios were proposed as a foundation to design various potential forms of interactions in the Mobile 2.0 platform; these scenarios were then used to propose potential Mobile 2.0 applications in a travel and tourism context.

4 Patterns of Tourists-Mobile Phones Interactions

4.1 Mobile Phone Use

In order to give a clearer context to the pattern identification, this section presents the general findings of participants' use of mobile phones while they were touring, the information they searched, the applications they used, the problems they had to deal with, and the solutions they found to solve those problems. The results indicate that tourists mostly search for information on attractions/sights (78.7%), shops (59.6%), and restaurants (44.7%); other on-site information searched by tourists include weather, transportation, and events. Even though the mobile phone offers a number of services, only 27.7% of the tourists used mobile internet to search for travel related information. Indeed, most tourists used street signs (80.8%), followed by brochures/leaflets (36.2%), friends/relatives (34%), paper maps (31.9%), and info centre/kiosks (27.7%).

From the ethnographic study, it was also found that tourists tend to use more than one media to get assistance for solving problems while on tour. Some tourists, especially ones travelling in groups, were using multiple media to search for information. Some of them tried to compare information they got from the internet on the mobile phone with the information provided on the guidebook. When tourists tried to navigate themselves to a certain place, some of them also tried to synchronize the map they have (with the GPS-assisted application on the phone) with the street signs to get a better orientation.

4.2 Identified Patterns from Tourists-Mobile Phones Interactions

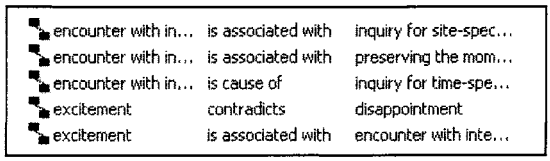
The first phase of pattern analysis was to deconstruct stories into several episodes and code them based on the activities, problems, solutions, contexts, information needs, etc. Extract 1 represents an example of an episode containing six codes ("asking others for information," "calling," "negotiating decision," "reference to others to signify decision," "task," and "use of mobile phone"). A total of 32 codes were identified from the entire textual data. The relationships between codes (e.g., "associated with," "cause of," "part of," "contradict," etc.) were then defined to create a topological network of codes. Extract 2 represents an example of codes relationships.

Extract 1. A Coded Episode of Observers' Field Notes

P 1: fieldnotes.txt - 1:15 [We walked out of the visitor c..] (72:72)
Codes: [asking others for information] [calling] [negotiating decision] [reference to others to signify decision] [task] [use of mobile phone]

"We walked out of the visitor center but before we crossed the street Jonathan saw the store (at the visitor center), they went back inside to the store. Rebecca said Jonathan had to buy a birthday gift for his grandmother. They found silver spoons with the liberty bell decoration. Jonathan called someone to be sure about buying the spoons, and then he bought them (it was his mother on the phone)."

Extract 2. Samples of Code Relationships



A total of 12 patterns were recognized from the code network: Reference to Others, Negotiating Decisions, User Stories, Location-Based User Review Sites, Sound-Based User Review Sites, Task Fulfilment, Site-Specific Instant Information, Preserving the Moments, Sharing the Experiences, Instant Uploader, Self Map, and Sound-Based Navigation System. Table 1 illustrates the detail information of each pattern.

Table 1. Identified Patterns

Pattern 1 *Reference to Others* Context: Design of collaborative interface Forces: People always want to make sense and meanings of their decisions and experiences Problem: When references are unavailable on site (e.g., insufficient interpretation, no personal interpreter, no interaction with others), people will be dissatisfied. Solution: Provide an interface where people can easily get references from others' stories, reviews, and opinions.	Pattern 2 *User Stories* Context: Design of collaborative user-created content Forces: People want to know what interest others and what others do in the city Problem: People would feel uninspired when they are on tour if they couldn't find some interesting reference from others. Solution: Develop a narrative self map where users can easily find stories from others about events occurred at a particular point on the map.
Pattern 3 Negotiating Decisions Context: Design of collaborative interface Forces: People want to consider others' opinions, needs, & wants when they make decisions Problem: A failure to communicate with	Pattern 4 Self Map Context: Design of location-based navigation system Forces: People want to know their self orientation Problem: People will get stressed out if they

Table 1. Identified Patterns - *Continued*

friends & relatives to negotiate decisions can cause a failure in decision making. Solution: Develop an interface where people can interact with others who are separated in space and time.	always have to change directions to find out their orientation when reading a map. Solution: Develop a GPS-based map where users can see themselves in it – the icons on the map will move as they move physically, making it easier to get self-orientation.
Pattern 5 *Task Fulfilment* Context: Design of informative interface Forces: People want to get fully mediated when they are trying to get something done in a place foreign to them Problem: A difficulty to access their preferred source of information on tour can lead to frustration Solution: Integrate a mobile version of a customized web-based information source with the location-based services	Pattern 6 *Sound-Based Navigation System* Context: Design of location-based navigation system Forces: People want to get clear instructions about direction to a desired site Problem: It is quite inconvenience for people to always fix their eyes on the map while walking – they would miss the sights in between Solution: Develop a GPS-based navigation system with spoken instructions – once people locked their desired location on their self map, they can follow the instructions with their headset
Pattern 7 *Site-Specific Instant Information* Context: Design of location-based information source Forces: When people encounter an interesting artefact, they would like to know and understand more. Problem: If there is no information and interpretation available, people will be disappointed Solution: Create a quick-response code on urban artefact that users can capture it with their phone and retrieve information	Pattern 8 *Location-Based User Review Sites* Context: Design of collaborative user-created content Forces: People want to know other people's opinion and evaluation about a site Problem: If it is too difficult to retrieve information from different people in one task, the force is not resolved, and people will be dissatisfied. Solution: Develop a review site connected with user's self map – create an icon on the map where user can automatically retrieve reviews from others about the site
Pattern 9 *Preserving the Moments* Context: Design an interface to capture slices of experiences Forces: People need to capture and store moments representing their memorable experiences Problem: A poor quality images and sounds cannot fully represent people's image of the experiences Solution: Integrate a high quality camera and voice recorder in the mobile phone	Pattern 10 *Sound-Based User Review Sites* Context: Design of collaborative user-created content Forces: People want to easily retrieve other people's opinion and evaluation about a site/event Problem: It is too difficult and time consuming to read text reviews on a small screen while people are moving around Solution: Develop a review site based on sound file – users can listen to the reviews with their headset on while seeing the en-route sights

Table 1. Identified Patterns - *Continued*

Pattern 11 *Sharing the Experiences* Context: Design of collaborative interface Forces: People want to show off and share information to others Problem: People would not have a chance to express themselves fully in their mobile-mediated social networks when they are on tour Solution: Develop an interface where people can easily interact with others, share their experiences, and get feedback from others	Pattern 12 *Instant Uploader* Context: Design of collaborative user-created content Forces: People want to immediately show others what they have created Problem: The gap between the actual moments on tour and their representations on the web will cause the excitement to cease Solution: Develop an interface where people can capture and create files and immediately upload the files from their mobile phone to the web

In addition to the 12 patterns described in Table 1, two patterns were identified based on the cognitive processes apparent in the interaction patterns. They are: *Story building;* when people communicate with others to share their experiences or retrieve information, they engage themselves in the process of story creation, and *Narration*; the story building process results in narrating the stories through texts, sounds, images, and combination of those.

4.3 Using Patterns to Design Tourist-Mobile 2.0 Interactions

To conceptualize the design of Mobile 2.0 applications, a scenario of tourist-Mobile 2.0 was created as a narrative pattern language. Based on the hierarchy and relationships of the patterns, a typical story of a tourist associated with the use of mobile phones was created (see Fig. 2). The story was then broken down into scenes where patterns were then placed. The story begins when a tourist has an encounter with an interesting site. The tourist needs to make a decision whether or not she will enter the site (i.e., trade off between time-cost and enjoyment). To negotiate the decision, the tourist needs reference from others to retrieve information and justify her decision. This resulted in an interaction with a Mobile 2.0 interface that would provide her with location-based, site-specific user reviews and stories. Once she decided to enter the site, the tourist feels the need to preserve the experience and share it with others. This leads her to the process of story building and narration and results in another interaction with the Mobile 2.0 interface. The "instant uploader" should enable the uploaded files to be compatible to the contents sites, make the files immediately available for references of others. In this case, additional applications such as geo-tagger are necessary for the uploading process.

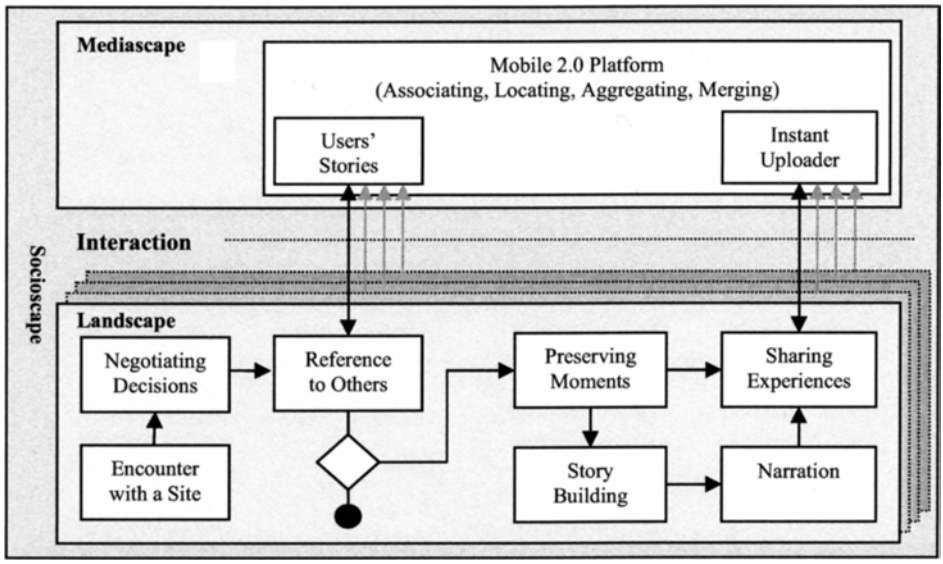


Fig. 2. A Typical Tourist-Mobile 2.0 Interaction Scenario

Fig. 2 also seems to indicate that the storyline applies to other people in different landscapes. That is, tourists within the same social networks, even though they are physically separated (i.e., experiencing different landscapes), still can enjoy immediate interactions within the mediascape to perform a co-creation of shared narratives and joint mobility. This scenario is one of the many possible scenarios that the analysis suggests. Due to the space limit, this paper only presents this particular one in order to demonstrate the efficacy of the pattern analysis in exploring new design options for Mobile 2.0 applications.

5 Concluding Remarks

This study used the patterns from narratives of tourists' experiences to develop a meaningful scheme for designing Mobile 2.0 applications. Since tourists' stories consist of interrelated sequences of experience, recognition of story sequences means recognition of interrelated patterns of tourists' interaction with others occurring in the landscape, socioscape, and mediascape. The study conceptually contributes to the idea of mediation and brokerage of tourism experiences by describing patterns of tourists' interaction in the new media and mobile technology. It is argued that pattern language analysis of a typical tourist story can be used to design a platform of Mobile 2.0 applications in travel industry. However, further research is needed to study the

detailed components of user-interface interaction in order to more fully develop a prototype for different types of mobile applications.

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A Case Study on Automating Information Aggregation Processes in Information Centres

Markus Bauer[a], Christoph Herzog[a],
Hannes Werthner[b], Birgit Dippelreiter[b]
and Kathrin Prantner[c]

[a] E-Commerce Competence Center EC3, Austria
{markus.bauer, christoph.herzog}@ec3.at

[b] E-Commerce Group,
Vienna University of Technology, Austria
{hannes.werthner, birgit.dippelreiter}@ec.tuwien.ac.at

[c] DERI Innsbruck, Austria
kathrin.prantner@deri.at

Abstract

As tourism is an information business, tourists have to rely on the information available beforehand. One – prominent – source of information are call centres of national or regional tourism organisations, which provide users expert advise and also pre-compiled information documents and brochures. However, such requests are usually answered with on-demand off and on-line searches, communicating the required information to the customer via telephone. This is a cumbersome and often low quality process. The project OnTourism aims at improving these processes by automatically extracting (publicly) available information about the requested topics and compiling them into comprehensible documents which can then be sent to the customers. The information access for the call centre's personnel is supported by semantic annotation of the available documents, thus improving the required time to answer customers' requests as well as service quality.

Keywords: applied research, web extraction, information aggregation, semantic annotation

1 Introduction

Tourism is an information centred business, and tourism goods are mainly confidence goods (Werthner 2003). That means that it is usually impossible for the customer to judge the quality of a tourism offer (e.g., a music event or a hotel room) beforehand. Therefore, customers are heavily dependent on the available information to make their decisions. One major source of information for tourists are the call centres of regional or national tourist organisations, such as the *Urlaubscenter* of Österreich Werbung. The call centre agents not only provide expert information for the customer, but also send them available brochures or information documents on request. For the latter, they have defined a process, where for major and anticipated user preferences related content objects are assembled, which are then compiled into

respective documents. However, since the effort to create these documents is relatively high, only major preferences and related topics are considered.

For even slightly more individual information needs, online searches are conducted in order to provide the customer with the required information. These online searches offer opportunities for improving the call centre's process and the quality of the information provided to the customer. This can be achieved by pre-compiling a larger number of more specific documents. However, the time consumption for manually assembling documents even for only the most important categories of customer requests would be unfeasible.

In the OnTourism project we improve the information aggregation process of Österreich Werbung's call centre by categorising the customer requests which have to be answered through on-demand online searches and analysing which information sources are queried in order to provide the caller with the required information. These processes are then automated, using advanced web extraction techniques to aggregate the information from the identified web sources. These data is further compiled into comprehensible PDF documents, which can be sent to the customer by email. Information about upcoming events (e.g., cultural or sports events) has been selected as a use case for our approach.

Furthermore, the call centre agents need to be able to quickly access the compiled information documents. For storing pre-researched information, they have a document repository available, which supports a semantic search functionality for more precise information retrieval. The automatically generated documents are stored within that document repository and are also automatically annotated with a description of the documents' contents in terms of a formal ontology. This enables a more precise search result with better recall through semantic reasoning.

While our solution is based on the specific needs of the call centre scenario, it comprises a toolkit for extracting information from web sources, integrating them in an intelligent manner into comprehensive documents for human consumption and for describing the contents of these documents in terms of a formal ontology, enabling advanced business processes to be triggered and controlled. In the remainder of the paper we focus on the call centre application as a case study or proof of concept of our approach.

The paper is organised as follows: Section 2 gives an overview of the information extraction process and tools. Section 3 details the process of creating comprehensive human-readable documents from the aggregated information, while section 4 describes how these documents are semantically annotated and stored in the call centre's document repository. Section 5 details some of the obstacles we faced during the implementation of our solution and section 6 gives examples for further application scenarios of the underlying technological infrastructure.

2 Automatic information extraction

In order to create valuable documents, we have to extract information from a multitude of different websites, producing semi-structured information as the basis for further processing. The extraction engine uses listings of events from all Austrian provinces and extracts additional interesting information concerning these events (e.g., weather forecast, travel information, etc.). Automatic document generation out of aggregated up-to-date information of upcoming events assists the call centre agents in answering specific customer requests in a highly efficient manner, which will be described in the following.

2.1 Document sources

In the call centre, the most common requests are answered by sending manually prepared information documents to the customer. Answering questions regarding up-to-date information, however, was previously only possible with on-demand searches on different websites. In order to speed up this process, requested information types (e.g. events) are assessed, analysing which ones have a high demand for up-to-date information with previously little or no coverage in the knowledge base.

Source selection. This assessment is based on data about the tourist requests collected at Österreich Werbung's call centre. These data were collected by the call centre agents, summarizing the requests over the period of a year. The survey result shows that the major part of requests came from German speaking countries and was concerned with the topics of city/culture as well as with upcoming events. The topic of events, however, was previously not covered with up-to-date information, mainly due to the fact that the call centre personnel couldn't afford the time needed to assemble documents about a large number of events each week.

In order to generate additional value by automatically aggregating up-to-date information, the essential sources were found from which the necessary information can be extracted (i.e., the challenge was to identify structured and stable websites with enough information for an automatic extraction).

OnTourism uses listings of events from the web pages of each of the Austrian provinces as a basis for further extraction. Then for each event additional interesting information from other sources is extracted. The integrated document sources are:

- Event calendar of each province – these deliver important event information
- Location information – deals with the location of the event and a short description, including pictures
- Arrival and mobility – shows how to arrive by car and other information about mobility in the region
- Connection to public transport – details the arrival by train or other public transport means

- Current weather – shows the weather forecast for the next week
- Obstacles on the road – advise about possible obstacles on arrival (blocked roads)
- Press releases – offer current press reports about the event

2.2 Information extraction

Information extraction is "the automatic identification of selected types of entities, relations, or events in free text" (Grisham, 2003) - an emerging technology whose function is to process natural language text in order to locate specific pieces of information, or facts, within the text. These facts are then further transformed into structured or semi-structured representation formats. The aim of a so-called wrapper program is to locate relevant information in well and clearly structured websites and to put the information into a self-describing representation format for further processing. Hence wrappers should offer the following fundamental qualities (Gilleron, 2005):

- *Expressiveness* to cover various data formats and heterogeneous sources
- *Efficiency* of the generated wrappers and of the generation process
- *Robustness* in missing values and changes in the layout
- *Maintainability* to support the generated wrapper a long time

Toolkits for generation wrappers can be differentiated in a number of ways. They can be categorised by their output methods, web crawling capability, interface type, use of a graphical user interface (GUI) and several other characteristics. Laender et al. categorise a number of toolkits based on the methods used for generation wrappers (Laender, Ribeiro-Neto, Silva & Teixeira, 2002). These methods include specially designed wrapper development languages and algorithms based on HTML awareness, induction modelling, ontology and natural language processing. For the OnTourism project a wrapper has to fulfil some necessary conditions:

- A data integration module for generated wrappers is essential to allow the wrapper designers to integrate external web data sources and extract the information with web crawling support.
- An important feature is the possible output format in which the extracted data can be exported. XML allows for the most flexible handling and easy processing of the data into comprehensive, human readable PDF documents.

As a state of the art product, the tools should support a GUI and an editor for visually designing the wrapper programs and for setting up and executing the information extraction as well as the aggregation process.

The *Lixto Visual Developer* fulfils these requirements as a state-of-the art tool for supervised wrapper generation and automated web information extraction. Furthermore, the *Lixto Transformation Server* provides a platform for the subsequent processing of the aggregated information. Therefore, the Lixto Suite (www.lixto.com

[Nov. 8, 2007]) has been selected as a means for implementing the outlined call centre application.

In the first step of a wrapper design process, extraction rules have to be semi-automatically and visually defined in an iterative process to build extraction patterns (Baumgartner, Fröhlich & Gottlob 2007). Figure 1 depicts this process. Information extraction systems rely on a set of extraction patterns that they use in order to retrieve the relevant information from each source. The distinctive features of Lixto are mainly (Gottlob et Al. 2004):

- *High productivity*: Lixto includes a fully visual wrapper specification process to allow for a steep learning curve and high productivity in creating wrappers.
- *Expressivity and Stability*: The Lixto extraction engine is based on an internal logic-based language similar to Datalog called *Elog*. This language allows for the extraction of target patterns based on surrounding landmarks, on the content itself, on HTML attributes, on the order of appearance and on semantic and syntactic concepts. Elog in its core fragment captures precisely the expressiveness of monadic second-order logic (MSO) over trees (Gottlob & Koch 2004) and has been proposed as a yardstick for evaluating and comparing wrappers.

Each document source is covered by a single wrapper program. XSLT composition files, managed by an admin interface, are used to aggregate the information produced by these wrappers into a unified XML document. The admin interface is an application that modifies the global XSLT composition by changing its defined structure. This way the information available for further processing can be controlled.

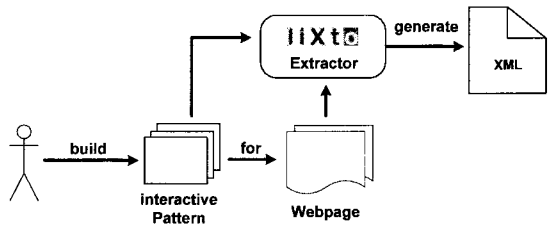

Fig. 1. Data Extraction

3 Document generation and semantic description

Following the data extraction step the XML data generated by wrappers are processed within the transformation server, which schedules the extraction process on one hand and transforms the generated data into the required output format on the other one.

3.1 Information transformation

The desired output of the information aggregation process is an easy to read and information rich PDF document, which the call centre agents can email to the customers on request. The aggregated information, available after the extraction process, needs to be compiled into a human readable and well structured document. Furthermore, in order to ensure that the documents can be easily found by the call centre personnel, a semantic annotation in the terms of a formal ontology is added. The ontology serves as a formal conceptualization of the tourism domain, allowing for semantic reasoning and formulating precise search queries. The OnTourism ontology is expressed in OWL (www.w3.org/2004/OWL [Feb. 10, 2004]), an RDF (www.w3.org/RDF [Feb. 10, 2004]) based ontology language.

Figure 2 shows the whole workflow of building a PDF file and the semantic description represented as an OWL document from the extracted XML data. The system features an administrator interface for selecting the information sources which serve as basis for building the individual documents. This gives the call centre agent the possibility to modify the document content in order to adapt it to specific needs.

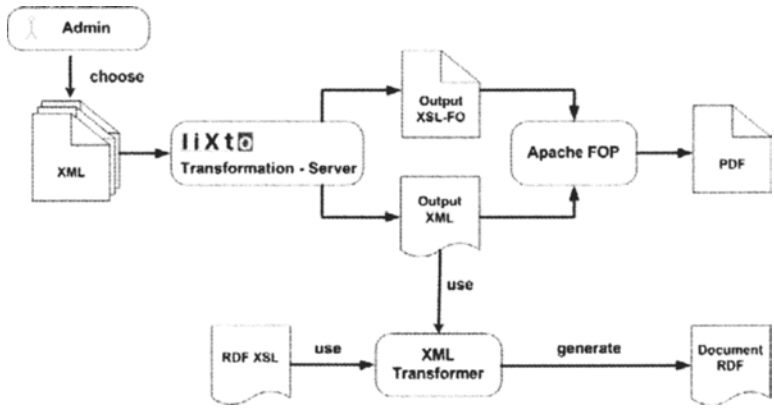

Fig. 2. Document Generation

Based on the selection of information sources, the transformation server merges the extracted information and compiles it into an output XSL-FO document and an output XML file. Both are subsequently needed to generate a PDF file and the OWL annotation from the extracted information.

Schedule. In order to capture up-to-date information, the extraction process is performed at least once a week. Regarding the time required for extracting and processing the information, as well as the rate at which new events are published at the monitored portals, a shorter extraction cycle does not seem to be need.

3.2 Semantic annotation

The OnTourism ontology aims to map real-life tourism concepts and relations into an appropriate vocabulary, paying special attention to the needs of the environment of the call centre. An essential part of the ontology design process was the consideration of reusing existing ontologies in the tourism domain (Prantner et al, 2007). Since the semantic metadata annotation will be used mainly to enhance the search process in the call centre (Herzog, Luger & Herzog, 2007), the metadata structure is developed in close collaboration with the call centre agents and adopted to their special needs.

Ontology modelling. The respective OnTourism ontology is represented in OWL Lite, the least expressive and most efficient subclass of OWL languages (Zhanova & Keller 2005). However, this language already requires reasoning with equality, which significantly increases computational complexity. In OWL based ontologies, information is annotated by adding statements to an arbitrarily resource characterized by a unique reference. Instances can be derived from the basic classes to represent a concrete document or event and can be further related to class instances representing metadata such as a place or month. Such relations can be easily added to document, allowing for efficient handling of the metadata. Figure 3 shows a small part of the OnTourism ontology, which contains its major characteristics. The basic structure, founded by the classes "document" and "metadata", is connected using transitive relations and offers the possibility of adding information to each document in the repository. Therefore, new events are connected with other metadata, expanding the ontology.

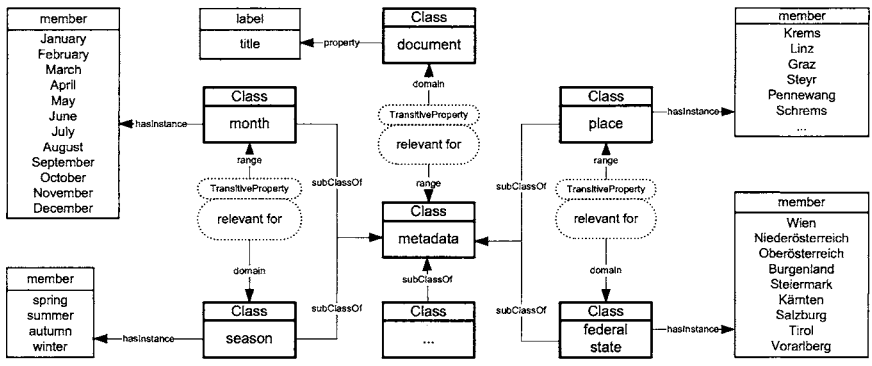

Fig. 3. Ontology Model

3.3 Document generation

A scheduled and automatically controlled application imports the XSL-FO (www.w3.org/TR/xsl [Dec. 5, 2006]) result document provided by the transformation process and uses it to generate the final PDF document. The implemented

transformation server is able to activate automatically this application after completing the extraction and transformation processes. With XSL-FO, which is an XML based print page description language, a direct transformation from XML to PDF is possible. The extracted event information is converted into a XSL-FO representation. The topical content and the detailed design is governed by predefined rules regarding the available information items and their properties. Apache FOP, a print formatter driven by XSL formatting objects (Apache software foundation, 2007), is used to generate a PDF document from the XSL-FO specification.

4 Document storage

The generated PDF documents are automatically imported into the repository (a Microsoft SharePoint server). Figure 4 depicts this process. After an automatically generated document has been added to the repository, the likewise generated OWL document, containing the ontology representation of the newly added document's description, is sent to the repository's semantic subsystem and is further used for search and retrieval. Towards this end, a semantic search application allows the user to refine search queries by selecting objects from the underlying semantic data model (Herzog, Luger & Herzog, 2007). Since the semantic data model allows for semantic reasoning processes, this search method also finds documents related to but not directly annotated with the specified search terms (higher *recall*). For example, documents annotated with "Inntalkette" (a mountain range in Tyrolia) can also be found with the terms "Mountain" or "Tyrolia".

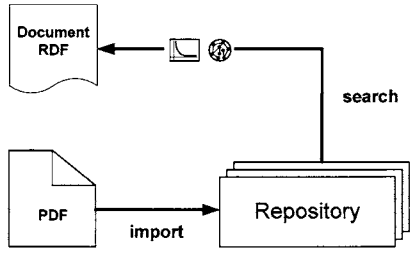

Fig. 4. Document Import & Search

5 Obstacles faced

The following key areas were identified in the course of the project.

Usability-Engineering. One of the most common causes for project failures is the lack of user integration during the design and implementation phase as stipulated in the standard of "human-centred design processes for interactive systems" by DIN EN ISO. Hence, the members of the call centre where integrated in the design process to

adopt the system to their special needs. This close cooperation ensured the design of a system which, while as a framework applicable to a larger set of usage scenarios, meets the demands of these users.

Ontology mapping. Creating a metadata description based on the OnTourism Ontology was a major challenge during the design process. Since there is no way to foresee all possible combinations of available metadata that can be extracted from the web sources, a framework was required in which mappings between the extracted metadata and the ontology terms have to be hypothesized dynamically as the terms are encountered after extraction. This mapping needs to be controlled and adapted when the extracted meta information is significantly modified (e.g., should a new categorization of events be introduced by a website listing events). The challenge of this mapping was closely related to the challenge of building a stable ontology structure which can accommodate the information required to describe the created documents. A crucial step in this process was the incorporation of existing ontologies, enabling a wide coverage of the tourism domain (Prantner et al, 2007).

Information extraction. A further challenge faced appeared during the development phase when a significant structural changes of a web source required the adaptation of an existing wrapper program.. However, by using an extraction and transformation tool with a stable and expressive data language, like Lixto's Elog, wrapper programs can be designed to be able to cope with slight to medium changes in a source web site's structure.

6 Further application scenarios

Apart from the application in the call centre for pre-assembling information in order to provide better answers to customer requests, the described mechanism offers a generic solution for extracting and assembling data from web sources and turning them into PDF documents for human consumption. The automatically generated semantic description offers advanced means for automatic classification through semantic reasoning, or for triggering decision processes. We shortly outline two of the many possible scenarios for utilizing the project results

Tourist information. A possible refinement of the call centre scenario would be the automatic aggregation of information about cities' sights. With location information and current weather reports and forecasts, a tourist can plan ahead for his or her stay in a given city. Should the weather change the tourist can then request an alternative program for the current location on demand (e.g., foul weather program or outdoor activities).

Hotel Leaflets. Hotels often provide leaflets with tips for nearby sights or activities to their guests. Through automatically created documents, these could incorporate up-to-date information (e.g., including current events) and the suggestion can be based on customer preferences and weather conditions.

7 Conclusion

Tourists are highly dependent on information available beforehand to judge the attractiveness of a tourism offer. Call centers of national or regional tourism organizations provide expert advice and are a valuable source of information for the customers. Sending informative documents per email, the customers quickly get the required information for consumption at their own leisure. However, the number of up-to-date documents available to the call centre agents is very limited, since the effort of researching and compiling such documents makes the preparation of documents about information with a short life cycle (e.g., cultural, sports or music events) unfeasible.

In the OnTourism project we implemented a system for automatically aggregating up-to-date information about upcoming events and compiling them into informative and comprehensible PDF documents which can be sent on request to the customers. By pre-assembling the information from public web sources, we can improve the speed and quality of the process and of the answer the customer receives (i.e., a comprehensible and printable document). Furthermore, with semantic annotation of the documents' contents in terms of a formal ontology, the call centre's semantic search application can be used to make the document quickly accessible. The benefit of our solution is, however, not limited to the call centre scenario at hand, but can be used wherever publicly available information needs to be compiled into printable documents for human consumption in an intelligent manner, adding a semantic description that makes it possible to steer business processes.

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Enhancing Cultural Tourism e-Services through Heritage Interpretation

Nicole Mitsche[a], Sofia Reino[b],
Dan Knox[a], and Ulrike Bauernfeind[a]

[a] Tourism, School of Arts, Design, Media and Culture
University of Sunderland, United Kingdom
{nicole.mitsche, dan.knox}@sunderland.ac.uk

[b] SITI Research Centre, School of Business, Enterprise and Management
Queen Margaret University, United Kingdom
sreinopardinas@qmu.ac.uk

Abstract

Cultural heritage is a major contributor to tourism development. Cultural heritage tourism relies heavily on the communication process for attracting visitors and providing them with a satisfactory experience. The tourist encounter can be significantly enhanced through effective and engaging heritage interpretation. This paper argues that there are opportunities for the application of e-Services in the delivery of heritage interpretation through the Internet – optimising results for the fulfilment of both marketing and interpretation purposes. This paper investigates visitor satisfaction with museums, and explores the use of e-Services for both cultural attraction operators and destination managers over a two-stage empirical investigation. Firstly, this study identifies the contribution of heritage interpretation practices to overall visitor satisfaction in museums, and to the best and most memorable experiences during such visits. Secondly, the paper evaluates the integration of e-Services in cultural attraction and destination websites. The results are integrated and developed into practical industry implications for cultural attractions and destinations websites offer of online heritage interpretation.

Keywords: eTourism, ICT & heritage interpretation, destination & cultural attraction websites.

1 Introduction

Tourism relies on cultural heritage as a source of visitor attractions and for the development of the destination image (Prentice & Duncan, 1994). In turn, cultural heritage needs to be provided with meaning in order to acquire an exchange value. Such meaning is related not only to the physical attributes of the exhibited artefact, but also to its historical and/or cultural aspects, which require some kind of teaching or knowledge transfer to enable visitor appreciation of the site (Harvey, 2001). This communication process in the context of cultural heritage is known as heritage interpretation – a process which starts as soon as the potential visitor obtains information on the heritage site, frequently taking place before the visit starts and finishing with the last information collected on the exhibit, or even once the visit is completed. In this sense, heritage interpretation refers to the communication process which reveals meanings and relationships based on historical facts, allowing visitors

to obtain, understand and potentially remember information (Aldridge, cited in Copeland and Delmaire, 2004; Sigala, 2005).

Information and Communication Technologies (ICT) facilitate the dissemination of information from remote locations, enabling heritage operators to take control of the information their visitors obtain before, during and after their visits take place. This potentially extends their provision of heritage interpretation to the three stages of the tourism life cycle. E-Services – the provision of services based on an interactive information exchange over an electronic network (Baida et al. 2004; Rust & Kannan, 2003) – have been previously applied to museums for heritage interpretation. Furthermore, there is previous work assessing the opportunities arising from these applications including wireless networks and other electronic environments such as kiosk systems to heritage sites. However, there is still only limited research exploring the opportunities for heritage interpretation over the Internet. According to MacDonald & Alsford (1991) heritage sites have a duty, intrinsic to their nature, to disseminate information on their exhibits both onsite and offsite. The Internet widens these opportunities for remote accessibility. This paper presents the results of a two-stage study that explores opportunities for offsite heritage interpretation over the Internet – through the use of e-Services. The study firstly identifies the attributes of heritage interpretation contributing to satisfactory onsite visitor experiences, and explores current forms of online e-Services, and how they either fulfil these attributes. The study concludes with an outline of the e-Services potential for heritage interpretation, and recommendations for integration into destination and cultural attraction websites.

2 Background

Destination is a construct of personal factors, previous experience and information sources (Baloglu & McCleary, 1999), and of the overall destination and its content by way of accommodation, transport and cultural heritage attractions (Pike, 2002). This relates to Prentice & Duncan's (1994) suggestions on the desirability of heritage tourism going beyond the attraction level, and generating information which helps not only to enhance the experience on the heritage site itself, but also to frame the destination image and to widen the tourism opportunities for the region.

In opposition to Lowenthal's (1998) and Hewison's (1989) apprehension of heritage as being about physical and innate characteristics, Harvey (2001) considers the essential attributes of heritage to also be related to discourses and interpretation. He regards heritage as a "value-loaded" term, the concepts of which change according to the contemporary contexts of power relationships and national identities, making the bridge between the exhibition and our realities. Therefore, heritage is a construct comprising different dimensions, which includes not only the physical attributes of the artefact but also a set of values together with the cultural identity that the artefact represents. The process of interpretation is intrinsic to the term heritage, whether this is provided by the heritage operator or sought by the visitor individually; and whether

this is obtained before the visit, afterwards or onsite. Heritage acquires its value when the asset is provided with meaning, which implies the need for interpretation. By delivering their service online, e-Services widen the opportunities for cultural heritage websites through allowing their operators to extend their interpretation offsite, taking an element of control over information provision, and enabling them to integrate communication activities of the cultural attraction within its offsite interpretative plan. Furthermore, integration within destination websites' content creates new marketing opportunities for the destination.

The range of e-Services which have been implemented in tourism websites – including product aggregators, destination websites and individual providers' sites – comprises a wide variety of tools such as recommender systems (Ricci, Fesenmaier, Werthner, & Wöber, 2006; and Zins et al, 2004); information on "how to get there" (Bernstein & Awe, 1999) or virtual tours (Breitenbach & Van Doren, 1998) and their potential to engage with visitors has been researched over the last decade. Reino, Mitsche and Frew, (2007) suggest that combined with other interpretative techniques, technology enhances visitor satisfaction in museums. However, their work does not identify the attributes involved in the provision of satisfaction experiences through heritage interpretation. There is previous research looking into ICT for onsite and offsite heritage interpretation. Within onsite interpretation, the work developed by Rocchi et al. (2004) suggest the use of electronic devices for heritage interpretation, such as guidebooks, cinematics or a combination of multimedia applications. Additionally, research into tools applicable for both onsite and offsite interpretation includes Beraldin et al. (2005)'s account of the role of 3D multimedia for cultural heritage interpretation. In terms of content, Raptis, Tselios and Avouris (2005) highlighted the importance of the content when using electronic devices for heritage interpretation. However, the insight provided by all these projects into the satisfaction outcomes – through learning, entertainment & experience – of heritage interpretation is very limited. Heritage interpretation approaches and their intended outcomes vary in accordance to museums' and heritage sites' paradigms. If their interpretative provision was originally purely oriented to conservational purposes, they have progressively evolved towards a more educational curatorship approach (Light, 1995; West, 1988). Originally considered as incompatible with learning, enjoyment and experience-related outcomes were introduced when assessing heritage interpretation due to the evolution of learning theory, which suggested a positive relationship between these two potential outcomes and learning (Moscardo, 1996). This led to a multidimensional concept of learning, in which fun and inspiration are part of individual development and a life-long learning process (Hooper-Greenhill, 2004).

3 Methodology and Results

This study aims to explore the opportunities that the integration of heritage interpretation through e-Services generates for cultural attraction and destination websites through a two-stage research project. Previous research has developed a framework for the evaluation of heritage interpretation practices over the Internet,

based on a constructivist educational perspective, and identified a lack of visitor-centric experiences (Sigala, 2005). However, the outcome-driven climate currently dominating cultural attractions, led both by accountability and social value (Hooper-Greenhill, 2004) suggests the need to evaluate heritage interpretation practices based on a demand-driven approach. This perspective has been adopted for this study.

The first part analyses visits to museums and forms of effective heritage interpretation for visitor satisfaction. In this sense, the effectiveness of heritage interpretation is measured in terms of its contribution to the overall visit and to the best experience within this visit, and the role of ICT to the achievement of positive experiences is evaluated. The literature on heritage interpretation (Copeland and Delmaire (2004); Prentice, Guerin & McGugan, (1998); Beeho & Prentice (1995); Reino et al. (2007)), together with observations at four different locations supported the development of a questionnaire. Reliability was assured through a pilot with four subjects. The second part of the study explores e-Services already provided through cultural and destination websites and their potential use of these e-Services for heritage interpretation. Finally, the results from both studies are combined and the potential opportunities and implications for cultural attraction and destination websites are provided.

3.1 Visitor Survey

A 168 questionnaire set was distributed in two museums – 81 at the Discovery Museum (http://www.twmuseums.org.uk/discovery/) and 87 at Bede's World (http://www.bedesworld.co.uk/), collecting quantitative data in relation to visitor satisfaction with heritage interpretation and with their visit overall. The selection of the museums was related to the convenience of their location – both based in the Northeast of England – as well as to the variety of interpretative media they provided in their exhibits, including not only traditional interpretative devices such as posters and labels with information, but also technology-based and live interpretation. The first part of the questionnaire looks into visitors' experience in the museums in terms of the different outcomes of heritage interpretation which have been identified through the literature review and observations. This is followed by questions examining the best experience of their visit – aiming to identify those physical, emotional and interpretative elements which comprise that experience. Following this, visitors' overall satisfaction and the satisfaction with the interpretative media used were recorded, as well as information on the demographics – age, gender and place of residence to identify potential differences.

The results show that in terms of the heritage interpretative provision, a high percentage of visitors (64.8%) reported being very satisfied with the information material in both museums and also with one of the games included in the Discovery Museum's interpretative provision (62.1%). Pictures (52.1%), exhibited objects (48.8%), interactive exhibit parts (42.9%), stories through speakers (39.3%) and videos (35.3%) were also perceived as satisfactory but at a lower percentage. These satisfaction results with the different interpretative media used were linked to the

overall degree of satisfaction with the museum ($p<0.05$). The only non-significant result related to the exhibited objects, underlining the fact that the explanation and interpretation of objects is very important for achieving visitor satisfaction, and suggesting that the interpretative provision has a key role in the overall museum visit and therefore the relevance of the media in the presentation of heritage.

Table 1. Visitor Satisfaction with Heritage Interpretation

	Strongly agree & agree		
Experience	*Very satisfied*	*Satisfied – not satisfied*	*Sign*
I had fun.	88.7%	71.4%	0.001
This museum inspired me.	89.6%	68.0%	0.000
I saw the links between the past & our lives today.	87.8%	77.4%	0.020
I found things which were similar to my life.	77.4%	62.0%	0.016
I understand the past better.	95.5%	87.7%	0.003

In order to identify the different elements that determine visitor satisfaction, a crosstabulation was produced which looked at percentages of satisfied visitors with the different attributes of heritage interpretation. Furthermore, in order to test the strength of the relationships between paired variables, the Mann Whitney U significance test was applied. Table 1 presents the results of visitor satisfaction with the heritage interpretation according to the different outcomes – learning, entertainment and experience. The results indicate that overall satisfaction with the visit to the museum is highly related to the heritage interpretation. In more detail, visitors who experienced fun, or were inspired, were able to appreciate the links between the past and their lives today, and/or developed a greater understanding of the past, were more satisfied.

Table 2. Heritage Interpretation Preferences Related to Visitor Profiles

Motivations for the Museum's Visit	*Tourists*	*Residents*	*Sign*
I like if the museum inspires me.	79.4%	66.1%	0.006
I came here to experience the stories the museums tells about its time.	87.7%	62.1%	0.002
I came here to see the links between the past and our lives today.	78.5%	62.7%	0.012
I like to compare things from the museum with things I knew and experienced before.	57.6%	79.2%	0.001

Table 2 shows interesting differences related to the visitor profiles divided by variables such as residents/tourists and age. Residents were clearer on the motivations which brought them to visit the museums, reporting in higher percentages a motivation related to an aim to obtain inspiration, to live an experience, to find links between the past and our lives today, or to compare with previous experiences. Furthermore, their experienced outcomes were stronger, reporting higher percentages of achieved inspiration (88.8% residents, 73.3% tourists), learning outcomes (91.3% residents, 85% tourists), finding things familiar to their life (89.7% residents, 75% tourists) and a feeling that they understood the past better (81.3% residents, 56.7% tourists). These differences might be based on the different knowledge that residents

and tourists would have in relation to the local history that formed some parts of the exhibitions. This indicates the role of cultural identity in motivating visits to heritage sites – more present in residents than in locals – and the relevance of knowledge acquisition on the exhibit and importance of interpretation. Age-related differences reveal diverse technology acceptance levels and therefore preferences for different interpretative media. Visitors under 40 years showed a higher satisfaction with the interactive exhibits and playing games, whereas visitors over 40 showed higher satisfaction with the written information material provided. This reflects the need to customise sites and to consider the different technology acceptance by visitors.

The "best experience description" showed that these experiences involved "having a friendly or welcoming atmosphere" (92.8%), "listening and/or watching" (92.7%), learning something new (92.1%), actively doing something during this experience (72.8%) and comparing the situation with something known and/or experienced before (69.6%). Less relevant attributes relate to "the situation being funny or involving jokes" (48.3%) and to feeling passive (44.2%). In terms of the interpretative elements which were involved in these experiences, the following attributes were present in a high percentage of "best experiences": exhibited objects (84.4%), followed by non-technology-based interactive objects (76.4%), text (76.6%), pictures (74.9%), sound (74.3%) and touch – only asked in Bede's World as this attribute was not available in the other museum – and were reported as important parts of the experience (67%). On the other hand, technology-based interactive objects (55.1%) and games (46.1%) were regularly noted as attributes of the best experience. Surprisingly, live interpretation – a member of staff explaining – was not mentioned as forming part of the "best experience" by many people. Only 4.6% consider performances by actors as very important that could be due to the limited availability of this interpretative resource in these museums, as well as to other elements of the communication process, such as the visitors' attitude towards the communicator (Scott Morton, 1991).

3.2 Website Analysis

Interpretative media as described earlier are often used in an interconnected manner within e-Services. Some of these e-Services use heritage interpretation combined with different interpretative media to provide information, but also to engage web users for longer on the site, enhancing fun factors, the general experience of the site and increasing knowledge related to the attraction or destination. An expert evaluation of cultural tourism attraction and destination websites was developed for the identification of e-Services that are already integrated into these websites and to explore how they could be used for heritage interpretation. The website selection responded to their search engine optimisation, to their balance between content, technology and e-Services provision and to their special focus on cultural tourism. Overall, 34 English (not necessarily the main or native language of the website) and 26 German cultural attractions as well as 41 English and 20 German destination websites, were evaluated. Details of the e-Services provided were collected, classified and evaluated on the basis of the e-Services they offer.

Attraction and destination websites show differences in their focus related to their different nature which is mainly reflected on a more extensive online heritage interpretation at cultural sites. Nevertheless, some of the destination websites already make direct use of heritage interpretation on their sites to enhance their offer, and are also using tools which include heritage interpretation aspects. A categorisation of the e-Services was developed and established that typical attraction websites include interactive maps, 3D applications, virtual tours, online exhibitions, interactive learning resources, games and fun tools, online collections and databases, user communication, community aspects, personalisation and online shops. Destination websites tend to focus on the provision of a gateway for making accommodation and events bookings, with e-Services on offer including personalised navigation, interactive maps, travel journey planners, virtual tours, podcast files – offline and online tours – games and fun tools, user communication, and online shops. Interactive maps on attraction websites display the outline of the attraction – floor maps or wider areas – including location information about exhibitions, exhibits, further facilities, and sometimes the surrounding environment of the place – public transport, access points. These identified e-Services vary in their technological development, from some simple – interactive – structures to more complex interconnected e-Services, not only using different media, but also linking and displaying the different e-Services together. It shows that it is possible for organisations with limited technical resources to apply and interconnect e-Services integrating information provision and the delivery of a pleasant navigation experience for effective user engagement.

Interactive maps lend themselves to illustrate complex and layered information, making it more accessible for the user. They are commonly used as a starting and central navigation point, where different layers are interconnected, enabling the user to continue through virtual tours, fun activities, more factual and interpretative information, databases, and further multimedia tools such as sound and video files. Curating the city – Wilshire Blvd in Los Angeles (www.curatingthecity.org) uses an interactive map, displaying historic photographs, textual information and linking this to a memory book (user-generated content), collecting memories related to local history and (memorable) places. Symbolic and 3D presentation of these maps further enhances the virtual experience, e.g. the Alhambra, Spain connects the interactive 3D map to virtual tours and their stories (www.arsvirtual.com/visitas/visitas/Alhambra). Probably the best example identified for interactively combining e-Services through a central map, is the THEBAN Mapping project (www.thebanmappingproject.com). Its website shows the Valley of the Kings, and the Theban Necropolis. It allows users to explore the place interactively, allowing entrance to the tombs through a 3D virtual tour. This tour enables the user to pause the tour at any point, so that the user can click on items mentioned and pointed out by the storyteller, allowing the user to explore interpretive material in more detail (e.g. close-up images and expanded textual information). Whenever the user desires, the tour can be resumed. It provides further links to the archaeological developments on site. This example shows the potential of cultural attraction websites, overcoming accessibility restrictions for users not able to visit the place, and also enabling users to access as much information and

explanation as they desire. Users can have these generic experiences on the website which support other heritage interpretation aims such as learning and entertainment.

More focused on learning are online exhibitions, collections and databases which are a core e-service provided by many museums. Top museums with large collections, such as the Rijskmuseum (www.rijksmuseum.nl/meesterwerken) and the Tate Gallery (www.tate.org.uk/learning/schools), provide interconnected services such as virtual tours and searchable databases, including pictures and textual information. They also link from their exhibitions to further, more focused, fun tools. Information is not only connected via maps, but related to artists, themes, and also through a time line (www.musee-suisse.com). Many attractions and museums provide learning material for use offline and online. Offline material is most commonly targeted at educators for use within classrooms or linked to a museum visit. Online material either links to databases to support educators, or focuses more on making learning fun in targeting younger audiences, and those who still feel young. These outcomes can be achieved through sub websites especially designed for young people, or through games and fun tools. These vary from crossword puzzles and quizzes to game environments (www.kindermuseum.at). These game environments can also be linked to online exhibitions (www.thetech.org/nmot), or be introduced and connected to the places' mascot as in the case of Poldi (www.schoenbrunn.at/kinder) the castle's ghost. But not all learning activities are focused on the younger market. Despite online databases and collection access some examples provide adult learners with interactive learning tools (www.nationalarchives.gov.uk/gettingstarted/in_depth_guides.htm, www.musee-suisse.com).

Two examples on German destination websites were identified that make significant use of heritage interpretation, integrating stories and legends about the place by using a variety of interpretative media such as sound, videos, and pictures. Bremen (www.bremen-tourism.de/bremen.cfm?menu=Stadtmusikanten-Casting) presents the famous fairy tale from the Brothers Grimm related to its city, the "Bremer city musicians", portraying them in a casting situation for musicians' positions, and connecting this to different stories and factual information. The Stuttgarter Staeffele (staircases) (mw.hdm-stuttgart.de/staeffele) is a tool independent from the main website, telling stories related to each staircase, shows pictures and provides audio files where stories and facts are told. This is presented on an interactive abstract map, connecting the staircases. An increasing number of destinations are developing podcasts to be used either virtually or during the visit to the city (www.brusselsinternational.be). Dublin's iWalks are supported through map based printouts (www.visitdublin.com/multimedia/DublinPodcast.aspx?id=275).

4 Conclusions and Industry Implications

The results highlight the direct influence that heritage interpretive provision has on overall satisfaction in visitor experiences and the influence that this has on visitor perceptions of best experiences at museums that involve interaction and the use of the

senses. This underlines that a key focus should continue to be on content but that enabling improved access and understanding through the use of interactive interpretative media is valuable in cultural heritage tourism contexts. The stimulation of senses and emotions appropriate to the media employed is also likely to enhance online visitor satisfaction. In the virtual world, human senses are somewhat curtailed because of a dominance of the visual, though motioned images and sound can be used to emulate touch and smell.

Differences related to visitor profiles underline the need to cater for different target groups – e.g. residents/tourists, with/without children – and to choose interpretative media that suit the preferences of different age and target groups. Messages aimed at visitors with children, and interpretative media used in this context need to be fun, as well as supporting the learning aspect. It might be that the same content is delivered through different interpretative media to reach the different markets, making it more accessible. Many attraction websites already cater for different groups, enabling visitors to access similar information at different levels according to need. There is still much untapped creative potential to exploit the opportunities that technology provides for a range of virtual experiences, and heritage providers and operators should look more thoroughly at ways to engage consumers offsite as well as onsite.

Results related to perceived best experiences indicate that the practices of listening and/or watching, learning something new, actively doing something, and comparing the situation with something known and/or experienced before are important to satisfaction. All of these demonstrate that heritage interpretation is perhaps more human than many researchers and practitioners had imagined, and that people enjoy the processes of being engaged and moved and valuing these experiences above simple passivity. Similarly, stories, both personal and about the time and places represented by the museum, are important for a good experience indicating the desirability of making emotional and personal connections with visitors. This underlines the importance of interpretation in enabling visitors to experience material and immaterial cultural heritage, enabling them to connect with their own stories, to remember or to share. Online this experience could be emulated through the use of integrated e-Services, enabling people to listen, to watch and to experience stories as well as to share them online (verbally and through pictures), and could be encouraged by interaction with welcoming, appealing websites and e-Services. Additionally, the survey of existing e-Services found on tourism websites can be used to define suitable attributes for the emulation of satisfactory heritage interpretation designs - e.g. integrative navigation experience, the provision of interactive tools, virtual visits and the introduction of differential navigation paths for diverse target groups enabling customised visits. The current situation strongly suggests that the industry has the technical capability to implement e-Services in support of online heritage interpretation. This research project shows that this is something that should be further developed and more widely adopted, and furthermore can contribute by enabling systems of benchmarking to be established relating to contemporary best practice as well as providing a rationale.

E-Services for heritage interpretation can fulfil a double functionality for both cultural attractions and destination websites. Firstly, E-Services can enhance users' experiences of their virtual visit by helping them to engage in an interpretative and personalised navigation through the exhibit. Secondly, opportunities are also provided for operators to use such tools for the development of a unique and distinctive online experience and subsequent stronger brand image differentiation. Further studies should focus on the attributes of effective communication for online heritage interpretation, and on how providers can incorporate such technologies into their overall interpretative strategies.

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Open Space – a Collaborative Process for Facilitating Tourism IT Partnerships

Philip Alford

Department of Tourism & Leisure
University of Bedfordshire, UK
philip.alford@beds.ac.uk

Abstract

The success of IT projects depends on the success of the partnerships on which they are based. However research has identified a significant rate of failure in these partnerships, predominantly due to an overly technical mindset, leading to the question: "how do we ensure that, as technological solutions are implemented within tourism, due consideration is given to human-centred issues?" The tourism partnership literature is explored for insights, revealing that issues connected with power, participation and normative positions play a major role. The method, Open Space, is investigated for its ability to engage stakeholders in free and open debate. This paper reports on a one-day Open Space event sponsored by two major intermediaries in the UK travel industry who wanted to consult their business partners. Both the running of the event and its results reveal how Open Space has the potential to address some of the weaknesses associated with tourism partnerships.

Keywords: tourism partnerships, Open Space, collaboration, stakeholder participation, boundary critique, normative position.

1 Background

Outside of the vertically integrated tour operations of big players such as TUI and First Choice, the tourism industry is not characterised by vertical and horizontal integration but rather by a network of partnerships which create the tourism product "assembly process" (Bramwell and Lane 2000: 1). According to Zhou (2004: 198): "Partnerships are important because of the nature of the hospitality and tourism industry, which is an interrelated group of businesses that serve the needs of travellers". The people focus is normally discussed in the business-to-consumer (B2C) domain in the context of the customer / supplier interaction as described above. However people also play the leading role in the business-to-business (B2B) domain, where the effective packaging and distribution of the tourism product requires collaboration and 'co-opetition' – "when organisations collaborate with players that they would normally regard as competitors" (Buhalis, 2003: 336). A study of the B2B processes for a cruise operator revealed that the accounting, sales, and inventory and fulfilment processes depended on partnerships within the supply chain (Alford, 2005). IT is an important facilitator of these partnerships but their success, first and foremost, is dependent not on technology but on the level of consensus among stakeholders.

2 Introduction

This paper reports on applied research undertaken as part of the author's doctoral research (Alford, 2007b). A one-day event was organised in December 2002 to facilitate engagement with travel industry organisations by ntl travel and Galileo, two major intermediaries in the UK packaged leisure travel industry who wanted to investigate the issues and opportunities associated with travel distribution and technology. The workshop was facilitated by the author through the method, Open Space (Owen, 1997).

2.1 Aim

The overall aim of this paper is to investigate the role of Open Space (OS) as a method for engaging stakeholders during the IT consultation and planning stages.

2.2 Objectives

The objectives of this paper are to:

- examine the role of partnerships in tourism IT and potential causes of failure
- investigate the potential of OS in surfacing stakeholder normative positions
- examine the potential for augmenting OS with boundary critique

2.3 Purpose

The purpose of this paper is to critique the contribution that OS can make to the stakeholder consultation process, and to strengthen OS through the incorporation of the theory and practice of boundary critique – a field of study located in Critical Systems Practice in Management Science. The author facilitated an OS event at the ENTER 2006 conference in Lausanne, Switzerland, in a workshop which explored collaboration between academics and industry in the Tourism IT field. In December 2007 the author will facilitate an executive forum, organised by Travel Technology Initiative (www.tti.org), to investigate the technology issues facing UK tour operators and agents.

3 Theory/issues

Despite their importance, there is a marked rate of partnership failure, particularly in inter-organisational, multiple stakeholder, business-to-business (B2B) IT implementation projects. The reasons lying behind this failure have been investigated in earlier studies by the author (Alford, 2004; 2007b; 2007a) and are encapsulated in the following problem definition in the author's PhD thesis: "multi stakeholder B2B Tourism IT projects are dominated by a view which privileges the technology at the expense of considering the interaction with that technology by human actors, and that this view is a contributory factor to a high rate of failure. We therefore have a problem which can be stated as: how do we ensure that, as technological solutions are implemented within tourism, due consideration is given to human-centred issues?" (Alford, 2007b:4). A range of methodological approaches were deployed in the author's doctoral research in addressing this question and this paper focuses on two of

those methods, OS and boundary critique, both of which will be explained in more detail below.

In order to develop insights into the issues affecting tourism partnerships, this section now reviews the role of partnerships within tourism planning to enable a better understanding of the human issues which affect their success. Bramwell and Lane (2000: 3) pose some incisive questions relating to the inclusiveness of partnerships: "Are all participants in a partnership fully involved in the discussions, is there mutual respect and shared learning, and are all participants equally influential in the negotiations and decision-making"?. These are issues of empowerment and collaboration and the ability of OS to generate and sustain these is critiqued later in the paper.

Mason, Johnston et al's (2000c) case study of a project designed to bring stakeholders together to plan Arctic Tourism also allows for reflection on the questions posed by Bramwell and Lane as to the inclusiveness of the partnership process and the opportunity for participants to make equal contributions. It appears as if the terms of reference for the project were established by a core group of participants who attended early meetings and continued to have a dominant say. Restrictions, including funds for travel, computer access and language translation, meant that some participants could not make a contribution at all or at best on an ad-hoc basis. Although accepting the inevitability of such restrictions, the authors point out the "important implications for the process and the final product" (Mason, Johnston et al. 2000: 110). Clearly those participants who did not have the opportunity to contribute to the process, to express their views or to challenge those of others were going to have less ownership of the final product.

Commenting on the non-participation of the private sector in the Costa Dourada tourism project in Brazil, Medeiros de Araujo and Bramwell (2000: 292) caution that "if legitimate stakeholders are excluded or ignored then the quality and degree of acceptance of the project plans will be questionable". This has parallels with the English Tourism Network Automation project critiqued by Alford (2004), in which the national tourism office failed to secure the support of local authorities whose buy-in was essential in determining the success of the project. Medeiros de Araujo and Bramwell (2000: 276) speculate that the exercise of power and coercion, "through access to material or financial resources, or through normative pressure" may have been a factor in the lack of private sector participation. For example, some sections of the private sector appeared to hold the normative position that it *ought not to be* involved in regional public sector projects.

Identifying both who is and who ought to be included in partnerships, and the normative positions which potential project partners hold, would therefore appear to be an important part of developing successful collaboration. Lawrence refers to "evaluative frameworks" (1997) which are made up of values and expectations which

stakeholders apply to an issue in order to determine its legitimacy. Writing with reference to ecotourism in Canada, he refers to:

> "the profit-oriented and conservation-oriented frameworks of the private entrepreneur and the environmental activist. Along with these, however, are the parochial economic and political ideologies of local government, the concerns of local citizens, and the cultural concerns of indigenous peoples" (1997: 310).

These evaluative frameworks are in effect normative frameworks which shape the way in which stakeholders think an issue *ought to be* addressed. Although Lawrence et al refer to one stakeholder changing another's perceptions and to "an approach that accommodates the multiple perspectives and evaluative frameworks of stakeholders", the paper does not elaborate on what this approach might be, other than to stipulate the need for "open communication and unhurried collaboration" (1997: 315).

The theory surrounding OS and boundary critique is now reviewed to develop a theoretical position from which partnerships might be developed and managed, and stakeholders' normative positions critiqued. OS is a process that encourages "emergence and self-organisation" (White 2002: 153). This runs throughout the event – from the co-creation of the agenda, merging discussion issues and organising the breakout spaces. One of the OS guiding principles – "Whatever happens is the only thing that could have" - "is a reminder that real learning and real progress will only take place when we all move beyond our original agendas and convention-bound expectations" (Owen 1997: 96). Bryson and Anderson (2000: 146) state that OS "is most useful when mission, vision, and goals are very unclear and very simple framing and analysis tools are needed" (. However Bryson and Anderson also point to the lack of theoretical support for OS and other large group interaction methods: "Another difficulty in researching LGIMs is that the theoretical bases for each approach need to be articulated better (Bryson & Anderson, 2000: 152)." Lightfoot supports this assertion:

> "Many organizations are now using OS, but little research has been conducted on its effectiveness. Anecdotal evidence from the previously cited organizations has shown that OS is extremely popular among participants and planners (Owen 1997), but there is no actual empirical evidence regarding which aspects of OS work well and if there is any lasting impact" (2003: 8).

With regard to "lasting impact", Bryson and Anderson claim that OS "is probably best for creating ideas, not necessarily action (2000: 152)."

Boundary Critique (BC) - a field of study within Critical Systems Practice potentially has the ability to strengthen the OS process. BC derives from earlier work by Ulrich (1983; 1998; 2003). Ulrich's methodology, Critical Systems Heuristics, emerged from his work in attempting to establish a philosophical and epistemological basis for

socially rational planning: "...in the context of applied social inquiry and planning, being critical therefore means to make transparent to oneself and to others the value assumptions underlying practical judgments, rather than concealing them behind a veil of objectivity" (Ulrich 1983: 20). He designed 12 critical boundary questions which cover four key areas of concern: motivation, control, expertise, and legitimacy, and which contrast the 'is' with the 'ought' encouraging critical reflection on the boundaries surrounding a system. For example, what *is* the purpose and what *ought* to be the purpose? What worldview underlines the system and what worldview ought to underline it?

Ulrich's methodology has been the catalyst for further BC studies. Midgley (1998; 2006), a proponent of boundary critique, focuses on the conflict that arises when groups make different boundary judgements on the same issue. He uses the concept of primary and secondary boundaries and the contested marginal area in between, as part of this focus. When one group makes a narrow boundary judgement (primary boundary) and another makes a wider judgement (secondary boundary), the contested area of difference between them lies in the marginal area. This area contains marginalised elements which effectively represent points of dispute between different stakeholders. The author used this approach in a recent presentation at the Travel Tourism Research Association (TTRA) European conference (Alford 2007a) in critiquing the EnglandNet case study where there was dispute between the national tourism office and an association of self catering businesses, essentially over what ought to be the role of a national tourism organisation (Travel Weekly 2004; Williamson 2004).

The following sections will now describe the OS methodology, report on an OS event, discuss the ability of OS to address some of the weaknesses associated with tourism partnerships, and evaluate the contribution with BC might make to strengthen the OS method.

4 Methodology

OS is based on a study of myth, ritual and culture in U.S.A. and Africa and aims to "combine the level of synergy and excitement present in a good coffee break with the substantive activity and results characteristic of a good meeting" (Owen 1997: 3). OS has been used extensively around the world by organisations, consultants and academics for the facilitation of group processes and meetings including change management, community projects, organisational (re) design, and strategy development (the OS community web site www.openspaceworld.org provides additional information and case studies).

The methodology incorporates the following steps: *The headline issue:* "An Open Space event usually takes the form of a theme or a question which the participants accept responsibility for tackling in collaboration with each other" (White 2002: 153). The theme for the ntl travel / Galileo event was "Travel Distribution & Technology: the Issues and Opportunities". *Opening the event:* The participants are arranged in a

large circle in the main meeting room with quarter flip chart paper, marker pens and masking tape in the centre. The circle is significant as it is a means by which equality is encouraged – there is no table or raised area for panellists at the front of the room. One wall of the room is kept completely free of any obstructions. The facilitator makes the introductions, states the theme and provides instructions for what will happen during the day. Then participants volunteer themselves to come into the centre, write down the issue that they want to debate, announce this to the rest of the group and then tape their issue to the wall (referred to by Owen as the "village market place"). They also post the time slot and location for their discussion on the board. By the time this process is finished the group has moved from a blank wall and a meeting with no agenda to a wall covered in issues and an agenda, time slots and breakout sessions, created by the participants themselves.

The village market place: The "market place" is now open for participants to sign up for the issue / debate in which they are interested. The person who initially suggested the issue is responsible for facilitating the discussion but the way in which this gets done is down to the group itself. *The "law of two feet":* As the discussion sessions convene, there is no rule that each session has to take the time allotted to it or that participants have to stay for the whole session. If they feel they have no more to contribute or to learn, they can move to another parallel session. However there should be a person (s) in the group responsible for submitting a written record / summary of the session. This summary should include a set of action points, designed to work towards proposed solutions to the issue. At the end of the session the summary is printed off and posted on to the "bulletin board" – blank walls around the venue, where participants can read it and add to it if they wish.

Concluding and prioritising issues: The participants reassemble in the main room in a circle and are given an opportunity to vote for those issues that they consider to be a priority. This can be achieved manually or electronically and is designed to facilitate action for the future.

5 Results

ntl travel and Galileo sponsored a one-day OS event in order to find out the distribution and technology issues which travel companies were facing. They were keen to get the 'whole system' in the room – tour operators, travel agents, IT intermediaries and IT suppliers – in order to get an overview of the global issues. Nixon (1998) identifies a long list of benefits, provided by large group methods such as OS and Future Search Conference, derived from getting the whole system into the room. These include "new organisational norms about how to behave are created" and "a sense of common vision and purpose is created" (Nixon, 1998: 6). In the pre-event publicity, Galileo's Vice-President (EMEA) indirectly alludes to this "whole system" approach: "to brainstorm with people who would not normally get together to discuss these issues" (Fox, 2002). This makes it clear that the concept of creating an open communicative space is an unusual one in the travel industry. He was also conveying the point that the event was targeting a broad spectrum of people, not just

technology experts, and that, for non-technology managers, discussing technology-related issues is not common practice within the travel industry. Therefore there was an opportunity to bring 'two worlds' together – the technical world and the business world which often do not mix well.

Galileo employed its marketing agency to assist with the wording of the invitation which captures the essence of OS:

> A departure from the normal seminar format, this Open Space session is for industry 'doers' only. We want the people who, on a daily basis, tackle these issues head on. By creating a sales-free, non-competitive, experience-driven environment, we will be putting the core business needs front and centre. There is no agenda as such. We believe that by assembling the industry's most senior people, we can create our own agenda, an active agenda that will be relevant and real.

Representatives from 35 travel companies in the UK attended the event. The first surprise for delegates was the room layout with all chairs arranged in concentric circles. It was clear from the curious expressions on people's faces that this was unexpected and did not conform to the traditional theatre-style seating, which usually accompanies travel industry conferences. This had the effect of levelling the playing field and creating a shape conducive to participation and collaboration. When invited to nominate their issues, there was an almost immediate surge of activity with some delegates, in formal business suits, on their knees writing issues on the paper. Instantaneously, delegates were empowered to do something and to 'have a say' in creating the agenda. There is, inherently, an emancipatory element to this initial process, with delegates given the freedom to physically move around and propose ideas. In some cases delegates tackled this task individually and in other cases, collectively with someone else. This is in marked contrast to a traditional conference where delegates sit, theatre-style, waiting to hear from the 'experts'.

When all the issues were posted, the delegates gathered at the 'marketplace' to sign up for the discussions they were interested in joining. The output from the 10 discussion groups, posted on the walls around the main conference room, was voted on at the end of the event by delegates in order to prioritise the issues. The issue which attracted the most votes was entitled: "I know technology can be a great enabler - but how do I figure out what to do/invest in first?" This discussion was not primarily a technical one but rather focussed on how smaller travel agents in particular can choose the most appropriate technology for their business. The author, in the role of a delegate, joined this discussion group, which broadly divided into two groups – small agents or agency consortia and IT providers or IT Directors within an organisation. The output, as recorded by the group and by a travel journalist reporting on the event, reflects the concerns that smaller travel organisations have when looking for an IT partner for their business, and raises interesting questions concerning partnerships between smaller players and IT providers. It also highlights the different

"evaluative frameworks" (Lawrence, Wickins et al. 1997: 310) of the two sub groups and the different perceptions of what a 'system' actually is.

From the agents' perspective, technology is often considered intimidating, resulting in inertia. It was revealed that travel agents felt at a disadvantage when negotiating with IT suppliers because of their relative lack of technical skills. One of the group's contributors, the owner of a small chain of independent agents, criticised technology suppliers for not allowing agents to trial technology systems before making a decision whether to purchase them or not. He often makes decisions based on the 'lesser of two evils' – hardly a rational approach. The primary need is for agents to get their brand in front of customers, and this business process is something that IT providers might not fully understand. Finally, the delivered IT solution often falls short of the agent's expectations. From the IT provider perspective, there is an onus on agents to become more "techno-aware", to articulate business requirements clearly, and to give IT providers enough time to understand their needs – these steps will help to prevent agents becoming a "victim". The use of words such as "intimidating" and "victim" also points to coercion and power as relevant issues.

Although not available as part of this empirical research, it is postulated that Ulrich's 12 critical boundary questions and Midgley's application of primary and secondary boundaries would be an effective means for not only stimulating debate but also for summarising stakeholders' normative positions. Ulrich's questions could be used to frame part of the discussion in a formal sense or simply as a tool to ask searching questions. For example, in the ntl / Galileo event, debating what is the purpose of an IT system and what ought to be its purpose would have explored further the differing positions held by small travel agents and by IT providers. The former highlighted the importance of putting their brand in front of the customer and the extent to which IT could enable that. Midgley's approach can be applied graphically to highlight points of difference between stakeholders – such a graphic approach was taken in the author's thesis (Alford 2007b) and his TTRA presentation (Alford 2007a). In the ntl / Galileo event this technique would have been useful in illustrating the business priorities of agents versus the technical priorities of providers. The suggestion is not that these two positions should be diametrically opposed but rather to highlight the potential points of difference between the means-ends efficiency which often dominates technical perspectives and the more 'messy' reality of business and organisational issues.

Recommendations reached by the group included "Talk to other companies in a similar position", "Educate yourself on technology", and "Understand benefits/costs/timeframes - be realistic". A suggestion was made that case studies of best practice IT use in the travel agency community be developed and published, thereby providing a useful resource and a means of addressing the power imbalance through knowledge transfer. This technique was identified by Medeiros de Araujo and Bramwell (2000) for involving stakeholders in a project. Such case studies would contain insights which could then further inform the discussion and partnership

process. Where, for example, technology suppliers lay claim to certain benefits accruing from a system, travel agents must be empowered to debate that claim from a position of equal strength. The use of case studies of best practice among travel agents would enable this by contributing evidence to assist in the debate of those claims. For example, one of the primary objectives of travel agents which arose from the OS discussion is "to put their brand in front of their customers" – an example of IT as an enabler of business processes; the ability of technology to enable this could be ascertained through detailed case study analysis and discussion. In this way the distortion is eased, as travel agents are in less of a position of powerlessness and now possess some knowledge, from a trusted source, which they can use in their deliberations and negotiations. It empowers them to raise issues with their technology suppliers from a position of strength.

The question remains as to the next step, after an OS event has finished, normative issues have been surfaced and a spirit of collaboration attained. One delegate, after the ntl / Galileo event, praised the participant-centred nature of OS, but questioned its ability to facilitate real action-oriented change. This limitation was identified earlier by Bryson and Anderson in their evaluation of a range of large-group interaction methods (LGIMs). The ntl / Galileo event did allow time for voting on the issues in a plenary session, but of course this is no guarantee that anything will be done afterwards. Although the groups reached conclusions and made recommendations, tangible follow up was never part of the original objective which the two sponsoring organisations set for the event. This was principally to create "whole system" insights, increase awareness and generate positive publicity, all of which were undoubtedly achieved by the OS event. Furthermore, any follow up action would have taken place over the longer term, when the author's relationship with the companies had finished. Again, while not part of the original research agenda for this event, it is postulated that the methods linked to BC could provide useful frameworks for facilitating future action. For example, by clearly identifying stakeholders' normative positions and points of difference between boundaries, a plan of action for further exploring and addressing these issues could be recommended.

6 Conclusions and future research

The original problem was stated as: "how do we ensure that, as technological solutions are implemented within tourism, due consideration is given to human-centred issues? (Alford 2007b:4)" The issues arising from the tourism partnership literature related to the importance of empowering partners, providing them with the opportunities to contribute equally and free from coercion, and identifying their evaluative, normative frameworks. There are a number of elements to Open Space which address these issues and point to its role as a suitable method to facilitate more effective Tourism IT partnerships. The review of tourism partnerships revealed that the involved and affected concept of inclusivity is a central one in ensuring the success of partnerships. OS gives all delegates the opportunity to effectively construct their own agenda for the day, thereby enabling those affected by an issue to have their voice heard, regardless of status. There is one caveat here in terms of the

ntl / Galileo event – namely that it was invitation-only, with a potential list of invitees drawn up by the two sponsoring companies. This presented challenges to the author as a researcher and required active intervention in order to ensure that small independent travel agents were adequately represented at the seminar. This intervention added an important perspective to the discussions reported in this paper.

In planning discussions with TTI about its forthcoming Executive Forum, which will be facilitated by OS, a number of suggestions were discussed for generating follow up action; monitoring the effectiveness of these suggestions will form the basis for a future research agenda. Firstly, delegates should be asked to attach their names to issues which they would be prepared to take responsibility for following up. A second suggestion, drawing on a shortcoming of the ntl / Galileo event, is to allow more time in the plenary to facilitate discussion of prioritised issues in addition to voting – thereby combining qualitative with quantitative insights. A third possibility is to allow for sessions after the prioritisation – 'action-planning' sessions, which would specifically be devoted to what action needed to be taken and by whom. The author will also take the opportunity to investigate the contribution which BC methods can make to strengthening the OS process.

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Determinants of Restaurant Employees' Technology Use Intention: Validating Technology Acceptance Model with External Factors via Structural Equation Model

Sunny Ham[a],
Woody G. Kim[b], and
Hazel W. Forsythe[a]

[a] Hospitality and Tourism Management/Department of Nutrition and Food Science
University of Kentucky, USA
sham2@uky.edu

[b] Dedman School of Hospitality
Florida State University
wkim@cob.fsu.edu

Abstract

The study aims to examine if the Technology Acceptance Model (TAM) works for restaurant operations in using computing systems. In addition, we pursued other external variables, not included in the original TAM, to see how they affect perceived ease of use, perceived usefulness, and intention to use. These included user characteristics, system quality and organizational support. The survey collected data from restaurants in Kentucky, and the response rate was 25% based on the total contacts eligible. SPSS 15.0 and AMOS 7.0 were used for the data analysis. Structural Equation Modeling (SEM) was the primary analysis used to examine the proposed hypotheses developed in fulfilling the study objectives. The SEM statistics supported all the proposed hypotheses but one. The SEM results were interpreted relative to industry implications.

Keywords: TAM; Restaurant computing systems; external factors; SEM.

1 Introduction

The purpose of the study was to develop and verify a conceptual model on the use of technology in restaurants. Specifically, the study intended to validate user acceptance of technology use in restaurant operations. The use of technology in restaurant operations has been researched less than other hospitality industry sectors such as hotel and tourism sectors (Lam, Cho, & Qu, 2007; Kim, Lee, & Law, In Press; Lee, Kim, & Lee, 2006) despite the growth in technology use. The framework of this research is modified from the Technology Acceptance Model (TAM). TAM has been explored frequently in the use of technology acceptance and has been modified in order to investigate appropriate factors that affect user acceptance in a variety of industry sectors.

The results of the study will demonstrate if the TAM is an appropriate tool to measure the use of technology in restaurants. The study findings will benefit the restaurant industry if TAM use is shown to positively affect restaurant operations by increasing revenue and customer satisfaction through the promotion of technology use.

The TAM on which this study was based, originally developed by Davis, Bagozzi, and Warshaw (1989), has been recognized as one of the most influential extensions of the Theory of Reasoned Action (TRA) to determine factors that influence technology acceptance. TAM is a theory that models how users accept and use a technology and has been applied to and empirically tested for a variety of business settings, including the hotel and travel industry (Lam, Cho, & Qu, 2007; Kim, Lee, & Law, In Press; Lee, Kim, & Lee, 2006). However, little research has been devoted to the application of TAM in the restaurant operations (Park, 2006). Based on the literature, little research has been noted on employees' acceptance of technology use in restaurant operations. The present study proposes the research framework depicted in Fig.1.

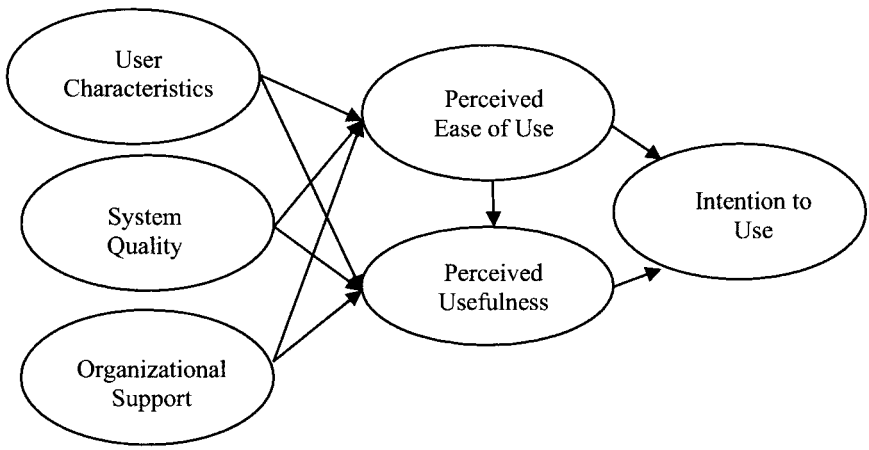

Fig. 1. Suggested Research Model

The study intends to determine the factors affecting restaurant employees' technology use intention. For the end result, TAM was applied while additional constructs were added. The additional constructs that we proposed to affect restaurant employees' technology use included user characteristics, system characteristics, and organizational support, which were adopted from Igbaria et al. (1995).

The suggested model holds five research objectives in employees' technology use intention for restaurant operations, 1) to determine if external factors (user characteristics, system characteristics, and organizational support respectively), affect

perceived ease of use positively, 2) to determine if external factors, respectively, affect perceived usefulness positively, 3) to determine if perceived ease of use affects perceived usefulness positively, 4) to determine if there is a positive relationship between perceived ease of use and behavioural intention to use the computing systems, and 5) to determine if there is a positive relationship between perceived usefulness and behavioural intention to use the computing systems in restaurant operations,.

The study objectives engendered the following hypotheses.

Hypothesis 1: User characteristics (along with computer experience and user training) have a positive impact on perceived ease of use in utilizing computing systems for restaurant operations.

Hypothesis 2: System characteristics (quality) have a positive impact on perceived ease of use in utilizing computing systems for restaurant operations.

Hypothesis 3: Organizational support has a positive impact on perceived ease of use in utilizing computing systems for restaurant operations.

Hypothesis 4: User characteristics (along with computer experience and user training) have a positive impact on the perceived usefulness of utilizing computing systems for restaurant operations.

Hypothesis 5: System characteristics (quality) have a positive impact on the perceived usefulness of utilizing computing systems for restaurant operations.

Hypothesis 6: Organizational support has a positive impact on the perceived usefulness in utilizing computing system for restaurant operations.

Hypothesis 7: Perceived ease of use has a positive impact on the perceived usefulness of utilizing computing systems for restaurant operations.

Hypothesis 8: Perceived ease of use has a positive impact on the intention to use computing systems for restaurant operations.

Hypothesis 9: Perceived usefulness has a positive impact on the intention to use computing systems for restaurant operations.

After the survey development, it was clear that six constructs would be measured with indicator variables. Herein, the proposed model was illustrated with six latent variables along with hypotheses described above.

2 Theoretical Background

2.1 TAM use and Explanation on the constructs

The TAM research (Davis, 1986, 1989) claims that perceived usefulness (PU) and perceived ease of use (PEU) "correlate with system use, a relationship that seems to explain fairly well why people accept or reject an IT" (Gefen & Straub, 1997, p. 390). The TAM model shows that PU and PEU causally affect user attitudes which, in turn, affect user intentions which, subsequently, affect the actual system use.

Of the factors affecting the user acceptance of computer technology, Fishbein and Ajzen's (1995) TRA and Davis et al's (1989) TAM are the two most frequently employed by Management Information System researchers (Igbaria et al., 1995). Although both models proved adequate in satisfactorily predicting usage and intentions, the TAM "was found to be a much simpler, easier to use, and more powerful model of the determinants of user acceptance of computer technology" (Igbaria et al., 1995, p. 89). Also, its concise attitudinal determinants were found to be superior to the TRA's bigger set of measures. Igbaria et al. (1995) suggest that the external factors affecting those determinants (e.g., PU and PEU) of usage need to be further studied .

Davis (1989) has provided significant support for the claim that perceived usefulness directly and positively affects usage intention. Moon and Kim's work (2001) claimed that ITs (in this case, Internet banking) that are easy to use will be less intimidating to the user and thus more likely to be adopted by them. Wang, Wang, Lin, and Tang (2003) suggest that PEU will have a positive relationship with PU, perceived credibility, and behavioral intention. Wang et al. (2003) identified "perceived credibility" as a dimension that reflects the user's security and privacy concerns in the acceptance of Internet banking. Their findings demonstrated the significant influence of computer self-efficacy on behavioural intention via PEU, PU, and perceived credibility, confirming the extended TAM in predicting the users' intention of adopting Internet banking.

2.2 External Factors added to TAM model

Igbaria et al. (1995) posit that user beliefs are determined by three external factors: individual, organizational, and system characteristics. The TAM model predicts that these external characteristics influence users' beliefs and thereby directly affect their behaviour.

The individual characteristics, built on Zmud's (1979) theoretical model, play a vital role in MIS success (Igbaria et al., 1995). In the case of computer technology (as well as all new technologies), the skill level of individuals employing the technology—as well as the technology itself—are pivotal to the acceptance of the technology (Nelson, 1990). The skill levels of individuals are directly correlated to user training and experience (Gist, 1987). Therefore, the more training individuals receive, the more

comfortable they are with the technology, their comfort level influences their beliefs and attitudes toward the technology. Previous researchers (Delone, 1988; Fuerst & Cheney, 1982; Igbaria, Pavri, & Huff, 1989; Kraemer, Danziger, Dunkle, & King, 1993; Lee, 1996; Leitheiser & Wetherb, 1986) confirmed that user training and computer experience were found to be in line with system usage. The converse is also true: the greater the lack of training and experience, the greater the resistance in user attitudes and beliefs toward adopting the new technology.

Several researchers (Ein-dor & Segev, 1978; Fuerst & Cheney, 1982; Igbaria, Pavri, & Huff, 1989; Lucas, 1978) have pinpointed organizational support as a major factor in affecting user beliefs and attitudes about the system. It may seem self-evident, but Robey and Zeller (1978) have documented that the quality of the system directly affects system usage. In fact, the quality of a system functions as a "source of information relevant to feelings of self-efficacy, judgments of mastery, and self-determination, and hence as determinants of perceived ease of use and usefulness" (Igbaria et al., 1995, p. 93). Continuing the research into the IS community, Szajna (1996) hypothesizes that a person's beliefs (his PEU and PU) inform his attitudes, which determine his intention to accept or reject a new IS. However, this correlation is made problematic by the fact that attitudes, beliefs, and intentions are affected by such external variables as political influences, organizational factions, tasks given to perform, user characteristics, and so on. Szajna (1996) proposes to apply the TAM model to this recursive mixture of influences in order to resolve the previous inconclusive research findings.

2.3 IT research on the restaurant industry

In spite of the growing IT adoption rate in hospitality firms, limited research has been done for hospitality and tourism companies such as hotels (Lam, Cho, & Qu, 2007; Kim, Lee, & Law, In Press) and travel agencies (Lee et al., 2006) in the hospitality industry. Lam et al. (2007) examined the impact of perceived IT beliefs, task technology fit, attitude, and self-efficacy on Chinese hotel employees' behavioral intention of IT adoption. They found personal self-efficacy was the most influential variable affecting employees' behavioral intention followed by attitude.

Kim, Lee, and Law (In Press) used an extended TAM to examine the influence of information system quality and perceived value on users' acceptance of hotel property management systems (PMS). Perceived value of the PMS had the largest impact on attitude of hotel employees towards IT use behavior among the predictors of attitude towards use (i.e., perceived ease of use, perceived usefulness, and perceived value). Lee et al. (2006) investigated the relationship between users' perceptions and beliefs about a proposed system and their daily usage in the context of the travel industry's computerized reservation systems (CRS). They used the TAM to investigate the effects of task, career, and organization fits on CRS users' routine usage. The findings showed that none of three dimensions of fit have any significant influence on perceived ease of use, while they all have significant relationship with perceived usefulness. They found that users' intentions were affected by various evaluations (attitudes and beliefs)

of the system. Consistent with many previous findings (Agarwal & Karahanna, 2000; Davis, 1989; Igbaria et al., 1995), the authors showed that perceived usefulness is a stronger determinant of CRS users' intention to use than perceived ease of use. Park (2006) adopted TAM to investigate the acceptance of the Intranet in restaurant franchise systems. The author extended the TAM model by adding an external variable, franchise support. Regression analysis reveals that TAM is a valid model in predicting Intranet adoption in restaurant franchise systems.

3 Methodology

3.1 Sample and Data Collection

The sample of the study is employees in restaurants which are affiliated with the Kentucky Restaurant Association and who have used computing systems in their work. The Directory of Kentucky Restaurant Association offered the names and addresses of restaurants in Kentucky. The employees who have worked for restaurants at least three years were eligible to participate in the survey. The initial survey was mailed to 689 restaurants on March 27, 2007, followed by follow-up postcards and second mailing. Out of the 689 in the original sample, the completed surveys were 167, and thus, the response rate, 25%, is based on a pool of 659 eligible addresses.

3.2 Research Instrument

The survey was based on the previous research on technology usage acceptance or adoption intention (e.g. Igbaria et al., 1995; Lee et al., 2006) and modified to fit restaurant operations. The survey consisted of three parts. Part one features items for user characteristics, system characteristics, and organizational support and those items were designated in the research model as external factors hypothesized to impact restaurant employees' computer usage intention mediated by constructs in original TAM. Computer Experience and user training are included in the user characteristics. Computer experience items measure employees' experience of using four different types of software in their routine work and they are 1) Microsoft Windows applications (such as Word, Excel, and PowerPoint), 2) Internet, email or websites, 3) restaurant/business specific applications (such as inventory & purchase order, customer relationship), and 4) portable tools used in the restaurant industry (such as handheld terminals, fixed touch screen terminals, wireless headsets for servers). For the user training items, the respondents were asked to answer to which degree they were trained for using computers 1) from schools (middle/high school, college), 2) computers/Point-Of-Sale system from vendors, by the restaurant or restaurant company. A 5-point Likert-type rating scale was used for the items' measurement, from (1) none to (5) extensive.

Another construct as an external factor, system characteristics, included four items indicating different dimensions of the quality of the computing system used in the restaurant operations. They are functionality, equipment condition, performance, and

interactivity, which were generated from previous publications (Igbaria & Chakrabati, 1990; Igbaria et al., 1990; Lucas, 1978; Lucas, 1975). The responses ranged from (1) poor to (5) excellent by applying a 5-point Likert-type rating scale.

The other construct of Part one was organization support. Previous research (Igbaria, 1990; Igbaria & Chakrabati, 1990) identified two components in measuring organizational support for computing system use, end-user support and management support. The survey includes four items, such as availability of assistance, specialized instruction, guidance in using specific software applications, and computer/POS use encouragement by company/manager/operator. Those four items for organizational support opted from (1) strongly disagree to (5) strongly agree in responses.

Part two of the survey encompasses items for perceived usefulness, perceived ease of use and intention to use. The items were adapted from Davis (1989) and modified to make them relevant to computers/POS in restaurant operations. Perceived usefulness and ease of use are the two measurements of beliefs in TAM in predicting technology acceptance. The beliefs measure if using computing system would enhance his/her job performance (perceived usefulness) and if learning/using the computing system would be free of effort (perceived ease of use). For our study, perceived usefulness and ease of use constructs were measured with three items, respectively, using a 5-point Likert-type rating scale, anchored from (1) strongly disagree to (5) strongly agree. The other construct in part two, intention to use, asked respondents to rate their agreement on the statements about their intention to use computing systems/POS in their routine working environment. One item about recommending use of POS to others was added to the intention to use construct from Moon and Kim (2001). There were three items in the intention to use, and measured with a 5-point Likert-type rating scale, ranging from (1) highly unlikely to (5) highly likely.

Part three asked restaurants' information on demographics, including location, type, food type, size of the restaurant. The restaurant type encompasses four sectors, such as casual/family, quick service, take out/delivery, and others. The type of food listed American, Mexican, Chinese, Indian, Japanese, Italian, and others.

3.3 Data Analysis

SPSS 15.0 was used for the collected data analysis. Descriptive statistics were computed for all the variables. Reliability test was performed on each construct to verify if individual indicator variables are good to represent the designated construct. Amos 7.0 was employed to verify the hypotheses proposed in the research model. Construct validity was measured with convergent validity and discriminant validity. As a final analysis of the study, Structural Equation Modeling (SEM) was performed to empirically test the relationship of the constructs in the proposed model.

4 Results

4.1 Reliability and Validity Test

Cronbach's alpha coefficients were calculated on all six constructs to measure the internal consistency reliability. Reliability test resulted in a low Cronbach's alpha coefficient for user characteristics (0.56), which is not within the limit of acceptability, 0.70, according to Hair et al. (1998). Herein, user characteristics construct was removed for further analysis. The other constructs yielded acceptable levels of Cronbach's alpha coefficients, namely system characteristics (.93), organization support (.81), perceived ease of use (.93), perceived usefulness (.92), and intention to use (.93). A revised model excluding the user characteristics construct was proposed. The directions and signs of the hypotheses in the revised model are shown in Table 1. Confirmatory factor analysis and discriminant validity test confirmed the uni-dimensionality of the constructs in the revised model.

Table 1. Hypotheses in Revised Model

Hypothesis		Signs of Hypothesis
H1	System Characteristics→Perceived Ease of Use	+
H2	Organizational Support→Perceived Ease of Use	+
H3	System Characteristics→Perceived Usefulness	+
H4	Organizational Support→Perceived Usefulness	+
H5	Perceived Ease of Use→Perceived Usefulness	+
H6	Perceived Ease of Use→Intention to Use	+
H7	Perceived Usefulness→Intention to Use	+

4.2 Structural Model Fit

Using SEM, the statistics were generated to see if the proposed model fits the data. According to all the statistics ($\chi 2$ =189.301, df= 110; p<.001; CMIN/DF=1.72; CFI=.97; GFI = .89; AGFI = .85; RMSEA = 06.), the proposed model proved a good fit to the data and the statistics are presented in Table 2. With all the statistics indicating goodness-of-fit, the proposed model is not rejected.

The other group of statistics suggesting the model fit relative to the inclusive constructs are Squared Multiple Correlations (SMC). The proposed model draws that there were three dependent variables, perceived ease of use, perceived usefulness, and intention to use. According to SMC statistics, the model explained 46.3% of variance in perceived ease of use (SMC=.463), 64.6% of the variance in perceived usefulness (SMC=.646), and 41.3% of the variance in intention to use (SMC=.413).

Table 2. Results of Structural Equation Model

Path	Standardized Path Estimate	*p*-value	*Hypotheses testing*
H1: System Characteristics→Perceived Ease of Use	.41	<.001***	Accepted
H2: Organizational Support→Perceived Ease of Use	.35	<.001***	Accepted
H3: System Characteristics→Perceived Usefulness	.32	<.001***	Accepted
H4: Organizational Support→Perceived Usefulness	.32	.001***	Accepted
H5: Perceived Ease of Use→Perceived Usefulness	.30	<.001***	Accepted
H6: Perceived Ease of Use→Intention to Use	.08	.422	Not Accepted
H7: Perceived Usefulness→Intention to Use	.59	.001***	Accepted

$\chi 2$ =189.301, df= 110; p<.001; CMIN/DF=1.72; CFI=.97; GFI = .89; AGFI = .85; RMSEA = 06.
***$P\leq$.001

The path coefficients provide the basis for the relationships hypothesized in the proposed model. Hypothesis 1, 2 examined the impacts of system characteristics and organizational support, respectively, on perceived ease of use in utilizing computing systems in restaurant operations. Hypothesis 1 (system characteristics→perceived ease of use, β=.41, p<.001) and hypothesis 2 (organizational support→perceived ease of use, β=.35, p<.001) were accepted with the positive path coefficients. The restaurant employees viewed system quality and organizational supports as significantly important components affecting when they used computing systems.

Hypothesis 3 and 4 are concerned with the effects of system characteristics and organizational support, respectively, on perceived usefulness of using computing systems in restaurant operations. Hypothesis 3 (system characteristics→perceived usefulness, β=.32, p<.001) and hypothesis 4 (organizational support→perceived usefulness, β=.32, p=.001) were supported with positive and significant path coefficients. With the positive path coefficients, the better the quality of computing systems they have, and the more organizational supports they have for computing systems use, the more they feel using a computing system is useful or beneficial in doing their routine work.

Hypothesis 5, 6, and 7 investigated the relationships among constructs originally included in TAM. Hypothesis 5, the impacts of perceived ease of use (β=.30, p<.001) on perceived usefulness was significant. Hypothesis 6, perceived ease of use yielded a positive but not significant effect on perceived usefulness (β=.08, p=.422), while the positive effects of usefulness (β=.59, p=.001) on intention to use were verified in the restaurant computing system usage. In summary of the SEM results interpretation of

the proposed model, all of the hypotheses were supported with positive significance, with the exception of hypothesis 6.

5 Conclusion and Implications

The study intended to examine if TAM works for restaurant operations in using computing systems. In addition, we pursued other external variables, originally not included in the TAM, namely user characteristics, system quality and organizational support. The survey was distributed to restaurants from the Kentucky Restaurant Association.

The SEM statistics support all of the proposed hypotheses but one. All external variables included in the revised model (system characteristics and organizational support) produced positive and significant impacts on perceived ease of use and perceived usefulness. Among the relationships in the original TAM, the relationship about perceived ease of use and intention to use was not supported.

Organizational support showed a significant influence on both PEU and PU. Financial and human resources allocated for restaurant employees and guidance in specific application software may not only improve the ease of use, but also foster higher perceived usefulness. In other words, additional assistance program offered by restaurants has a positive influence on enhancing work performance, increasing productivity, and completing a quick task. PEU had a significant influence on PU, which is consistent with previous findings (Davis,1989; Davis et al., 1989; Adams, Nelson, & Todd, 1992; Igbaria et al., 1995).

The effect of perceived usefulness and ease of use on the behavioral intentions can be different along with the different purposes of the system. For instance, in case of more task-purposing technology (e.g., spreadsheet), the effect of perceived usefulness on intention to use is more significant than perceived ease of use. On the other hand, in entertainment-purposing WWW use, the influence of perceived ease of use is more significant than perceived usefulness (Moon & Kim, 2001; Gefen & Struab, 2000). In other words, if the respective system is used by the purpose itself, the role of perceived ease of use increases. However, if the system is used as the tool to perform the other work, the role of perceived usefulness is more influential. Thus, the significant relationship between PU and intention to use was confirmed in this study. On the other hand, the insignificant relationship between PEU and intention to use can be explained by the same logic.

Consistent with previous findings (Agarwal & Karahanna, 2000; Davis, 1989; Igbaria et al., 1995; Pijpers et al., 2001; Lee et al., 2006), POS usage intention in the restaurants was heavily influenced by perceived usefulness rather than perceived ease of use. The findings confirm that POS users in the restaurants would consider the functionality of the POS system more important than ease of use. Since POS is mainly utilized as the vehicle to improve the productivity of restaurant business, it is not

surprising to find the significant influence of PU on intention to use. The results may imply that the most recent POS systems are touch-screen and already easy to use to the restaurant operator. In addition, most restaurant employees are getting used to using easy systems without intensive training which had been required in the past. Thus, POS developers and marketers should keep that mind that POS needs to be equipped with a variety of useful functions first, before the ease of use is highlighted as a selling point.

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etBlogAnalysis –Mining Virtual Communities using Statistical and Linguistic Methods for Quality Control in Tourism

Klemens Waldhör,
Alexander Rind

Krems Research
Forschungsgesellschaft mbH, Austria
{klemens.waldhoer; alexander.rind}@kremsresearch.at

Abstract

Travellers use Virtual Communities such as blogs or forums to share their experiences. This content can give invaluable support in developing and improving tourism products. Since the quantity of online travel reports has exploded in recent years, tourism managers and marketers cannot check all the entries potentially mentioning their product, enterprise or destination. The approach of the etBlogAnalysis project, which aims to provide a semi-automatic tool for this purpose, is described. This software includes routines for crawling, sentiment extraction and text categorisation. It combines robust linguistic parsing methodology with information and terminology extraction methods in order to determine polarity and power of expressions.

Keywords: Virtual Communities; Blogs; Computational Linguistics; Information Extraction; Text Understanding; Sentiment Analysis.

1 Introduction

Virtual Communities (VCs) have become very popular over the past years. Blogs, Wikis, discussion forums, rating services, YouTube, Second Life or Google's Panoramio are examples of VC, which make it easy for people to make their experiences and opinions public. While communities like YouTube or SecondLife focus on the visual experience, blogs, forums and Wikis concentrate on the written word. Even though photos or videos are possible, the communication focus is "text". This implies that blogs can be processed and indexed by software tools. Apart from general purpose search engines, there also exist specialised services for blog search such as Google Blog Search or Technorati.

As a consequence, a travel report provided by a tourist can be found by everyone world-wide. In comparison to pre-Web times, when travel experiences were communicated only to personal acquaintances, positive or negative feedback can now spread fast and have a significant impact on bookings. Virtual Communities can also provide valuable input to market research and allow tourism organisations to stay on top of current tourist behaviour developments. What does the tourist expect, what does he/she think about a destination, where will he/she travel in the next years, how

does he/she communicate his/her experiences, and what does he/she state about a specific hotel?

The project *etBlogAnalysis* studies how tourism organisations can handle the opportunities and risks implied by Virtual Communities. Furthermore a software prototype is developed to support tourism organisations in analysing statements about their products in Virtual Communities. etBlogsAnalysis is a sub project of the ANET (Austrian Network for eTourism) project etNewProduct. This paper gives an overview of the project. Implications of blogs for tourism are described in the next section, while an overview of the software prototype is given in section 3.

2 Blogs and their relevance to tourism

The term blog is short for *Web Log* - personal websites that are frequently updated with new entries and are displayed in reverse chronological order. Blogs can be easily created and maintained without technical experience. They are usually published by a single person or a small group. In comparison to private "homepages", blogs are tightly integrated into the so called *Blogosphere*. Features like comments, track backs, news feeds or bookmarking services (e.g. del.icio.us) allow many forms of interaction with readers. Furthermore blogs are in most cases hosted by specialised providers (e.g. twoday.net), which optimise their content with regard to search engines.

TravelBlogs, online diaries to document travel experiences, are a frequent scenario. Their original purpose is to keep friends and family up-to-date. These resources are also used by other travellers to prepare their next trips. For example they can check whether a hotel has positive or negative coverage before booking.

In addition to blogs there exist numerous Virtual Communities that are specialised on travelling such as TripAdvisor.com or HolidayCheck.de. To a large extend the issues and technologies discussed here in the context of TravelBlogs can also be applied to such text-based Virtual Communities.

2.1 Questions for tourism organisations

Not long ago, tourism organisations (TOs) focused their Web presence on a website or Web portal with beautiful photos, search engine optimisation etc. The organisation acted as an active contributor to the Web while the tourists had to behave "passively", reading the information they found in the Web. As both blogs and other VCs now provide an easy way to move from the passive consumer position into an active content provider position, TOs need to give their attention to VCs.

The following figure summarises some of the questions that TOs have to consider when they want to make use of Virtual Communities (adapted from Waldhör, 2007).

- How do those reports influence readers = potential guests?
  - How do people react to *positive / negative* statements in blogs?
  - How do guests react when they realise a gap between report and reality?
    - Whom will guests blame? TO? Author?
  - Who should be blamed for „negative evaluations and reports"?
    - How should a TO react to negative statements?
  - How are competing TOs referenced in blogs?
    - Image of competition in Web?
- Who "controls" blogs or Virtual Communities? Who provides the blog?
  - Should a TO provide its own blog?
  - How can a TO animate guests to write blog / forum entries?
    - What about opinion leaders? Can they be identified?
  - What about "entries", which are obviously pure marketing entries?
  - What about spam?
- Which kind of conclusions can a TO draw from these sources of information?
  - Using it as a tool for quality assurance and measurement?
  - How can trends be identified?
  - How can products be optimised and further developed?
  - What about market research? Is the analysis used as a replacement or add-on on market research?
    - How and where are tourism destinations / enterprises mentioned / referenced?
    - Which target groups write blogs?
- How can a TO access blogs / Virtual Communities?
  - Watch just specific blogs and forums and how many?
  - Is it possible to read the contents of all relevant blogs in an acceptable time? If yes, how?
  - Which personnel resourced are needed? What are the required qualifications?

Fig. 1. Questions for TOs

2.2 Classification of use cases for blog analysis

Blogs do not constitute a coherent communication mode. Both writers and readers will have different goals depending on the target group. A traveller will read a blog entry with different objectives to a hotel or destination manager. In the remainder of the paper the *focus is given to tourism organisations* (destinations, hotels, travel agencies, transport etc.), which are interested in understanding and learning from the entries written by travellers and guests.

The following table shows how blogs can be classified (adapted from Waldhör, 2007).

Table 1. Tourism Blog Classification

Blog Type	Explanations
Target groups	This classification deals with the type of markets involved. Is the blog dealing with C2C, C2B, B2C or B2B?
Blog target	Here the TO must ask if it is mainly interested in content written about the TO itself or if the focus of analysis is the competition. This will have heavy influence on the number of entries to be reviewed.
Goal of the analysis	There are several goals which can be achieved by the analysis. Quality management, marketing, trend analysis, market research, competition analysis and comparison
Tourism sector	Transportation, accommodation, travel agency, destination, ...
Provider of the blog	Is the blog operated by an independent organisation? Or by a tourism organisation? Is there a mix between independence and offering travel services? Obviously this classification is important when one deals with the credibility of the blog.

Based on the classification, the TO will have to understand different types of texts and also the results generated by the analysis will differ.

2.3 Advantages of automatic blogs analysis

The main challenge in analysing the Blogosphere is to discover all utterances that are relevant to the scenario. As Virtual Communities have produced an immense number of travel reports, which keeps expanding rapidly, this task cannot be executed with reasonable effort. Two arguments in favour of using software support are as follows. Firstly, a manual analysis will require a person to spend some days up to some weeks solely on this task and still only a small part of the Blogosphere would be covered. Consequently most organisations will perform such an analysis just at certain occasions. A software agent works permanently and visits most of the available blogs. Secondly, even if computers have problems with complex linguistic constructs or general knowledge, they outperform humans on routine analytic tasks. A person will quickly get tired and bored. Furthermore a person will be biased by previous experience and tend to overestimate the occurrence of specific facts while other facts are ignored.

2.4 Related research on Virtual Communities and tourism

The implications of Virtual Communities on tourism have been addressed in many recent research works. Douglas and Mills (2006) have studied travel blogs of travellers to Middle East and North African countries. They utilised a neural network analysis computer program for text mining. Apart from developing a brand personality of the region their research highlights the usefulness of blogs as an information source for tourism. In her master's thesis Wenger (2007) analysed blogs

related to trips to Austria. The findings include an image analysis of Austria as a destination, descriptions of problems encountered by tourists and demographic background information about the bloggers. Carson and Middleton (2007) have compared blog analysis with other methods of monitoring visitor attitudes (such as tick box surveys and focus groups). They concluded that the cost of manually locating enough relevant blogs was too high and recommend focusing on clearly identified markets. While these approaches use software tools to a limited extend, the etBlogAnalysis project builds tool support for all aspects of blog analysis, so that large scale studies become feasible.

3 The etBlogsAnalysis software application

The etBlogsAnalysis prototype consists of several components, which connected via a common data format. Tourism-related blog entries are located and downloaded by the retrieval component and then converted to the etBlogsAnalysis data format. The data is enriched with the results of several procedures for linguistic analysis and information extraction and finally summarised into a report. The prototype will support blogs written in English and German. A basic overview about the application architecture is given in figure 2; the components will be described next.

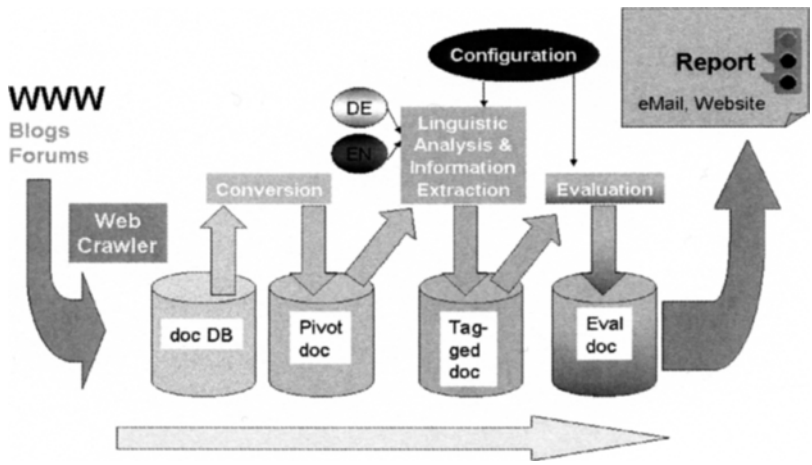

Fig. 2. Basic application architecture

3.1 etBlogAnalysis data format

The data format for the etBlogAnalysis software is based on the XML Localization Interchange File Format (XLIFF). XLIFF was standardised by the Organization for

the Advancement of Structured Information Standards (OASIS) for the localisation of software (Savourel, & Reid, 2003). Its main features in respect to this project are:

- XLIFF files can be created from diverse input format. Formatting (e.g. bold, italic) can be preserved by dedicated mark-up elements. With this it is possible to reconstruct the complete input document.
- Special mark-up elements can be used to store semantic information
- Processing steps (e.g. segmentation, parsing) and the software tools used for each step are documented in a history section.
- The format is extensible.

The XLIFF header is extended to store additional meta-data about the blog entry (permalink, author, date ...) and the aggregated results of the analysis (destination, product, target group, polarity ...). These fields are formally specified as a XML Schema.

The results of the linguistic analysis are stored in <mrk> elements. These include grammatical properties as retrieved from a parser (subject, predicate object ...), sentiments statements computed by opinion mining (polarity, power) and keywords used for categorisation (e.g. terms related to accommodation).

```
<file datatype="htmlbody" source-language="en" original="http://w...log-52948.html" >

<blog:blog-info site="www.travelblog.org" last-modified="2006-04-01T00:00:00Z"
                type="blog-posting" >
        <blog:category uri="http://www...Austria/Salzburg/">Salzburg</blog:category>
        <blog:author>Ursula Kordis</blog:author>
</blog:blog-info>

<blog:tourism-info>
        <blog:motive>sport-winter<blog:motive>
</blog:tourism-info>

<source>Back country <mrk mtype="activity">snowboarding</mrk> on
<mrk mtype="location">Ankogel</mrk>!!!!</source>
```

Fig. 3. A blog entry encoded in XLIFF (fragments)

3.2 Retrieval

The retrieval component is responsible for finding and downloading relevant blog entries. It applies crawling and indexing techniques like they are used by Web search engines. A software program called crawler downloads blog entries and follows hyperlinks that are found. At regular intervals the blogs are checked for updates. Since blog engines provide news feeds (RSS or Atom), this check can be done efficiently.

When they are downloaded the content of the blog entries is immediately segmented and converted to XLIFF as described above. Then it is indexed with the help of Lucene, an open-source library for information retrieval. Alternatively the etBlogAnalysis system can be adapted to work on a single site such as a forum provided by a tourism organisation. In this case the content is retrieved directly from the database.

3.3 Document classification and valuation

The next step is to determine the topic and relevance of a blog entry. If the author just writes about a family meeting somewhere, it will not be interesting to a tourism organisation. Therefore, a selection must be applied, which removes those documents that have low relevance. This can be done by algorithms for automatic text categorisation (Sebastiani, 2002). Weighted term lists for domains and sub-domains are produced and form the basis calculation for an aggregated relevance score. Depending on a threshold, irrelevant documents are removed. An output of the classification could be that the entry is about hotels and that it deals with the tidiness of the rooms.

3.4 Opinion mining

The key feature of the system is the identification of opinions. Those results will be presented on a *macro level*, displaying the overall results for a certain destination/hotel, and on a *micro level*, showing details about each utterance (e.g. "The room looks dirty.").

In general, this type of analysis is called *sentiment analysis* or *opinion mining* (Dave, Lawrence, & Pennock, 2003; Hatzivassiloglou & McKeown, 1997; Turney, 2002; Turny & Littman, 2003). Sentiment analysis has been applied to several fields, e.g. in the area of automotive or movies. Most approaches combine computer linguistic methods with statistical routines. Other approaches dealing also with social networks and the analysis of the communication can be found in Stein and Meyer (2007) with a model for topic identification, Berendt and Draheim (2007) dealing with an e-mail corpus from a German news service using LSA (latent semantic analysis) and Hoser et al. (2007) showing how to analyse the development of topic trends in a newsgroup for mobile phones.

Utterances can be qualified as positive, neutral or negative representing the *polarity* (POL) of the term (or phrase). In addition, each utterance has an associated *power* (strength). The power (POW) of an utterance is a number between 0 and 1 and represents the weight of a term with regard to given context. The context is important as attributes (mainly adjectives) change their meaning – power and polarity. The meaning of the word *"high"* differs depending if it appears in the context of "mountain" or "charges". In addition, the word meaning also depends on subjective measures. "High mountains" may be valuated positive by a climber while for others

this may induce negative feelings and fear. POL and POW evaluations of terms can be obtained from a text corpus with machine learning techniques (Esuli & Sebastiani, 2006, 2007). For the analysis of a concrete product the lists can be adapted and extended by experts.

A key issue is also identifying multi-words and phrases. Words like "very", "not" have no meaning in itself, they have to be seen in context. Thus, a model is needed that allows modifying the basic polarity and weighting of a term like "dirty" when they appear in the context of another word. A multi-term like "very dirty" must get a higher power than "dirty" appearing alone. For this, a *power modification function* (PMF) is required, which modifies the original power in order to stay within the limit 0...1. One simple solution could be to provide a mapping table association a power value with the modified power value, e.g. "very" [(0.1->0.2) ... (0.5 -> 0.7), (0.9-> 1.0)]. Values in between can be estimated based on the lower and upper boundaries.

Table 2. Term Valuation Examples

Term	Type	Polarity (POL)	Power (POW/PMF)
dirty	Adjective	negative	0.6
very	Adverb / Particle	neutral	
not	Particle	negative	-1.0
heavy	Adjective	neutral	0.8
heavy	Adverb	negative	[(0.1->0.2) ... (0.5 -> 0.7), (0.9-> 1.0)]
cockroaches	Noun	negative	0.7
mountain	Noun	neutral	0.0
...			

Computing the valuation of an utterance basically implies determining all the relevant POW and POL values associated with an utterance. As a segment may contain several more or less related utterances we need to define an atomic utterance, which further can be combined to segment utterances and paragraph utterances by adding the utterances of lower levels. Alternatively, the values can be computed for each level.

3.5 Summarisation and report generation

The results will be provided as an interactive report. It is not supposed to give final results, but it should support users in analysing different aspects of their tourism business.

Once the valuated statements (VS) have been determined from a document, overall tables and statistics can be produced. Segments will normally form the smallest aggregation level. But even this case may cause problems if the author inserts several topics within one segment. The next level will be the paragraph level which will sum up all the VS from the segment level. Both segment and paragraph level can then form the basis of the document valuation. The valuations on these individual levels

are easily computed by just summing up all the individual VS. The final level will be a set of documents, which sum up the values of the individual documents.

The summary process is obviously influenced by the user's goal. A hotel manager responsible for quality management might be interested in mainly negative utterances in order to find out weaknesses. As he is not so much interested in the positive statements he would define his term list profile in such a way that he associates only very low positive power values for positive utterances while he would increase the power of the negative utterances. Thus, he would immediately find out where actions would have to be taken. In addition, he also might be interested in the individual negative utterances in order to find out more. Hence, he would need direct access to the individual blog entries and utterances. A client manager, on the other side, would also be quite interested in the negative utterances because this might give him the chance either to write a correction if the utterance was wrong or immediately get into contact with the writer to thank him for his valuable hints and explain the actions based on the writer's entry.

On the contrary, the marketing officer would not be much interested in negative utterances. He would be more in favour of positive utterances – testimonials – which he could use on the website. Similarly, a product developer would be more interested in new combination of services (expressed through terms). Thus, he would have a look at less frequent but interesting new combinations of keywords.

4 Conclusions

Virtual Communities should not be ignored by tourism organisations, because they provide valuable insight to marketing and quality management. The etBlogAnalysis prototype described above consists of several blocks which are currently implemented by Krems Research. The software will be evaluated for two destinations in Austria and Australia. The inclusion in a leading tourism information system is planned. Future research will focus on classifying blog authors to tourist target groups and evaluation of the impact of individual blog entries.

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Developing and Implementing an eCRM 2.0 Strategy: Usage and Readiness of Greek Tourism Firms

Marianna Sigala,

University of the Aegean
Business School, Greece
m.sigala@aegean.gr

Abstract

Although previous CRM studies treat eCRM as synonymous with 1:1 communications and personalised service at an individual basis, Web 2.0 further enables firms and users to generate customer value and build customer relations through social networking, co-learning, co-production and collaboration. The paper advocates the development of eCRM 2.0 strategies aiming at exploiting both the networking and social/customer intelligence of Web 2.0 by integrating and engaging customers and communities along firms' value chain operations. The usage and readiness of Greek tourism firms to embark on eCRM 2.0 strategies was examined by conducting an e-mail survey and focused groups with tourism professionals. Despite the low adoption rates of eCRM 2.0, respondents were aware and greatly concerned about the practical implications of this field, which in turn elucidated an agenda for future research studies.

Keywords: eCustomer Relationship Management, Web 2.0, readiness, challenges, adoption.

1 Introduction

Effective e-Customer Relationship Management (eCRM) is a strategic imperative for increasing customer satisfaction and service, online sales, website patronage, loyalty, and retention (Feinberg & Kadam, 2002; Kotorov, 2002; Adebanjo, 2003). eCRM is also an effective tool for addressing consumers' increased mobility amongst products and suppliers (Sigala, 2006), as CRM can have positive effects on retention rates, repeat purchases, lower propensity to switch, and higher profits (Chen & Chen, 2004). Nowadays, Web 2.0 further empowers consumers by changing the way they search, read, gather, share, communicate and create information and by transforming the way in which customer value is created. On the contrary, the literature has treated CRM almost as synonymous with 1:1 marketing and with personalisation at an individual basis (Adebanjo, 2003; Chen & Popovich, 2003; Fjermestad & Romano, 2003). This notion of CRM focusing on the creation of personalised value and individualised communication for a specific customer is also evident in the tourism literature (e.g. Jang et al. 2006; Sigala, 2006). Nevertheless, Web 2.0 applications have rendered 1:1 marketing insufficient for communicating with customers, for attracting their attention and loyalty, and for creating customer value. Nowadays, customers expect to become active firms' partners for creating and consuming their personalised product, while through social networks, customers can also generate value for and from each other. Hence, it should be recognised that customer value creation and communication

do not happen solely between firms and customers, but also amongst customers themselves, and within blurred firms' and customers' networks. Business examples reflecting such trends include: firms' websites created as social network websites for enabling multiple forms of customer communications (Sheraton's redesigned "Belong" website); and firms building an island on SecondLife for allowing customers to design and buy their personalised products (e.g. Nike). Although, the role of virtual communities on CRM is widely discussed (e.g. Bughin & Hagel, 2000), there is a lack of research on how firms can exploit Web 2.0 for further enhancing eCRM strategies. Thus, there is an urgency to further investigate how Web 2.0 broadens the scope of eCRM by empowering consumers themselves to largely contribute to the formation of relationships and by allowing both consumers and firms to interact instantly and co-create value in various ways (C2B, B2C, C2C).

This paper addresses this literature gap by: 1) investigating how Web 2.0 applications are advancing the concept and implementation of eCRM; and 2) examining Greek tourism firms' usage and readiness to embark in this field. To achieve these, first, a literature review analyses how Web 2.0 capabilities and tools are challenging the aims and implementation of eCRM and then, a framework illustrating usage of Web 2.0 for building and maintaining customer relations is developed and used for exploring the usage and readiness of Greek tourism firms for implementing eCRM 2.0 strategies. Primary findings are gathered through an e-mail survey and focused group discussions with tourism professionals. Findings and their implications are discussed.

2 Theoretical Background

2.1 eCRM: definition, aims, customer value and implementation

Despite the plethora of (e)CRM definitions, there is a general consensus on (e)CRM's aim and focus on developing and retaining relations with profitable customers through value creation processes (Sigala, 2006). For example, CRM is defined as a process of understanding and managing profitable customer relationships by delivering superior customer value, service and satisfaction (Christopher et al. 1991; Chen & Popovich, 2003; Morgan & Hunt, 1994; Webster, 1992). CRM is also defined as the approach that involves identifying, attracting, developing, and maintaining successful customer relationships over time for increasing retention of profitable customers (Bradshaw & Brash, 2001; Massey et al. 2001). When these activities and techniques are delivered via Internet based media (e.g. e-mail, forums) then, eCRM is applied (Lee-Kelley et al. 2003). Forrester (2007) also recognised eCRM as a process of transferring CRM onto the Internet and as a way for synchronizing customer relations across channels, functions and audiences. Yet, eCRM must not be viewed as an IT application, but rather as a combination of hardware, software, humanware, processes, applications and management commitment aiming at attracting and keeping economically valuable clients (Fjermestad & Romano, 2003) and at enhancing marketing effectiveness through creating and delivering maximum value to customers (Scullin et al. 2004). eCRM is mainly about aligning business processes with customer value strategies

supported with ICT (Rigby et al. 2002). Indeed, previous studies have used the ways for creating customer value as a criterion for identifying (e.g. 43 items by Fjermestad & Romano, 2003) or classifying (Sigala, 2006) the numerous eCRM IT features as follows: website interactivity; shopping convenience, care and service; relationship cultivation; website character; community building; collaboration and personalisation.

In developing successful relationships with profitable clients, firms need to understand and manage all phases through which relations are evolved, as each phase is characterized by differences in behaviours and orientations and thus requires different CRM approaches (Dwyer et al. 1987). Theory and practical evidence has shown that customer relations evolve over three major distinct phases related to the customer lifecycle (Dwyer et al. 1987; Reinartz et al. 2004; Greve & Albers, 2006): initiation, maintenance and retention or termination. Hence, all CRM implementation models (e.g. Christopher et al. 1991) are based on identifying CRM practices for managing each relational phase. These models were enriched by Park & Kim's (2003) dynamic CRM implementation model identifying appropriate customer information management (CIM) strategies for each relational phase. As Web 2.0 is mushrooming user-generated content, this study used the latter's model for developing a framework illustrating the potential and the exploitation of web's 2.0 social intelligence for supporting and augmenting eCRM strategies (Table 3). "Of-the-customer" information includes customers' personal and transaction data for understanding and measuring their profile, e.g. sales, profitability, purchasing patterns, preferences. "For-the-customer" information refers to product, service and firm information perceived as useful by clients for making more informed decisions. "By-the-customer" information reflects customer feedback (e.g. customer complaints, suggestions, reviews) used for new product development or business improvement.

2.2 Web 2.0 and the evolution-augmentation of eCRM

Although the benefits of virtual communities on CRM (e.g. P2P interactions, mutual support, market research) are well documented (e.g. Bughin & Hagel, 2000), research has failed to examine Web 2.0's impact on eCRM. Yet, the mass collaboration and communication tools of Web 2.0 empower users, democratise entrepreneurship and innovation by providing users with numerous opportunities for social collaboration, networking, learning, intelligence and community building. So, two major Internet advances are currently challenging eCRM implementation: 1) Web 2.0's networking and connectivity capabilities; and 2) the social intelligence/knowledge created collaboratively through user-generated content. Literature stressing the need to augment eCRM strategies for addressing these two trends is review as follows.

Dutta et al. (2002) developed a CRM matrix that expands CRM strategies by exploiting the Internet's interactive communication and networking capabilities. The model (later validated by Bhalla et al. 2004) features two dimensions: 1) the degree of customer connectivity and interactivity reflecting customers' integration along the firms' value chain for achieving personalisation, customisation etc.; and 2) the degree

of market-business integration along the value chain refers to the scale and scope of business partnerships that are used by a firm to deliver a range of products/services to its customers.This dimension reflects the networking effect amongst the market elements, companies, partners and customers along the value chain for achieving tasks such as cross-selling, bundling of products, collective learning of customers etc. Scullin et al. (2004) also recognised the relationship benefits created by building strategic alliances with partners. The opportunity and the need to augment CRM strategies by involving other market stakeholders beyond customers is further enabled nowadays due to mash-up capabilities of Web 2.0 that enable firms to create business partnerships on demand and in real-time. Such partnerships enable new business models offering new customer value and relationship building creation processes, e.g. create new bundle of products/services that can be customised for each customer. Table 1 summarises the major implications of this matrix on changing the focus and the target of CRM by illustrating them through different business models examples.

Table 1. Networked CRM matrix

High customer integration	Many-to-one Target: clients' networks Active customers' involvement *e.g. Lonelyplanet*	Many-to-many Co-exploitation of customers' profiles with other network partners *e.g. mash-ups, earthbooker.com*
Low customer integration	One-to-one Target: individual customers	One-to-many Ecosystems of partners offering a seamless experience to individual clients (cross-selling, products' bundling) *e.g. travelocity.com*
	Low market integration	High market integration

However, customer knowledge flows increase when customers are integrated in firms' operations and customer knowledge management is recognised as the lifeblood of CRM (Lin et al. 2006), Dutta et al. (2002) have failed to identify how firms can better manage and exploit such customer intelligence for creating value. To address this gap, Gibbert et al's (2002) advocated the need to shift from CRM to knowledge enabled CRM (referred to as Customer Knowledge Management, CKM) whose aim is to make customers active partners in the value-creation process and collaborate with them for joint value creation. Such arguments have also implications when examining Web 2.0's impact on CRM, as their major tenet is based on the fact that firms have to manage not only knowledge about customers, but also the knowledge from customers (i.e. user-generated content). CKM's philosophy *'if we only knew what our customers knew'* stresses the need to exploit knowledge generated by and residing in customers' networks and to actively involve and collaborate with customers for co-creating experiences. To that end, eCRM 2.0 can utilize the five CKM styles (Table 2) for creating customer value and building customer relationships by exploiting the social networking, learning and intelligence capabilities of Web 2.0 for transforming customers from passive recipients of customised products to active co-marketers, co-producers, and/or co-designers of their tourism experiences. Specific ways for achieving these are analysed in the following section.

Table 2. Five styles of CKM and Web 2.0 practices in tourism

CKM style	Examples	Business cases exploiting Web 2.0 for CKM
Prosumerism	Creating and sharing travel videos, reviews etc	www.youtobe.com www.tripadvisor.com
Team-based co-learning	Collaborative creation of travel guides	www.wikitravel.com, users become LA's DMS partners www.experiencela.com/About/xlapartner.htm
Mutual innovation	Firms and customers collaboration	Aloft hotel concept designed by secondlife users www.traveltogether.com (group trips)
Communities of creation	Social networking websites and blogs	Yahoo "trip planner", Sheraton's Belong website, Lufthansa's www.jetfriends.com
Joint intellectual property	Mash-up: combine resources from different partners for new business development	www.earthbooker.com (assembly of services from Google earth and www.hotels.com for enabling hotel reservations)

2.3 Web 2.0 usage for customer value creation and relationship building

For exploring the capability of Web 2.0 in building customer value and relationships, one can start by building on literature examining the role of online communities in supporting CRM practices along the customer lifecycle phases (see Table 3). Wang & Fesenmaier (2004) illustrated that virtual tourist communities are useful for managing customer relations by: attracting customers through in-depth, focused and member-generated content; engaging customers through social interactions; and retaining customers through relation building with other members. Online communities also build customer value (Wang & Fesenmaier, 2004) by generating for users several types of relational benefits, namely functional, social, hedonic and psychological (Gwinner et al. 1998). Andersen (2005) explored the use of online brand communities for developing interactive communication channels and establishing social and structural bonds with devoted users. Jang et al. (2007) showed that online brand communities posses and develop features, such as, quality and credibility of information, service quality, member interaction and leadership, brand reputation and (intrinsic and extrinsic) rewards for members' activities, that in turn, contribute to increased users' brand loyalty, commitment and sales. Erat et al. (2006) discussed how the different types of communities of practice (e.g. B2C, C2C) can be used for acquiring and sharing customer knowledge in order to improve business processes and performance. Beyond collecting customer knowledge, online communities can also be used for co-operating with customers (individually or within communities) for new product development and innovation (Rowley et al. 2007). A plethora of cases and studies (e.g. in Pitta & Fowler, 2006; Lagrosen, 2005) reflects this as well. Hence, Web 2.0 enabled CRM must also reflect a culture shift from product *'designing for customers'* to *'designing with'* and *'design by'* customers. As an eCRM 2.0 strategy exploits Web 2.0 tools not only for learning about customers, but also for learning and improving with customers, the maximum benefits are realised when firms establish co-creation and co-learning adaptable and flexible ecosystems with partners.

The limited recent research also provides practical evidence and theoretical underpinnings to the capabilities of Web 2.0 tools in establishing online communities and providing customer value. Lin & Huang (2006) provided evidence of blogs' abilities to build community of interests by assembling and social networking Internet users, whose attention, interest, desire and action (AIDA) towards the discussed tourism services had been enhanced as a result of their online interactions. Ying & Davis (2007) and Lento et al. (2006) illustrated how blogs create and maintain strong online communities through their social ties tools such as blogrolls, permalinks, comments and trackbacks. Indeed, many authors (e.g. Lin et al. 2006; Ying & Davis, 2007) have started to apply social network analysis for measuring and illustrating the social bonds, networking and communication structures created within the blogsphere. Li and Stronberg (2007) summarised blogs' benefits for firms as follows: search engine optimisation; e-word-of-mouth (eWOW); improved brand perception and visibility; instantaneous client feedback; market research and insight; increased sales efficiency; and reduced impact from negative user-generated content. Damianos et al. (2007) advocated that social bookmarking generates social influence and bonds as well as creates value by: enabling resource management, information sharing and discovery, expert finding, and social networking; providing teams with a place to share resources; forming and supporting social networks around interest areas; and feeding expertise finding & user profiling. Awad & Zhang (2007) discussed the marketing benefits of eWOW generated in online review communities and debated firms' efforts and strategies addressing it. By examining the communication tools and social cues of myspace.com, Dwyer (2007) demonstrated the impact of social networking sites on developing customer interrelations and communities. In their study of videos' tags on Del.ici.ous, Paolillo & Penumarthy (2007) found that social tagging can generate community benefits such as: easy retrieval (as users use words they can remember and have useful meaning to them); contribution and sharing; attract attention; opinion expression; play; and self-presentation. Thus, since tagging can be used for providing functional services, creating social ties, market research on users' opinions and interests, and WOW, social tagging's ability in creating user communities is evident. Forrester (2006) demonstrated Web 2.0's ability to generate customer and business value in different processes: customer service (e.g. community self-service savings); sales (e.g. community loyalty and sales reduces commissions and price competitions); marketing (e.g. credibility of eWOW); production (e.g. co-design reduces waste); and R&D (e.g. community input raises success rate).

3 Research Methodology

Most CRM studies consider CRM as synonymous with 1:1 communications and personalised service at an individual basis. Although the themes of the latter remain valid, this conception restrains firms from developing eCRM strategies that exploit Web 2.0 tools and capabilities. This paper aimed at theoretically and practically investigating the trends in this field. To achieve that, first, a literature review debated the challenges set by Web 2.0 for augmenting eCRM and then, studies demonstrating the ability of Web 2.0 to support different eCRM practices at different lifecycle

phases (Table 3) for creating customer value and building customer relationships were analysed. Overall, it is advocated that eCRM 2.0 strategies should aimed at exploiting both the networking and social intelligence/customer knowledge of Web 2.0 applications by integrating and engaging customers and their communities (i.e. as co-marketers, co-producers, co-designers) along value chain operations.

The usage and readiness of Greek tourism firms to embark on such eCRM 2.0 strategies was examined by conducting an e-mail survey and focused group discussions with tourism professionals that were members of the e-Business forum in tourism and/or the DIALOGOI-SETE networks. These networks were used for designing the study's sample as their members represented tourism professionals that were not only up-to-dated with current e-tourism trends and applications, but they also held relevant professional positions. The e-Business forum in tourism (358 tourism professional members) convenes regularly for brainstorming, drafting and consulting the state with policies and measures aiming to boost e-tourism diffusion in Greece. DIALOGOI-SETE is a similar initiative (157 members) of the Innovation Special Interest Group of the Greek Association of Tourism Enterprises (SETE), but the former runs virtually (http://forum.sid-sete.gr/). Access to members' contacts was possible due to the researcher's participation in these initiatives. After eliminating the networks' duplicated entries and members not belonging to industry circles from the database, 278 professionals were identified and e-mailed the questionnaire in May, 2007. After a reminder e-mail, 126 usable responses were received.

The research instrument included two questions: a yes/no question inquiring which of the following Web 2.0 tools are used for communicating and building customer relations (blogs; podcasts; vodcasts; forums; tagging; social networking and review sites; social search engines; social bookmarking; Massively-Multiplayer Online Games; RSS; wikis); if at least one tool was used, respondents indicated their specific eCRM use of Web 2.0 by ticking the relevant box (see Table 3). Respondents' perceived Web 2.0 readiness and concerns were explored by inviting them in focused group discussions; two events were held (54 e-mail respondents participated) and moderated by 2 members of the tourism team committee of the e-Business forum. The first event's data was used for facilitating discussions and analysing respondents' perceptions in the secondly organised focused group. Miles & Huberman's (1994) analytical process (data reduction, data display and verification) was used, whereby data analysis is not considered as a discrete phase, but as an ongoing continuous process of data collection and analysis. So, steps used include: data transcription & identification of major ideas; definition of appropriate unit of analysis; identification & confirmation of categories; identification of themes and potential use of theory for interpretation. An additional member of the forum's committee was used for cross checking the reliability of the themes emerging from respondents' perceptions.

4 Analysis and Discussion of the Findings

The 126 e-mail responses reflect a diversified, but unequally distributed, sample of tourism firms (i.e. cross sectoral comparisons cannot be reliable): 76 accommodation firms; 21 travel agencies & tour operators; 24 destination marketing organisations (of which 2 were private); 2 transport companies; and 3 attractions. Web 2.0 take-up rates are very low both in terms of Web 2.0 adoption and Web 2.0's eCRM diffusion. Only 54 (42.8%) respondents use at least one Web 2.0 tool for business purposes. Six out of the 11 Web 2.0 tools were used (forums, 36 users; blogs, 21; social networking and review sites, 20; RSS, 17; tagging, 9; vodcasts, 8), while on average each respondent uses only two Web 2.0 tools. Web 2.0 use for eCRM practices is also low with the highest use for: monitoring users' reviews & comments (38.3%), handling complaints (28.5%) and market research (identifying & targeting customers 25.3% and customer understanding & profiling). It follows Web 2.0 use for boosting sales (creating brand awareness, cross and up-selling), while use for business improvement (identification of pitfalls/faults) is much lower (16.9%) than reputation management (38.3%) and complaints' handling (28.5%); so, the opportunity loss to use customer feedback generated in Web 2.0 for improving and correcting processes is obvious. Respondents' Web 2.0 usage heavily focuses on the first and last lifecycle phases (i.e. customer acquisitions and winback strategies), while it is almost non-existent or limited for customer retention and expansion respectively. The failure to exploit Web 2.0 for building a brand community, enhancing customer value and ultimately, retaining customers reflects an unbalanced and unsustainable eCRM implementation. This eCRM implementation gap along the relation lifecycle is detrimental, as the firm fails to offer any value creation mechanism for keeping its newly identified or winback customers. Respondents exploit Web 2.0 for enhancing the firm's benefits and value, while they fail to use it for providing ways to also expand customer value. Consequently, this Web 2.0 exploitation leads to an unbalanced value exchange between firms and customers, which is harmful for maintaining and building long lasting relations. Overall, respondents' eCRM use of Web 2.0 can be characterised as a defensive mechanism to any complaints or abuses as well as, as an opportunistic way of revenue creating from user-generated content and social networks, rather than a customer value eCRM strategy aiming at building and retaining customer relations.

Respondents' defensive use of Web 2.0 also reflects respondents' concerns and fears expressed during discussions that Web 2.0 can be and is easily abused by competitors or customers for purposefully harming their business. Thus, most respondents expressed the need to log in Web 2.0 sites for protecting their brand from mischievous comments, rather than using Web 2.0 for proactive purposes (e.g. as a mechanism for collecting customer feedback and improving/correcting processes). Other respondents' feedback and discussions at the two focused groups further explains this limited eCRM use of Web 2.0. Although almost all participants declared themselves to be aware of Web 2.0 developments, participants claimed to possess limited information, skills and competencies for using Web 2.0 tools. Nevertheless, participants claimed that Web 2.0 eCRM usage requires not only the acquisition of IT

skills, but also a cultural change; participants felt that e-marketers must be transformed from salesmen & information brokers to community builders and consultants, who perceive and treat customers as partners and not as targets. Achieving this cultural shift is not an easy task and respondents' feedback on how to achieve this focused on two major themes.

Table 3. Managing relationships during their lifecycle and CIM (% of respondents)

Phase	CIM focus: type of custom. info.	(Do you use Web 2.0:) eCRM practices	%
Acquisition	Of the customer information: transaction and personal data	Brand awareness through word of mouth	19.8
		Brand reinforcement through customer education about the brand	11.1
		Customer identification and targeting	25.3
		Customer understanding and profiling	27.7
Retention	For the customer information: relationship and product data	Enhancing customer service	4.7
		Personalisation	0.7
		Community building	0.7
		Innovation & NPD	0
Expansion	For the customer information: relationship and product data	Cross selling	19.1
		Up-selling	19.8
		Affiliation programmes	0
Win back	By the customer information: feedback and monitoring data	Identification of pitfalls/faults	16.9
		Handling customers' complaints	28.5
		Reputation monitoring and management	38.3

First, marketers' job description and professional attitude should change, while second management's perception of the duties and the metrics used for evaluating marketers' performance and practices should also support and motivate this change. Analytically, participants reported the need to spend hours on using Web 2.0, but for which they are not awarded or permitted to do so. Sometimes reading and navigating Web 2.0 is perceived by management as a waste of time. Respondents noted the need to identify and use reliable eCRM metrics based on which they can ask and gain management's commitment for additional resources (time, funds and people). Professionals' performance is currently evaluated based on traditional eCRM metrics (customers' economic lifetime value, share-of-wallet), which do not justify practices such as, for example, the provision of a free night to an online user who is an excellent community builder and opinion leader (e.g. one that spread good eWOW influencing customers' evaluation/selection processes), but who is not an economically profitable customer (e.g. with frequent past purchases). Participants stressed the need to use new metrics, for measuring not only the economic, but also the social customer value for the firm. Three major sources of social customer value that need to be measured to be managed were discussed, namely the intangible business value of the online community (e.g. eWOW); the customer value of a community (e.g. for developing customer bonding and retention strategies); the

intangible business value of different web users (e.g. of content creators, of critics' writers, of content distributors, of solely content readers). Based on his/her online behaviour, each type of Web 2.0 user generates different social value (which in turn, can be translated into economic value) to the firm and so, eCRM 2.0 segmentation strategies should also take into consideration such users' technographics. Thus, respondents' opinions that the widely and traditionally applied practice to segment and reward loyal customers based solely on their economic value (and specifically based on the frequency, recency and value of their previous transactions) cannot be applied in the Web 2.0 environment for building successful eCRM practices, because users that spread positive eWOW in social networks, but do not buy, may be necessary to be equally targeted and rewarded as frequent customers, since the former may acquire with their activity new profitable customers for the firm. Overall, findings revealed that Web 2.0 adoption for eCRM depends on factors affecting three variables namely easy of use, perceived usefulness and perceived risk of technology, as previous studies in the Technology Acceptance Model also indicate.

5 Conclusions and Recommendations for Future Research

The study explored and suggested ways for exploiting Web 2.0 tools for augmenting eCRM strategies. It also explored current Web 2.0 eCRM use and readiness of Greek tourism firms. The implications of the findings (from a small sample and so, larger scale research is needed for providing representative results) demonstrate the need to conduct research for developing metrics for managing the intangible social value and the processes by which Web 2.0 users provide business value. To that end, intellectual capital theory distinguishing people's capital in network and human capital may be used. Due to Web 2.0's connectivity, its users possess a significant network capital that businesses can exploit, and so, social network theory and approaches are proposed for identifying and measuring it. Web 2.0's user-generated content is also a huge human intellectual capital that firms should also recognise, measure and exploit.

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Mobile Positioning Based Tourism Monitoring System: Positium Barometer

Rein Ahas[a], Erki Saluveer[b], Margus Tiru[b] and Siiri Silm[a]

[a] Department of Geography
University of Tartu
rein.ahas@ut.ee

[b] Positium LBS
Tartu, Estonia
erki.saluveer@positium.ee

Abstract

This paper introduces experiences with mobile positioning data in the web-based tourism management and monitoring system: "Positium Barometer". The system has been developed for tourism enterprises, public authorities, scientists and planners to obtain statistical overviews and standardized analyses about the space-time movement of tourists. Positium Barometer uses passive mobile positioning data – location data that is stored automatically in the memory files (billing memory, hand-over logs etc) of mobile operators. Our database consists of records of the locations of roaming call activities in Estonia. Data is stored for every call activity of a foreign phone in Estonia. The data is anonymous, phone numbers and user data are not identified by mobile operators. LBS (Location Based Services) data is a new and promising source for studying the geography of tourism and space-time behaviour since the data is spatially more precise than questionnaires or accommodation statistics. The biggest problem of mobile positioning is fear of surveillance.

Keywords: mobile positioning, tourism geography, LBS, passive mobile positioning, Positium Barometer.

1 Introduction

Positium Barometer was worked out to meet the need for a tourism monitoring system in Estonia. The tourism industry has been developing very fast in Estonia: in 1995 there were 1.2 million visiting tourists and 10 years later, already 2.2 million. The main reasons for this fast growth are connected with European Union enlargement and the need for new tourism destinations in Europe, especially in Northern-Europe. Estonia's wild nature, medieval towns, spa areas and relatively low prices have made Estonia a popular tourism destination.

In order to study, evaluate, plan and manage developing tourism, appropriate data and analyses are needed. Traditional tourism data have not met the needs of these new tourism analyses. Statistics regarding border crossings have not been recorded since Estonia joined the European Union and accommodation statistics are too general

spatially, providing only accommodation location information. Also more and more tourists are not staying with official accommodation providers, but often use alternative accommodation or visit Estonia only for a day.

For the reasons mentioned above, the Institute of Geography at the University of Tartu, Positium LBS and Estonian mobile operators have been developing a monitoring system with mobile positioning data since 2002. LBS (Location Based Services) data has better spatio-temporal coverage than traditional sources which makes it a good base for in-depth tourist behaviour studies (Ahas et al., 2007a). The use of LBS data in geography and geography related studies has been covered by various geographers (Mountain & Raper, 2001; Ahas & Mark, 2005; Ratti et al., 2006). The objective of this paper is to introduce the LBS application Positium Barometer (www.positium.com/barometer/tourism); its functionality, usability and technical solution; and to discuss the methodological aspects of passive mobile positioning based tourism monitoring tools. From an academic point of view it is important to discuss the methodological aspects of using LBS to study human behaviour. Using LBS data makes Positium Barometer unique, but also raises a number of problems. Data is hard to get, privacy concerns have to be addressed and a special knowledge of LBS data processing is required (Klinkenberg, 2007). These are also reasons why mobile positioning is not very wide spread.

2 Need for monitoring system

The need for a tourism barometer arose mainly from the rapid growth of the Estonian tourism industry and also the need to manage geographical change, investment and improve spatial planning in development. The most important need was to obtain information about actual tourists' movements and to determine specific geographical locations and events which have many traditional and new applications. Positium barometer applications are divided into 5 groups (Table 1), these applications have been developed within our tourism geography research and planning works (Ahas et al., 2007b; Ahas et al., 2007c). *Strategic planning.* The main consumers in this area are public sector and local municipality representatives who need good spatial statistics for strategic planning and also to a certain extent analyses of spatio-temporal behaviour. *Business- and investment plans, funding applications.* This information is needed by municipalities for developing a tourism supportive infrastructure and by businesses for their business plans. Often this information is supportive in business plans when applying for a loan or funding. Statistics and analyses with good spatial and temporal coverage help to make a strong business plan and help donors with management. *Marketing and advertisement.* Businesses dealing with tourism or advertisement need general statistics of tourism for their marketing strategy. Also they need spatio-temporal behaviour information of target groups and event-specific tourism information. The marketing sector has become one of most important in tourism promotion and their need for spatio-temporal behaviour information and the impact of specific events is the greatest. *Business management.* The market of tourism related businesses is very variable, depending on weather, political situation, security

and many other matters. Therefore businesses need to monitor the current situation and make decisions based on it. An almost real-time monitoring system would help in these matters. *Public administration.* Public administration has, besides planning duties, other management and monitoring responsibilities: enterprise support, ensuring an infrastructure and planning money flows. As it deals actively with tourism, it needs statistical information for planning and also real-time monitoring information for everyday management. Positium Barometer follows the interests of these consumer groups. During the testing period of Positium Barometer there was much to learn regarding the consumers' actual needs, their computer skills and considerations for pricing schemes.

Table 1. Applications of mobile positioning data in tourism management

	Statistics, change	**Space-time movement analyses**	**Event modelling**	**Real-time monitoring**
Development plans, strategies and strategic planning	xxx	xx	x	x
Business- and investment plans, funding applications	xxx	xx	xx	x
Marketing and advertisement	xx	xxx	xxx	xx
Business management	xx	xx	xxx	xxx
Public administration	xxx	xx	xxx	xxx

xxx – high applicability, xx – medium applicability x – lower applicability

3 Input data

The input of Positium Barometer is passive mobile positioning data from databases of the biggest Estonian mobile operator, EMT. In the Positium database there are 30 million registered locations of 2.3 million tourists. Data is gathered by the company Positium, which has a contract regarding the use of LBS data with the 2 major mobile operators in Estonia. The contract addresses data security and privacy matters according to EU directives on handling personal data (Directive 95/46/EC) and on the protection of privacy in the electronic communications sector (Directive 2002/58/EC). Positium has access to download tourism data from the intermediate server weekly. The data is collected for every call activity of foreign mobile phones (registered with a network contract in another country) in Estonia. The phone registration country is determined here as nationality, the phone owner is defined here as a tourist. Call activity means any active use of the phone such as: call and SMS in/out; GPRS etc. The entries of passive positioning data include the following parameters for every call activity made by roaming phones: a) the exact time of the call activity; b) the random ID number of phone; c) the country of origin of the phone; d) the cell ID with the geographical coordinates of the antenna. An example of the database is: June 1, 2007 07:02:20000223 Finland E27-44-39.00 N59-25-49.00. The Positium mobile positioning database is powered by the open-source PostgreSQL database engine. Using network cells location information, the data is spatially interpolated with

Dirichlet tessellation. In order to specify mobile positioning data and for making additional surveys, accommodation statistics (data correlation to mobile positioning data is 0.9) and census data are used. Other sources of statistical data are hard to use within Barometer, because data owners are not interested in mediation services and want to sell the data themselves.

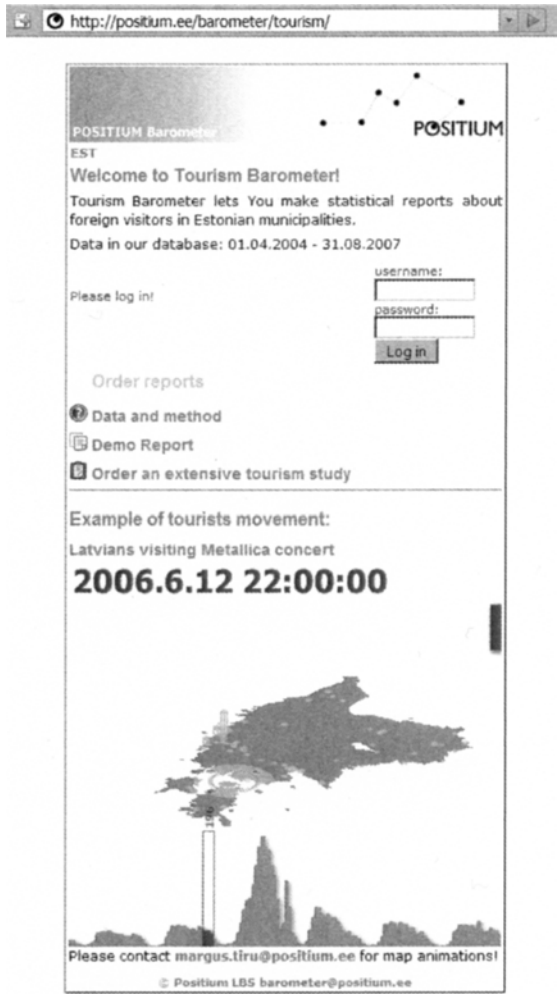


Fig. 1. Positium Barometer main page

4 Description of Positium Barometer

The Positium Barometer web-based tourism information query environment is located at URL http://www.positium.com/barometer/tourism. Positium Barometer uses a pre generated database of tourist mobile positioning data for fast data retrieval. All data is interpolated within municipality distribution and an administrative hierarchy is used. The barometer query environment is developed in PHP language allowing for a dynamic web page and graph generation. A map-server is used for generating maps on the fly.

On the main page of Positium Barometer (Fig. 1) a user can log in to the system or register for a new account by ordering reports within the interested municipalities and time frames. Cost calculations are made on the fly and bills are generated according to user selections, which can be paid by the user through an internet bank. User rights to access Positium Barometer will be sent to the user by e-mail within 24 hours following a money transfer.

A user can order reports on 4 administrative levels: whole country, county, municipality (parish or city) and the Estonian capital which is divided into city districts. Time frames can be chosen in monthly, weekly or daily units. Generally the more precise and more spatially detailed the data is, the more it costs. For example it is possible to place an order for specific days at certain locations only as an extensive order, as detailed data in large amounts is not delivered. Though, there is a wholesale discount. For every order, the user has to accept the Barometer terms of use. The methodology and description of data collection and processing are available from almost any page. On the main page there is an example of an interactive tourism event animation application that could be made by placing a custom order.

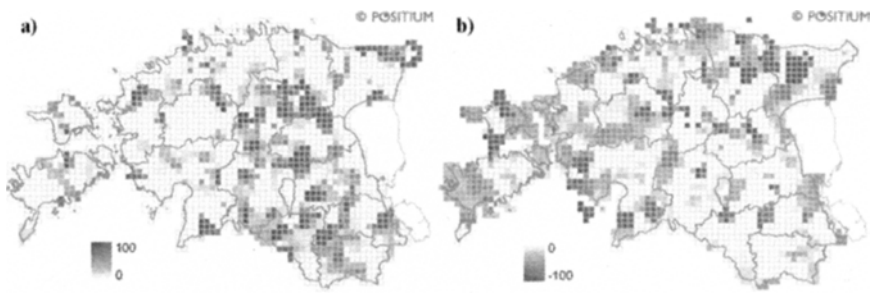
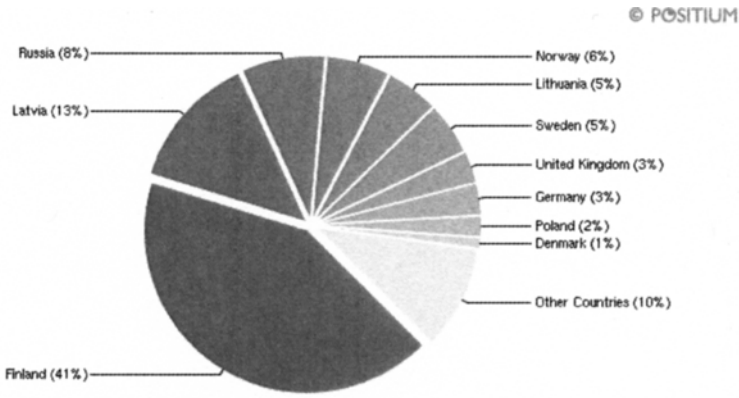


Fig. 2. Changes in visits compared to the same period the previous year on a 5 km grid (original system has colour palette) a) increase, b) decrease

After logging into Barometer and choosing a time frame and territory, the system calculates within seconds a report with eleven modules. The first is a general overview of the number of tourists and main visiting groups within the observed area and time period. It will be followed by 3 map modules of which the first represents the observed area and its surroundings. The second one represents the locations of foreign visitors during the observed period on a 5 km grid and the third a trend in the amount of tourists compared to the same period the previous year (see Figure 2). Better geographical distributions of tourists and also trends within a period are often asked questions by the consumers mentioned above.

a)



b)

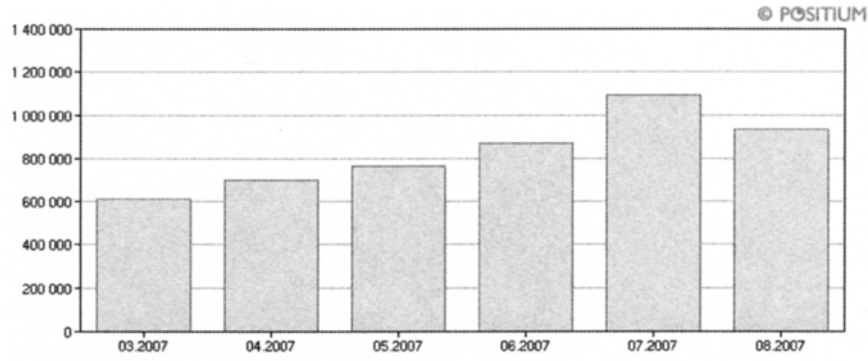
Nr	Nation	Visitors	%	* Change
1	Finland	2 060 000	41%	▼ (-7%)
2	Latvia	653 000	13%	▲ (+13%)
3	Russia	383 000	8%	▼ (-16%)
4	Norway	319 000	6%	▲ (+17%)
5	Lithuania	273 000	5%	▼ (-7%)
6	Sweden	248 000	5%	▼ (-13%)
7	United Kingdom	171 000	3%	▲ (+15%)
8	Germany	166 000	3%	▼ (-7%)
9	Poland	113 000	2%	▼ (-14%)
10	Denmark	67 900	1%	▼ (-5%)
11	Other Countries	515 000	10%	▼ (-1%)
	Total	4 970 000	100%	▼ (-4%)

Fig. 3. A Graph of top 10 countries of origin (a) and same table with changes compared to the same period in the previous year (b)

The fifth module represents the top 10 countries of tourist origin on graph and table (see Figure 3). Although there are more than 120 countries listed as possible origin of tourists, those other than the top 10 are marginal. Also some tourists from "exotic" countries have been generalised into a group "Other Countries" for privacy concerns, so it is not possible to identify spatially or in time any tourist or group of tourists.

In the following module the temporal trend of tourists is represented on graph and table (see Figure 4). The table of temporal trends is quite popular, and is used in the everyday work of many public sector institutions and businesses.

a)



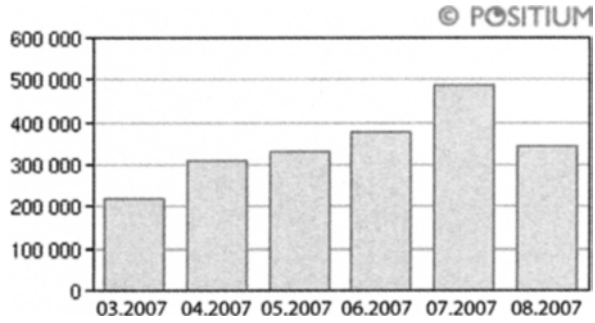
b)

Time Step	Visitors	* Change
March 2007	613 000	▲ (+11%)
April 2007	698 000	▲ (+4%)
May 2007	766 000	▼ (-10%)
June 2007	868 000	▼ (-11%)
July 2007	1 090 000	▼ (-2%)
August 2007	936 000	▼ (-5%)

Fig. 4. Visitor's distribution in the observed period on graph (a) and table with changes compared to the same period in the previous year (b)

Temporal variation is represented on separate graphs for the top 10 countries (see Figure 5) as tourist behaviour in time is very different and changes are different.

a)



b)

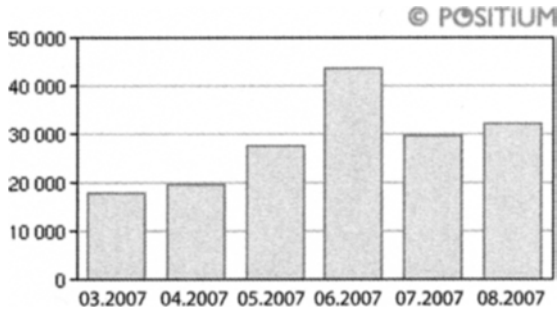


Fig. 5. Temporal trend of visitors from Finland (a) and Great Britain (b) in Tallinn

The rest of the Barometer modules compare observed territory statistics from higher administrative unit territory statistics, the amount of countries of origin and changes compared to the same period in the previous year, and the division of tourists between workdays and weekends.

5 Discussion and conclusions

Our experiences with LBS based tourism monitoring system and relevant studies show that there is a demand for such data and monitoring system. The first important advantage of LBS data is a better geographical preciseness than accommodation data. Mobile positioning data enables more precise studies of tourists' spatio-temporal behaviour and especially the analysis of visits to certain territories or specific events. We can study transit in less habited areas or visits to natural parks which do not have hotels. Standardised methodology helps to study larger territories such as the whole of Estonia. And even if the methodology has some weaknesses (we will discuss them later) we can compare visits to different regions or objects and trends in a visit. Geographically the LBS data used in Estonia also enables the study of tourist flow movement: where they came from, how long they stayed and where they went etc. In-depth analyses and modelling can be carried out on the impacts of events that are attractive to tourists. We have thoroughly studied weather impact on tourists' everyday behaviour in Estonia, which are quite accurate for summer and winter tourism (Ahas et al 2007b). A second important aspect why our monitoring system has a number of users is that this web based solution is simple and cheap for users. Our experiences show that Estonian local municipalities and also consulting firms do not have the personnel and programs for GIS analyses or even for basic statistics. Web based standard reports have also 3-5 times lower prices than relevant research projects as they do not waste the time of researchers with simple questions.

5.1 Users of Barometer

Positium barometer has gathered a number of users, among whom the biggest group are municipalities involved in tourism. The most common use is for composing

tourism development strategies or applications for funding. It is interesting that the very tourism based areas such as the Western Estonian municipalities are not as interested as the less developed areas in Central Estonia which want to develop tourism as their only chance to keep the economies running in rural areas. Also some public institutions, tourism managers and consulting companies are active users of Barometer. There are some common features for municipalities and institutions which use Positium Barometer actively; they have younger and more open-minded persons in their teams who start using the system and data. This means that even if our system is simple there is still a need for active persons on the user side "to open web-site for the first time". This is a typical problem of the majority of web-based applications. Although there is a lot to evolve, especially regarding user friendliness, Barometer reports are important to certain research projects and users. In reality, besides Barometer statistics, extensive scientific studies are often required. In connection with Positium Barometer, a user can order an extensive study or development plan which will be carried out by Positium in co-operation with scientists from University of Tartu and planners from the architectural office Urban Mark. Tourism related planning projects are in great need in fast developing tourism countries like Estonia.

5.2 Weaknesses in mobile positioning data

One point for discussion is sampling. The data source is new, and there is a need for future analysis concerning sampling and methodology. For example we do not know the exact proportion of phones and phone use between nationalities and social groups in their home country or when travelling. Therefore we can say that we are studying the geography of foreigners in Estonia who use mobile phones registered abroad (roaming) (Ahas et al 2007a). With the latest Eurobarometer survey (2007), we know that the average number of mobile phone users has reached 79% as an average for the EU. But different social groups in one nation use phones differently. Different nations also use phones differently because of the different costs of roaming calls. For tourism studies there is also the important methodological question of how to distinguish between business and leisure travellers who have different objectives, behaviour and phone usage. Still, our studies in the major tourist region in Tallinn show that business visitors are also active users of tourist attractions in the historical centre (Silm 2006). As the database is setup from call activities it is clear that different user groups and nationalities make a different number of call activities during a day. For example the number of call activities per visitor is up to 20 calls for Scandinavians and 5-7 for southern Europeans during their stay in Estonia. The activity of phone use is also determined by differences in network standards. American and Asian countries use phones with different standards and cheaper handsets that are not compatible with the GSM networks in Estonia. Therefore tourists from some countries may be under-represented in the database. The database is also influenced by tourists' behaviour – when they use phones, this determines the location of points. Business travellers may call throughout the day but members of group excursions may not have the chance to use their phone during parts of the day. This all influences the location of call activities and our geographical studies. The database is also influenced by cross-border noise or "hand-over" between mobile

networks especially in coastal areas with empowered base stations of GSM. Samples are influenced by the possibilities for recharging batteries (hiking in the forest) and the quality of radio coverage (Ahas et al., 2007a). For a better understanding of this huge quantitative dataset we have many important aspects to study about phone use routines and statistics.

5.3 Real-time GIS

A great part of LBS data and its applications is to create real-time maps and monitoring systems, which geographers have been successfully developing for years (Gartner, 2004). Inside Positium Barometer we have deployed an interactive 3D testing application of tourism events. It allows visualising tourists' movements during a specific event. This information is used in planning processes, evaluating impacts, analysing traffic during large events and also used as a nice feature on homepages or during presentations. In the future, Positium Barometer will become a real-time monitoring system with more analytical filters using both domestic and visiting tourism data. Also the "smart street and road" concept (Ahas & Saluveer, 2007) may find use in Barometer. For example restaurants on the road can get information of approaching tourists and show information in the tourists' language on a dynamic information board. Still the systems that are used for LBS data collection and the policies of mobile operators do not favour real-time systems using mobile positioning data. In addition to these reasons the biggest problem still is data privacy concerns and fear of monitoring. Mobile phones have become very personal for their users and often users are afraid of anything related to mobile phone monitoring. In conclusion it has to be pointed out that regardless of LBS data specifics and the functionality of the internet it is not possible to replace humans and create such a smart system capable of managing tourists and making decisions. Attempts have been made to build planning tools and systems, but so far the human has always been the user and the decision maker.

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Identifying the Online Tourism Domain: Implications for Search Engine Development for Tourism

Zheng Xiang [a],and
Daniel R. Fesenmaier [b]

[a] School of Merchandising and Hospitality Management
University of North Texas, USA
philxz@unt.edu

[b] National Laboratory for Tourism & eCommerce
School of Tourism and Hospitality Management
Temple University, USA
drfez@temple.edu

Abstract

Using search engines for travel purposes has become increasingly important on the Internet. However, the domain of tourism is complex and fragmented and thus gives rise to many problems in information search. This study provides a comparative analysis of the languages of the tourism websites represented through search engines and travel related queries using search engines. By employing a text analytical approach, the results of the study show that huge discrepancies exist between the representation of the industry and user queries for a specific destination. This finding offers important insights for developing systems that can better support travel-related search and planning on the Internet.

Keywords: Internet; tourism domain; travel information search; search engine.

1 Introduction

Consider the Internet as a virtual "galaxy" of information entities representing the "facets" of the tourism industry. Perhaps no other tool has ever been as powerful as search engines in terms of providing information in a comprehensive way and, because of this, they shape the way people use the Internet for travel planning. Search engines such as Google, Yahoo!, and MSN index a huge number of Web pages and thus serve as important gateways for people to access the Web on a daily basis. No wonder Google has become part of our everyday language itself, as in "I googled [fill in the blank] last night".

However, a critical challenge for the tourism industry relates to how the tourism domain is represented on search engines. This is important because it affects how people search the Web when planning a trip. Although there is growing interest in understanding the impact of the Internet on travellers' online behaviour, these issues have yet to be successfully addressed. The goal of this study, therefore, is to understand the nature of the tourism domain by examining how people use search

engines for travel planning. By doing so, this study aims to offer directions for technology development to support online travel planning.

In the following sections, the online tourism domain is conceptualized and research questions are formulated. Then, the methods of the study are described followed by the results of the study. Finally, implications of the study in terms of the role of search technologies, as well as the directions for developing innovative tools for supporting travel information search are discussed.

2 The Online Tourism Domain and Travel Planning

The tourism industry is generally defined as "the aggregate of all businesses that directly provide goods or services to facilitate business, pleasure, and leisure activities away from the home environment" (Smith, 1988:183). This section reviews the tourism literature in order to establish the theoretical foundations for understanding the online tourism domain with respect to: 1) The unique characteristics that distinguish it from others; and, 2) How travellers search within the domain.

2.1 Symbolic Representation of the Tourism Industry

The symbolic representation of the tourism industry leads to the understanding of the unique nature of information to be presented to, and used by, travellers (Leiper, 1990). Tourism has a discourse of its own, characterized by a myriad of representational techniques and formalities. Information provided by the tourism industry can be considered the "symbolic marker" of a place, and the representation of destinations can have fundamental impact on the consumption of travel (Dann, 1997; Leiper, 1990; MacCannell, 1989). The semiotic nature of the representation of tourism is captured in the notion of the "language of tourism" (Dann, 1997) in that the tourism industry uses a variety of techniques to "frame" the destination and other tourism products. This language of tourism spans a variety of media and occurs in the pre-trip, during the trip, as well as the post-trip context. The symbolic representation perspective implies that, while the online tourism domain is comprised of the industry facets in a destination, the representation of tourism on the Internet "transforms" the reality into a discourse that purposefully targets and promotes the destination to travellers.

2.2 Travel Planning and Information Search

The tourism domain as seen from the traveller perspective is much more dynamic and fluid in that travellers not only move from place to place but also engage in different phases and modalities of consumption. The notion of "tourism consumption system" describes the mental and behavioural components in the travel consumption process (Woodside & Dubelaar, 2002). It incorporates tourist's unplanned behaviour, which can be caused by a number of reasons such as impulsive consumption, deferred decisions, oversight, and even deliberation. Therefore, within a travel planning

context, certain types of business entities in the tourism industry (i.e., hotels, attractions, and transportation systems) will be considered more relevant to a traveller than others.

Travel information search activities can be roughly grouped into three stages with potentially different information needs (Gretzel, Fesenmaier, & O'Leary, 2006): the pre-consumption stage wherein information is used for planning, decision making, transaction, expectation formation, and anticipation of the trip; the consumption stage wherein information is sought to establish connections with people, facilitate en route and on-site navigation, aide short-term decision making, and conduct on-site transactions; and, the post-consumption stage wherein information generated from the actual trip is documented, stored, and shared with other people, and attachment might be generated for potential future revisits. The travel information search perspective also reveals the functional, as well as experiential, nature of information sought throughout the entire consumption process of travel (Vogt & Fesenmaier, 1998).

Further, travel planning on the Internet is a hierarchical, networked process contingent upon different situational factors related to the information seeker, the task, and the interface (Jeng & Fesenmaier, 2002; Pan & Fesenmaier, 2006). This literature recognizes that online travel planning involves searching for information to support different types of decision making, ranging from core decisions (i.e., those related to primary destination, attractions and activities, date and length of the trip, nature of the travel party, etc), secondary decisions (those related to accommodation and transportation modes), and tertiary decisions (such as dining, shopping, and potentially en route decisions). As such, it suggests that entities in the online tourism domain will be evaluated by a traveller based on the relevancy for his/her trip planning task. Depending upon a number of factors such as the characteristics and nature of the trip, the traveller's personal characteristics, the decision frame, different business entities will have different probabilities to be considered relevant by the traveller (Hwang et al., 2006).

Based upon the literature, the following research questions were formulated:

Q_1. What constitutes the online tourism domain represented through a search engine?

Q_2. How do travellers query a search engine to search for tourism related information? and,

Q3. What are the commonalities and differences between tourism related queries in search engines and the online tourism domain?

3 Research Methods

This section describes the research design and methods used in this study including data collection and data analysis approaches.

3.1 Research Design and Data Collection Methods

This research was designed as three phases. Phase I focused on understanding the online tourism domain represented through search engines; Phase II focused on understanding tourism related queries in search engines; and in Phase III, the results of Phase I and Phase II were compared against each other in order to understand the commonalities and differences between the representation of tourism and what travellers actually search in search engines.

The city of Chicago was chosen as the destination for its diversity in cultural and historical resources for tourists. Phase I employed a method that mimics travellers' use of keywords to query a search engine for information about the destination. Specifically, a set of 9 pre-defined keywords (i.e., "accommodation", "activities", "area", "attractions", "events", "information", "places", "restaurants", and "shopping"), in combination with the destination name (i.e., "Chicago"), were used to query Google. In Phase II, the same keywords, together with the destination name, were used as the "seeds" to extract user queries from a number of search engine transaction logs.

Data collection in Phase I followed a two-step procedure: First, the 9 keywords were used to form queries in conjunction with the destination name (i.e., "Chicago") to extract search results from Google. According to the information retrieval literature, most search engine users (>85%) do not view search results beyond the first three pages (assuming each page contains 10 search results). As such, the first 30 URLs which constitute the first 3 pages of search results are most likely to be viewed by travellers. In addition, another two search result pages (i.e., with 20 search results) were extracted, with one ranked in the middle of the entire set of search results and another at the bottom of the entire search result set, to provide a sample with more "depth". Then, a Web crawler program written in Perl programming language was used to retrieve Web page contents by following these 450 (50*9) URLs. The textual content in the body of the Web pages were then parsed and saved as plain text files to represent the tourism domain.

In Phase II, user queries from three major search engines, namely Excite, AlltheWeb, and AltaVista, were used as the basis for further analyses. These include 3 sets of log files from Excite, 1 from AltaVista, and 2 from AlltheWeb, dated from September 1997 to May 2002. All of them contain queries that had occurred on the search engines, and represented a portion of the searches executed on a particular date. The detailed descriptions of these transaction logs are provided in a number of publications in the area of the information science and information retrieval (see Jansen & Molina, 2006 for a complete list). Altogether, these transaction logs contain about 11 million distinct queries. The 9 pre-defined keywords in combination with the destination name "Chicago" were used to extract all queries related to certain aspects of tourism within Chicago, resulting in a total of 3,020 observations.

3.2 Data Analysis

Quantitative text analysis was employed as the primary tool to address the research questions (Krippendorff, 2004). Specifically, text analysis was used to identify the domain ontology based on the textual data extracted from tourism Web pages. In Phase II, words that were used by search engine users looking for tourism related information were analyzed; Phase III compared the results from the previous two phases with the focus on the commonalities and differences.

4 Results

4.1 The Online Tourism Domain Represented through Search Engines

Figure 1 shows the distribution of unique words after a natural logarithmic transformation due to the huge difference between the high frequency words (e.g., "Chicago" and "Hotel") and low frequency words (e.g., "Zenith" and "Quiznos"). Analyses indicate that the top 100 words of all unique words represent approximately 30% of all unique words; the top 500 unique words represent more than 50% of all unique words; the top 1,000 words represent more than 60% of all unique words; and, finally, the top 3,000 words represent nearly 80% of all unique words. As can be seen, there are a large number of words that are singletons and about 2/3 of all the unique words have a frequency ≤ 3. This indicates the distribution of word frequencies is extremely skewed toward a large number of idiosyncratic words that represent the tourism domain.

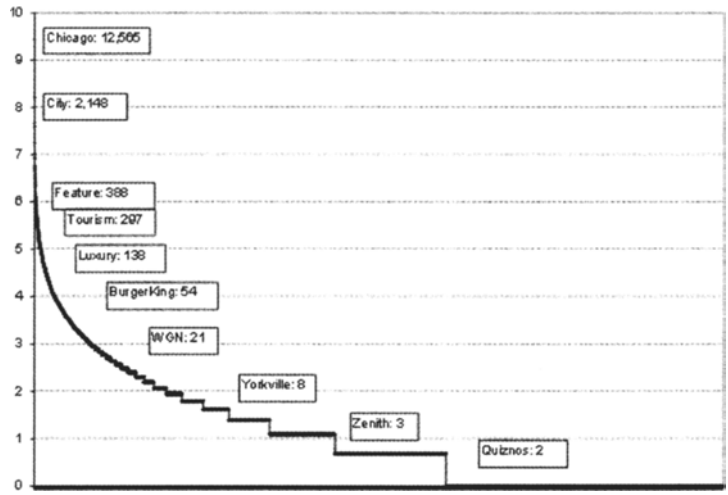

Fig. 1. Distribution of Unique Words (Logarithmic Transformed)

Analysis was then conducted of the most popular 364 unique words which represent approx. 45% of all unique words and range in frequency from 12,565 to 38. These words demonstrate the diversity of tourism resources available in Chicago. Some of the words are extremely generic such as "place", "area", "information", "map", "travel", and "tour"; words are related to attractions and activities such as "attraction", "events", "center", and "world"; still other words are about location such as "location", "west", and "downtown"; last, some words show the intention of promotion such as "best", "deal", and "service". An examination of the low frequency words (i.e., with frequencies lower than 38) reveals that there are a large number of words that do not exclusively belong to the tourism domain (e.g., words that are part of the "natural language" such as "familiar" and "immediate", adverbs like "specifically" and "commonly", and nouns like "transition" and "threat"); in addition, many of the words are proper nouns such as "cabrini", "blackwell", "bloomingdale", "zenith", and "quiznos" and thus, reflect the "locality" of tourism.

4.2 Tourism-related User Queries in Search Engines

Most (90%) of the user queries are short, ranging from 1 to 4 words and are either very general (e.g., "Chicago hotel") or very specific (e.g., "Chicago Wyndham hotel"). Figure 2 shows the frequency of unique words in user queries; it reveals that the 20 most popular words represent more than half (52%) of the total number of all unique words and the top 100 words represent 70% of the total. Also, approximately two thirds of all the unique words have a frequency ≤ 2; about 45% of all unique words were used once by search engine users. A very small number of the words represent a high percent of total number of words (e.g., this includes words such as "chicago" and "hotel") while a large number of words with low frequencies constitute the "long tail" of the distribution.

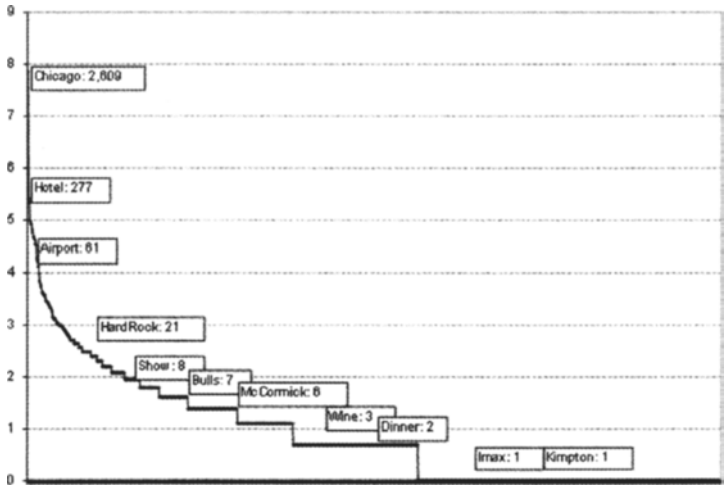

Fig. 2. Distribution of Unique Words in User Queries (Log Transformed)

Table 1 lists the top 50 words with the highest frequencies in user queries. In addition to the word "chicago", words such as "university", "hotel", "area", "il", "restaurant", "institute", "art", "chicagoland", and "mall" are among the top 10 words that people use to search for tourism related information in Chicago. Also, words such as "park", "map", "theater", "store", and "museum" represent people's general interest in Chicago. The list also shows that, even among the frequently used words, people did search for specific businesses, places, or events. For example, the two words "fabulous" and "janes" obviously were used in a combined way to search for information about the music event "Fabulous Janes". In addition, words like "handcock", "hard" and "rock" show people were searching for information about the John Hancock Building and the Hard Rock Café in Chicago.

Table 1. Top 50 Words in User Queries

Word	Freq	Word	Freq	Word	Freq
chicago	2,609	airport	61	sports	29
university	372	weather	54	building	28
hotel	227	events	47	ohare	28
area	208	downtown	45	catholic	26
il	148	suburb	43	library	24
restaurant	143	train	41	city	23
institute	123	guide	38	field	23
art	117	fabulous	36	picture	23
chicagoland	109	janes	36	hancock	22
mall	107	shop	36	cafe	21
park	103	bears	32	metro	21
map	102	church	32	midway	21
theater	94	football	32	rock	21
store	93	district	31	hard	20
museum	72	pizza	31	opera	20
info	69	mirage	30	place	20
band	68	bar	29		

4.3 Commonalities and Differences in the Domain Ontology and User Queries

Table 2 lists the common words shared between the domain ontology and user queries. As can be seen, there are 208 words in user queries that are also found in the domain ontology. While most of the common words apparently represent the business facets in the industry and are largely functional, a number of adjective words (highlighted in bold) including "fine", "fun", "unique", "free", "official", "friendly", "perfect", "romantic", "old", "cheap", and "special" are also commonly used by both the industry and search queries. It seems that while these words are used by the industry with the intention to promote their products and persuade potential visitors, search engine users have also learned to "adopt" these words in order to locate specific information about the products and services they want.

Table 2. Common Words Shared between the Domain Ontology and User Queries N = 208 (displayed in vertical order ranging from high to low frequency in user queries)

chicago	travel	phone	expo	card	directions
university	concert	review	facility	catering	feature
hotel	inn	show	family	contact	fresh
area	convention	association	food	designer	**friendly**
restaurant	boat	bike	french	dining	garden
art	reservation	blues	luxury	dinner	indian
mall	clothing	bus	parking	fashion	japanese
park	tour	exhibit	play	flight	jazz
map	jewelry	movie	report	**free**	kitchen
theater	public	performance	steak	game	landmark
store	shopping	activity	tourism	grill	local
museum	shore	address	zoo	group	mexican
info	attraction	basketball	auditorium	health	musical
airport	club	buy	business	hours	observatory
weather	festivals	company	**cheap**	kids	**official**
events	package	gift	college	lodging	perfect
downtown	ticket	golf	cost	medicine	planetarium
train	outlet	indoor	forecast	nature	plaza
guide	schedule	location	**fun**	pool	population
school	spa	nightlife	gallery	resort	quarter
shop	book	seafood	loop	sushi	resource
church	discount	visit	natural	**unique**	retail
football	merchandise	apparel	network	urban	**romantic**
district	water	baseball	party	vegetarian	room
pizza	history	bed	rate	weekend	shoes
bar	holiday	breakfast	style	ads	**special**
sports	**old**	children	traffic	amusement	temperature
building	rental	chinese	wine	bakery	thingstodo
library	sites	cook	admission	books	trip
city	aquarium	live	adventure	brunch	tv
field	conference	plan	africa	calendar	vacation
cafe	**fine**	price	antique	casino	video
place	market	sightseeing	arena	deal	village
program	motel	tourist	broadway	deli	
service	music	cultural	bureau	diner	

Table 3 provides the ratios of the frequencies of these common words to the total frequency of all words in both user queries and the domain ontology. As can be seen, a relatively small proportion (17.3%) of query words is actually represented in the domain ontology, while there is a relatively higher proportion (57.1%) of the words reflected in the queries people use to search. Taking into account that many of these overlapping words have high frequencies in both the domain ontology and user queries, the actual ratios that more accurately reflect their prominence are higher, that is, 33.1% for words in queries and 79.2% for the ontology words, respectively. However, there is still a large proportion of words in user queries (approximately 80%) not reflected in the domain ontology. An examination of these words reveals

that: 1) most words have low frequencies; and, 2) many of the words are proper names of an industry entity such as the name of a restaurant or bar.

Table 3. Ratios of Common Words Shared between Domain Ontology and User Queries

	Number of Words			Total Frequencies		
	Common Words	All Words	Ratio	Common Words	All Words	Ratio
Domain Ontology	208	364	57.1%	65,678	82,928	79.2%
User Queries	208	1,204	17.3%	3,242	9,788	33.1%

5 Conclusions and Implications

Online travellers are using search engines to gain access to different aspects of the destination in the information "galaxy" of the Internet. The results of the study show that the tourism domain represented on the Internet through search engines shows some seemingly interesting but contradictory results. While the identified domain ontology is relatively small, the entire domain is rich with numerous destination specifics. That is, while there are a relatively small number of words that constitute the "core" of the domain, there is also a "long tail" with a huge number of words that reflect the idiosyncrasies of the destination. When searching for information within this domain, search engines users express their information needs using only a small subset of the domain. The comparison between domain ontology and user queries showed that although the ontology reflects part of users' information needs, there is a substantial number of words in user queries are not reflected in this ontology. Through understanding the nature of the tourism domain and travel planning in search engines, this study offers important implications for technology development in tourism.

Specifically, this study clearly indicates that the tourism industry and search engine users use substantially different languages in the online setting. As shown in the following example (Figure 3), the semantic space representing a business entity (i.e., a hotel) in tourism related Web pages, which was established by extracting the words surrounding the focal word "hotel", is much more complex than the semantic space of user queries established in a similar fashion. That is, on one hand, the industry uses much richer vocabularies to describe an entity such as a hotel. For example, the Wyndham Hotel is associated with a number of concepts such as "Lakeshore", "location", and "luxury". This reveals that there may be multiple "paths" that link a domain generic word like "hotel" with a domain specific word like "Wyndham". On the other hand, a user either uses the combination of two words (e.g., "romantic hotel", which leads to very general search results), or uses a specific business name (e.g., "Marriott", which suggests that the user already knows what he/she is looking for), to express his/her information needs. These disparities clearly indicate that problems may arise when one does not know a specific business name (such as

"Wyndham Hotel" in this case) while looking for information about luxurious accommodation in the downtown area in Chicago.

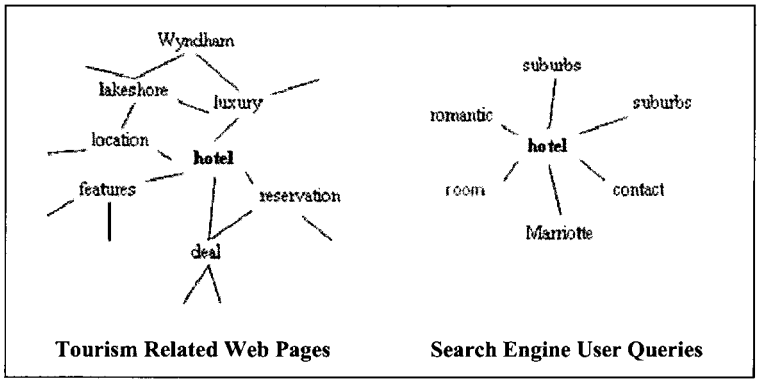

Fig. 3. An Example of Two Semantic Spaces for the Word "Hotel"

In order to address these problems, a search technology for tourism should establish dynamic, flexible modalities of interaction to allow the online traveller to articulate his/her needs. Particularly, system feedback not only needs to present search results that are highly relevant to a specific query but also should provide suggestions and recommendations to "inspire" the online traveller by expanding his/her consideration set. Search engines such as ask.com, tripadvisor.com, and others have, for example, developed a series of tools that support searching by providing context dependent interpretations of specific words. Many of these tools provide users with powerful semantics that lead toward more precise and relevant domain specific search results. It is clear, however, that these tools will have to be highly sensitive to the idiosyncratic nature of the tourism experience.

Additionally, the online tourism domain represents the symbolic transformation of the tourism industry in the online environment. As shown in this study, the domain ontology not only is comprised of vocabularies that represent various industry "facets" but also contains the semantics that the industry uses to promote their products and services and to persuade potential visitors. As such, the development of search technologies for tourism should also focus on establishing functions that "understand" the meanings connoted in this representation and building mapping mechanisms between the online traveller and the representation of the domain. For example, an intelligent system should be able to differentiate a user query which asks for a "spotless" hotel room from those for a "reasonably clean" room. Understanding the language used by the industry and the consumer and building appropriate domain ontologies seems to be necessary for establishing such mapping mechanisms.

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Personalisation and Situation Awareness of the Search Process in Tourism

Sven Döring[a] and Timotheus Preisinger[a]

[a] Chair for Databases and Information Systems
University of Augsburg, Germany
{doering, preisinger}@informatik.uni-augsburg.de

Abstract

We present a novel model for the search process in electronic commerce. Dividing the process into the four stages of *Preference Analysis & Modelling*, *Search Interface*, *Query Processing* and *Presentation*, a deep personalisation of the entire process is enabled. A situation model adequately adjusted to the tourism domain provides each stage of the search process with additional situational knowledge. The deployment of the personalised search engine *Preference XPath* delivers the best alternatives if there is no perfect match. In addition, it is possible to distinguish between hard and soft constraints. Tailoring packages exactly to customers' preferences and situations is a promising approach to meet high customer expectations in tourism.

Keywords: preference search, personalisation, situation awareness, online travel portals.

1 Introduction

A lot of researchers have noted that the short-living and intangible nature of tourism products make them ideal for internet distribution (Benckendorff, 2006). Low-cost airlines like Ryanair (www.ryanair.com) or EasyJet (www.easyjet.com) have gained huge significance. They strongly rely on their online portal in order to sell tickets. Nevertheless, there are still people who prefer to consult a human employee in a travel agency instead of using the internet for booking or organising a journey. The average consumer is often over-strained arranging a vacation trip on the internet due to technical problems, incomprehensible interfaces, and insufficient search engines. This might be one reason why there is still little evidence of electronic markets leading invariably to lower search costs (Öörni and Klein, 2003).

Nevertheless, consumers demand more personalised travel products instead of standard packages designed by tourist operators. This might be a reason for the emerging concept of *dynamic packaging*. It has been introduced to the tourism industry as an approach to achieve a competitive advantage providing consumers with flexible travel packages (Cardoso & Lange, 2007). The authors also state that product packages should be customized based on the requirements specified by consumers. But this even worsens the problems mentioned above. Existing online portals like Expedia (www.expedia.com) are sufficient for simple problems like inquiring a flight from A to B with specific hard constraints. However, complex problems involve the smart modelling of travellers as well as more intelligent systems (Werthner, 2003). A personalised search process, meant to deliver results exactly tailored to the customer's

wishes and requirements, can be quite challenging, as the following example will demonstrate.

1.1 Use-Case Scenario

In order to visit project partners and potential customers, business traveller Mark has to travel to London for a week. His company is located in Augsburg in southern Germany. Therefore, a package consisting of flight, hotel, and rental car is necessary. His needs and preferences are expressed as follows:

1. In order to represent his company in a positive manner, a premium class car **must** be rented.
2. The accommodation **should** be in the northern part of London because of the proximity to a great deal of his partners.
3. On account of good experiences in the past, the airline **should** be British Airways.
4. The limit of $1.500 **must not** be exceeded due to the company's policy.

Note that 2. and 3. describe soft constraints which should be matched, while 1. and 4. denote hard constraints which have to be matched. This is a reasonable scenario, since soft constraints, which are also called preferences for the scope of this paper, are usually understood as wishes in the 'real world'. If there is no perfect match, people are often prepared to accept alternatives. However, most of the search engines support only the specification of hard constraints, i.e. solutions are only shown if all constraints are matched. If a customer specifies a lot of search preferences, existing online booking engines will often return no solution (Torrens, Hertzog, Samson, & Faltings, 2003). This is called the empty-result-effect. Compromises have to be made manually by the consumer if an empty result was delivered. Often the entire search process has to be repeated over and over again, causing a very tedious and frustrating search. It is not uncommon to spend more than 1 hour organizing a trip as described.

Some providers of online travel portals try to avoid this problem by offering only a few search criteria to customers. Yet dynamic packaging requires the personalisation of all parts of the travel in order to meet the customer's expectations. On Expedia (www.expedia.com), for example, it is not possible to specify a preferred airline or the quality of a rental car, after opting for a travel package. The empty-result-effect is indeed often avoided. Unfortunately, customers again have to manually scroll through the offered search results in order to match common preferences as described above.

The lack of preference modelling in today's systems does affect tourism even worse, since travellers typically have a wide variety of preferences. Even in our simple scenario, there are preferences regarding individual aspects of the journey - for example the flight - and there are preferences about global constraints, e.g., for the total price of an entire package. Furthermore, there are preferences which **should** be fulfilled and hard constraints which **must** be fulfilled, respectively. Due to the missing preference modelling, consumers are often left alone to manually configure their trip in countless search sessions.

A personalised search approach for online travel portals is necessary in order to provide good sales experiences similar to the ones competent human travel agents can offer. Consumers' preferences have to be taken into account to offer personalised services. Still, preferences and constraints can be different, depending on the consumer's situation. For example, Mark may have other preferences in his role as business traveller than as family father. As demonstrated, satisfying customers' various preferences with respect to their situational context is a non-trivial matter (Fig. 1). It is even harder to deliver an optimal result with respect to the consumer's situation and wishes, since there are a lot of dependencies. For instance, the optimal flight might depart on Monday, while the preferred hotel is not yet available or the best combination of hotel, flight, and car might exceed the price limit.

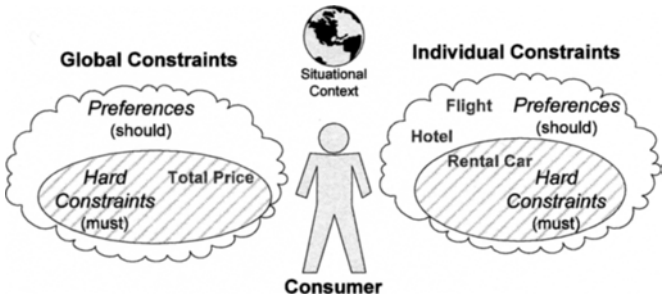

Fig. 1. Satisfying customers' wishes in tourism: a non-trivial matter

1.2 Objectives and Positioning

The contribution of this work covers the modelling of the search process with respect to personalisation in e-commerce and in tourism in particular, so that, the fundament for a deeply personalised and situated search process on travel online portals can be provided. It will be shown how the individual parts of the search model can be deployed by using preference technology. Thereby, the annoying empty-result-effect can be avoided. We aim to provide a better search for those consumers, who have at least a raw conceivability about their trip. This work does not cover the pre-purchase information search in tourism, which is, e.g., responsible for the first identification of the consumers' preferences as described by Crotts (2000). The travellers' information search on the internet as described by Pan and Fesenmaier (2003) is also not part of this work.

The situational context of consumer's preferences is a pivotal element of our search model. A theoretical foundation as well as a framework for the integration of situation aware preferences to travel portals is provided. However, the identification of situational variables influencing a tourist's preferences belongs to other research fields, e.g. to psychology or consumer-choice-behaviour. Those will not be covered here.

2 Personalisation of the Search Process

First, it will be shown in this section how the preference model of Kießling (2002) and the preference search technology based on it (Kießling, Fischer, & Döring, 2004) can be deployed in tourism. Thereby, we aim to show how some of the above mentioned problems can be dealt with. However, an underlying model for all parts of the search process in electronic commerce will be necessary for a deep personalisation. For this purpose, a holistic model will be presented afterwards.

2.1 Preference Model and Technology in Tourism

Within the research program 'It's a Preference World' at the University of Augsburg many preference based technologies for e-commerce have already been developed. They are based on the foundations of Kießling (2002), which provide a sophisticated and semantically rich model for preferences. Every child learns to formulate wishes in terms like 'I like A better than B'. This kind of preference modelling is universally applied and intuitively understood by everyone. Moreover, in mathematics one can easily map 'better-than' preferences to strict partial orders. Wishes can be formulated as strict partial orders and can even be engineered to complex, multidimensional preference constructs (Kießling, 2002).

Preference Search Technology

As opposed to plain attribute or parametric searches, *preference search* treats user search wishes as soft selection constraints, delivering automatically best alternatives if there is no perfect match (Kießling, Fischer, & Döring, 2004). This way, the annoying empty-result-effect is avoided automatically. The underlying BMO query model delivers Best Matches Only wrt. customers' search preferences. It is no longer necessary to manually adjust search parameters (e.g. the borders of numerical intervals) several times. For example, let us assume that business traveller Mark would like to book a hotel room. He expresses his wishes: *"I would like to have an accommodation for one night. It* ***should*** *be a double room. The price* ***must*** *be less or equal $ 70 according to the travel policy of our company."*

Considering Table 1 and treating all search preferences as hard constraints, there would be no perfect match, which leads to the annoying empty-result-effect. With a preference search engine like *Preference XPath,* wishes can easily be expressed within one statement only (Kießling, Fischer, & Döring, 2004). This enables the combination of common hard constraints and soft constraints, thereby automatically delivering best alternatives. The syntactic term '#[]#' instead of '[]' denotes a soft constraint. Mark's wishes can easily be expressed in a Preference XPath term:

/HOTEL [Price_per_night <= 70] #[Room is 'double']#

Using this query, the tuples t_{H2} and t_{H6} of the hotel database would be delivered as best matches. The preference for a double room could not be achieved, but both tuples match the hard constraint regarding the price limit.

Table 1. Sample hotel database

	Name	Category	Meals	Room	Location	Price_per_night ($)
t_{H1}	IBIS	3	full	single	downtown	85.--
t_{H2}	ARCOR	3	breakfast	single	city	70.--
t_{H3}	GREEN	3	none	double	city	75.--
t_{H4}	SUNSHINE	3	breakfast	double	downtown	80.--
t_{H5}	HILTON	5	breakfast	double	city	100.--
t_{H6}	TOKIO	2	none	single	city	60.--

For the sake of completeness, we would also like to mention the other preference based components (see Kießling, Fischer, & Döring, 2004): The *Preference Presenter* implements a sales psychology based presentation of search results, supporting various human sales strategies; the *Preference Repository* provides the management of long-term preferences; the flexible *Personalised Price Offer* and the multi-objective *Preference Bargainer* provide a personalised price fixing. Since all components are based on the preference model of Kießling (2002), they can easily be deployed to applications alongside the preference search above. These components provide a good starting point for the personalisation of the search process in tourism. But what pieces or stages are necessary for a deep personalised search? Of what does it consist? How about the integration of situational context? We will address these questions in the following sections.

2.2 Personalised Search Model

Based on existing models of buying behaviour in electronic commerce (see related work below) crucial pieces of the search process were identified. Based on this, we propose a four stage model in order to enable a deep personalisation of the entire search process in electronic commerce. The model comprises *Preference Analysis & Modelling*, a *Search Interface*, *Query Processing*, and the *Presentation* stage. A domain and application dependent *Situation Model* represents the pivotal element of our search, since all stages of the search model are very much influenced by the situational context (see also Fig. 2). Preferences of customers strongly depend on their situation. For example, a family father may be less flexible in terms of time, since the family trip has to take place during the school holidays. All pieces of our model are described in the following.

Preference Analysis & Modelling
During the first stage, relevant constraints have to be identified with respect to domain, customer, and situation. Thereafter, the constraints have to be modelled explicitly. This seemingly easy task includes rather complex activities. For example, even if a customer has a clear price constraint related to his situation as a business traveller (as described above), it has to be modelled whether this represents a hard constraint or a preference, i.e. a soft constraint. The preference model of Kießling (2002), as described above, provides a valuable foundation for this stage.

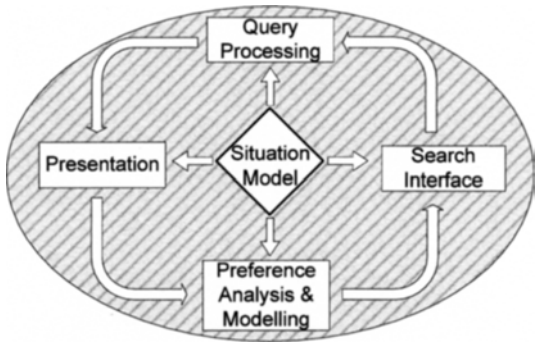

Fig. 2. Search model with respect to personalisation and situation awareness

Search Interface
In common systems, the preference modelling is reduced to implicit hard constraints gained from the customer's specification on the search interface. However, in order to provide a deep personalisation it is necessary to differentiate between preference modelling and search interface. Let us consider the following scenario for illustration. Traveller Mark registers to his preferred online travel portal to arrange a trip. The system knows by now that Mark is a business traveller with a strong price preference. Yet it is necessary to give Mark the opportunity to express his preference accordingly on the search form. There might be a single field for an upper price limit, or two fields for a price interval, or a slider for enthusiastic mouse users. Besides, Mark could be colour-blind, requiring the avoidance of some combinations of colours on the form. Thus, the search interface has to be considered as a single and important piece of the search process. In a recent study, Haarnagell (2007) examined possibilities for the visualisation of preference queries in tourism.

Query Processing
After the preferences of Mark have been identified and filled into a search form as described above, the search has to take place. Search queries have to be composed and executed accordingly. This process also has to be tailored to the individual being and situation. All preferences have to be mapped to the query. Since Mark has a strong price preference, this could be represented by a hard constraint in the query. But it could also be represented by a soft constraint which is prioritized to other wishes. This would prevent an empty result set if the price constraints cannot be fulfilled for any possible travel setup. Thus, queries have to be composed and modified with respect to the customer's preferences.

Presentation
The quality of search results represents an important factor in sales dialogues. But any discussion about quality has to take the consumer's preferences into account. Even if two different persons get the same search result, one of them might prefer a better

quality, while the other might prefer a lower price. For a deep personalisation the preferences of customers, therefore, have to be considered during the product presentation stage. Besides, the situation might be taken into account too: business travellers may have a precise list of results, while a young student may prefer a colourful presentation. The *Preference Presenter* of Kießling, Fischer, & Döring (2004) might provide a good foundation for this stage of the search.

Sometimes consumers are not able to state all preferences at the beginning of the search process (Torrens et al., 2003). A smart presentation delivering arguments about the search results' quality may help customers to discover other preferences. For example, after being offered a flight with 4 intermediate stops, a customer might recognize a preference for a non-stop connection. Such preferences have to be elicited from the customer in order to deliver perfect custom-tailored travel products. Therefore, our personalised search model is represented by a circular process. Note that the circle does not mean the search has to start all over again. On the contrary, new preferences are seamlessly included in order to refine the search result with respect to the customer's wishes.

The described search process represents a fine-granular model of buying behaviour in tourism-related electronic commerce. Preferences and situations are used in each stage of the process to support the customer as an individual being in an individual situation. More than once we emphasized the importance of the Situation Model as a pivotal element of deeply personalised search processes. In the next section we will outline a theoretical foundation as well as a framework for the integration of situational knowledge to the search process.

3 Situation Model for Tourism

Up to now, the term 'situation' has been used rather intuitively, e.g., for describing roles like business traveller or family father. In studies of Ricci (2002) and Grabler and Zins (2002), for example, socioeconomic factors and decision styles are identified. It seems obvious that such factors may belong to a situation influencing the behaviour of travellers.

The model presented in this work is built on an existing meta model for situations (Holland and Kießling, 2004, see related work). This model is extended by the incorporation of tourism-related aspects. In our model a situation is described by

- temporal-spatial aspects,
- personal influences,
- travel influences,
- search process stage.

Temporal-spatial aspects are included with entities for date/time and location, respectively. The time can be described by a timestamp denoting the validity period of a

situation, e.g., from Monday to Friday our traveller Mark acts as a business traveller. Entities for the location can be represented by a zip-code, city name or even by global positioning coordinates (GPS). For instance, Mark might want to include a special insurance if he rents a car in countries without regulated third party liability insurance. Since our situation model is meant to enable a deep personalised search process in tourism, the stages of the process itself have to be considered as a situational aspect. Finally, the most important entities of our situation model are personal and travel influences. Thereby, aspects and influences can be modelled and incorporated.

To illustrate our point, imagine the construction of a personalised, situation aware travel portal. The preferences and wishes of a customer are influenced by personal influences such as the decision style as described by Grabler and Zins (2002), colour distinction deficiencies, and the role of the customer. A personalised search form or a personalised presentation of search results, for instance, should take colour deficiencies of consumers into account. In addition, the composition of the travel group might also influence the customer's preferences. When travelling together with children, for example, a hotel denoted as 'child-friendly' might be preferred. These situational aspects can easily be defined using entity-relationship modelling techniques (see Fig. 3). Thereby, situational knowledge can be integrated seamlessly into the software development process of future travel portals.

With our model described below, situations may be considered by means of entity-relationship modelling. But how can these situations, which are influencing the costumer's wishes, be stored or integrated in the 'real' search process?

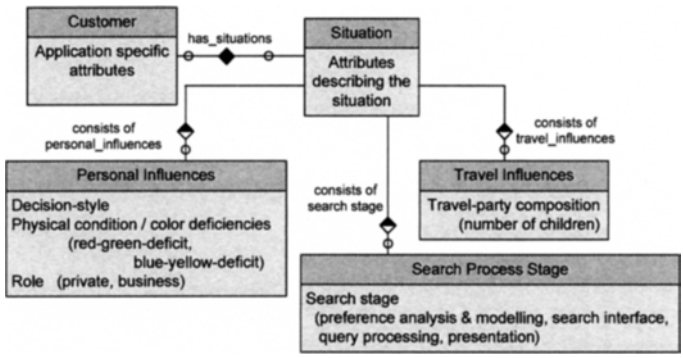

Fig. 3. Sample situation model for an online travel portal

Tourism-Related Preference Repository

The so-called *Preference Repository* (Kießling, Fischer, & Döring, 2004) allows the management of situation aware long term preferences. Adjusting it to the tourism domain provides a semantic, well-founded framework for the storage of travellers situated preferences. Let us again consider our traveller Mark. When travelling together with his wife and the two children, he prefers a hotel declared as 'child-friendly'. This

situation aware preference can be stored in the repository by an according XML-structure:

```
<PreferenceData name="Group-Composition">
 <Situation>
  <Condition key="Children_in_group" value="yes"/>
  <Condition key="Search_Phase" value="query-processing"/>
 </Situation>
 <Preference>
  <POS att="child-friendly">
   <Value val="yes"/>
  </POS>
 </Preference>
</PreferenceData> ...
```

If Mark would like to travel with his children, a search preference for 'child-friendly' hotels can be added automatically to the search query. Thereby, the *Query Processing* stage of the search process can be influenced in terms of his preferences. Note that *Preference Repository* as well as *Preference Search* are based on Kießling's model (2002). Situated preferences can therefore be seamlessly integrated into each stage of our search model, as shown above. For more details about the interaction of preference based technologies see the work of Kießling, Fischer, & Döring, 2004.

4 Related Work

In the work of Miles, Howes, & Davies (2000), a sequential three stage model of buyer behaviour in electronic commerce is presented. Here, search preferences of the customer have to be identified and managed during the first stage. Thereafter, the search for the product takes place. Finally, the products are compared by the customer in order to make a choice. Recognising the important role of personalisation in electronic commerce, this model was supplemented by three new components (Silverman, Bachann, & Al-Akharas, 2001); one component for the storage of customer preferences and psycho-demographic profiles, one personalisation component, and also the opportunity to speak to a human contact person. Obviously, a human contact partner is a nice feature. But it is also an intense cost factor, which can be reduced by the integration of preference components. This has been demonstrated by means of a joint-study (Döring, Kießling, Preisinger, & Fischer, 2006) with the *MAN Group* (http://www.man.de/MAN/en/, [Aug. 1, 2007]). In addition, the term 'preferences' is broadly defined in this work. It includes past behaviour and tendencies. There is no model or concept for the representation and management of preferences.

There are other papers dealing with the tedious empty-result-effect in tourism. The *Vague Query System* (VQS) uses multidimensional concepts and so-called Numeric-Coordinate-Representation-Tables to carry out similarity searches (Palkoska, Pühretmair, Tjoa, Wagner, & Wöß, 2002). Using a computed total distance, VQS always delivers best matches. Unfortunately, results can only be presented in a ranked list together with an according value for the total distance. However, such a numerical

presentation is mostly not intuitively comprehensive for human beings (Kießling, Fischer, & Döring, 2004). Another study proposes an interactive query management which can deliver results by the relaxation of query constraints in case of an empty result (Ricci, Blaas, Mirzadeh, Venturini, & Werthner, 2002). Unfortunately, the relaxation of a preference regarding categorical data, which is called a *symbolic feature constraint*, means that the whole constraint is discarded.

Belk (1975) already identified the importance of the situational context to buying behaviour in 1975. There has been a lot of research in tourism identifying such situational aspects since. For instance, there is an observational study delivering six different decision styles of customers (Grabler and Zinz, 2002). Ricci (2002) divides influencing factors into two groups: the first group contains socioeconomic factors, while the second group comprises travel features. Since there is a wide range of possible influencing situations and variables, a meta model for situations is advisable as described by Holland and Kießling (2004). It comprises *spatial-temporal* aspects as well as *personal* and *surrounding influences*. However, due to the 'meta' character of the model, tourism-related aspects were not covered. Recently, work has been done trying to determine situational factors in a user-friendly manner. For example, there is an approach determining tourist types by representative photos (Berger, Denk, Dittenbach, Merkl, & Pesenhofer, 2007). Still, as far as we know, there is no work providing a tourism related model for situations as well as a framework for the integration of such situations and preferences into tourism portals.

5 Summary

We feel that the search engine is the crucial link between customer and travel online portal and hence deserves highest attention. We have presented a novel model for the search process in tourism-related electronic commerce. By dividing the search process into the four stages *Preference Analysis & Modelling*, *Search Interface*, *Query Processing*, and *Presentation*, each step can be adequately adjusted to customers and situations, enabling a deep personalisation of the entire process. As a pivotal element of our search, a situation model adapted to tourism was presented. Thereby, knowledge about situations can be integrated seamlessly into the software development process of future travel portals. The technical deployment of situations to the search process was outlined afterwards. Finally, preferences and situation knowledge can be used in each stage of the process to support the customer as an individual being in an individual situation.

As we have shown, a preference model based on strict-partial orders can be used to explicitly model customers' preferences. The preference search automatically delivers best alternatives, therefore, avoiding the tedious empty-result-effect. As demonstrated by means of numerous examples, the search process can be further enhanced by the deployment of existing preference based components such as the *Preference XPath* search engine, the *Preference Repository*, or the *Preference Presenter*, adequately adjusted to the tourism domain. In other words, we provide a novel model for the

search process in electronic commerce, a situation model adjusted to tourism as well as numerous prototypically tested software components for the development of deep personalised travel portals.

5.1 Evaluation Issues and Further Work

Our current work covers the integration of heterogeneous information sources from the internet in order to determine customers' preferences which have been disregarded in the past. Thereby, customers can be better supported during the first stage of our search model. Another major part addresses the design of preference constructors tailored to the tourism domain as well as an advanced query processing (stage 1 and 3). We aim to integrate all these new components and technologies together with existing preference components into one prototype in order to show the feasibility of our search model. However, while we are convinced that our novel model can be applied on basis of well adjusted preference components, there is still a need for the according data, i.e. about preferences and situations. Customers are still often reluctant to specify personal and situation relevant information, e.g., their role or physical deficiencies such as colour-blindness. A reduction of process costs or a more satisfying search process may convince customers to declare more personal data in order to experience a better search process.

For this purpose, an evaluation of the search model and according components is necessary. First, the impact on search process costs can be examined. In a study we have already shown that a preference based search can significantly reduce search process costs in e-procurement (Döring, Kießling, Preisinger, & Fischer, 2006). Therefore, we assume that our novel model together with accordingly adjusted preference technologies will provide similar or even better results. Secondly, another evaluation has to be done with respect to the customer's satisfaction. According to a recent work of Heitmann, Lehmann, & Herrmann (2007), there are mostly five different factors influencing the *decision satisfaction*. On the one hand, we feel that our search model implicitly aims to positively affect the customer's decision satisfaction. For example, the *anticipated regret* of customers may be reduced by a personalized result presentation that takes the situations and preferences of a customer into account. On the other hand, it may not be an optimal strategy to increase the customers' convenience by a reduction in effort (Heitmann, Lehmann, & Herrmann, 2007). Thus, more research is necessary in order to make qualitative statements about the affects on search process costs and customer satisfaction.

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Investigating the Effects of Product Type on Online Decision-Making Styles

Young A Park
Ulrike Gretzel

Laboratory for Intelligent Systems in Tourism
Department of Recreation, Park, and Tourism Sciences
Texas A&M University, USA
{yapark, ugretzel}@tamu.edu

Abstract

Decision-making styles have received attention from consumer behaviour researchers as a factor that influences consumer purchasing behaviour. This study explored whether online decision-making styles vary for different products, specifically tangible, standardized products (consumer electronics) and intangible, non-standardized products (accommodations). The findings showed a statistically significant effect for product type on perfectionism consciousness, brand consciousness, novelty and variety consciousness, as well as confusion by over-choice. The study concludes that online shopping for travel accommodation involves specific decision-making styles which need to be recognized by marketers and system designers.

Keywords: online shopping; decision-making styles; product type; accommodations.

1 Introduction

What determines consumers' online shopping behaviour in the context of travel products is an important question for marketers and developers of systems to support tourism-related eCommerce. Several researchers have identified determinants of online shopping behaviour, including product recommendations and demographics (Pachauri, 2002; Swaminathan, 2003, McKinney, 2004). Some of the research on general consumer decision-making has noted that decision-making styles can be useful for understanding consumers' mental orientation and their decision making process when shopping (Sproles & Kendall, 1986; Sproles, & Sproles, 1990; Bakewell & Mitchell, 2003; Mitchell & Walsh, 2004; Tai, 2005). Decision-making styles are defined as "a mental orientation characterizing a consumer's approach to making choices" (Sproles & Kendall, 1986, p. 268). According to the authors, they represent an enduring orientation towards shopping and purchase (Sproles & Kendall, 1986). One can assume that such shopping styles are also important to explain online consumer behaviour. However, despite the rapid growth of online shopping, very little attention has been given to consumer decision-making styles in online shopping contexts.

Whether and how consumers apply certain decision-making styles might be context-dependent. Recently, Bauer et al. (2006) studied the relationship between consumer

decision-making styles and product type and concluded that consumer decision-making styles are influenced by product type. Taking these considerations into account, the purpose of this study was to test whether consumer online decision-making styles are influenced by product type. In particular, this study attempted to investigate whether online decision-making styles are different for tangible, standardized products (consumer electronics) and intangible, non-standardized products (accommodations).

2 Background

2.1.1 Decision-Making Styles in Online Shopping Contexts

Sproles and Kendall (1986) developed a consumer decision-making styles list, the so-called consumer styles inventory (CSI). The CSI was developed based on the assumption that consumer decision-making behaviour can be explained by eight central decision-making styles. The eight consumer decision-making style dimensions are: perfectionism & high-quality consciousness, brand consciousness, novelty & variety consciousness, price & value consciousness, recreational & hedonistic shopping, impulsiveness & carelessness, confusion by over-choice, and habit & brand loyalty. They can be described as follows:

1. Perfectionism & high-quality consciousness
This style is characterized by searching for the very best products or solutions. It involves shopping carefully, systemically, and by comparison.

2. Brand consciousness
This style involves purchasing best-selling, advertised, well-known brands, believing that brands represent higher quality products.

3. Novelty, variety consciousness
This factor focuses on experiencing pleasure by seeking out new things.

4. Price, value consciousness
This factor measures behaviour aimed at getting the best value for one's money. It involves concerns for finding sale prices and lower prices in general.

5. Recreational, hedonistic shopping
Shopping is seen as recreation and entertainment. Saving time is not a concern as time spent shopping provides pleasure.

6. Impulsiveness, carelessness
This style describes shopping in the spur of the moment, without planning and without concern to find alternatives.

7. Confusion by over-choice
This trait characterizes ineffective shopping because of being overwhelmed with options and alternatives available.

8. Habit, brand loyalty

This style involves buying the same product options or buying from the same providers or Websites.

Although some issues regarding the validity of the CSI have been reported, it is the most tested instrument representing the first systematic attempt to create a robust methodology for measuring shopping orientations and behaviour (Hafstrom et al., 1992; Lysonski et al., 1996; Mitchell & Bates, 1998; Wickliffe, 2004). This study aims to measure online decision-making styles of U.S. residents and adopting the CSI will be the best choice since it was supported when applied to U.S. samples.

Whereas many studies investigated whether decision-making styles vary according to personal factors such as culture and demographics (Hafstrom et al., 1992; Durvasula et al., 1993; Hiu et al., 2001; Kamaruddin & Mokhlis, 2003; Bakewell & Mitchell, 2003; Mitchell & Walsh, 2004; Tai, 2005), little research has been conducted to determine whether or not context factors such as product type influence decision-making styles. Sproles and Kendall (1986) already described that decision-making styles may vary according to product category and suggested that this area needs more research.

2.2 Product Characteristics

Some authors have investigated the difference between tangible and intangible products when consumers shop in traditional stores (Murray & Schlacter, 1990; Mitchell, 1999). They found that since intangibility makes it difficult for consumers to evaluate services in their decision-making processes, intangible products presented higher psychological and physical risks to consumers than tangible products.

Tourism services (destinations, tours, cruises, flights, etc.) are intangible products, i.e., they cannot be seen, touched, tasted, lifted, or dropped like tangible objects (Kotler, Bowen, & Makens, 2005). Thus, while tangible products (books, computers, clothes, etc.) can be compared using specific characteristics of the product such as design, color, shape, launch date, delivery time, return policy, etc., tourism products cannot be well described and, thus, not well compared. Previous studies described tourism products with four characteristics: intangibility, heterogeneity, inseparability, and perishability (Kotler et al., 2005). In addition, while tangible goods require delivery directly to customers, intangible products are considered to be more flexible in terms of fulfillment requirements (Rayport & Sviokla, 1995). The question that arises is: Do consumers shop differently for intangible tourism products compared to tangible products offered online?

Accommodations are not only intangible services, they are also often non-standardized. Consumers have a high possibility of perceiving a heterogeneous experience in terms of facility, atmosphere, and landscape when they stay at hotels. A hotel typically offers rooms with slightly different experiences (location, size, furniture, etc.). In addition, accommodations are more diverse in terms of price; even for the same accommodation establishment, more than one price can usually be found

online. Also, star rating systems are not consistent across countries or even travel Web sites. One can therefore assume that shopping for accommodations might trigger different responses in consumers compared to shopping for tangible, standardized products such as consumer electronics.

2.3 Conceptual Model and Hypotheses

Existing research suggests that consumers' shopping behaviour can vary according to product characteristics (Vijayasarathy, 2002). Especially the literature in retail studies shows that type of merchandise has a significant influence on shopping behaviours (Eastlick & Feinberg, 1999). Increasingly scholars in marketing are also suggesting that product classification schemes could provide a fruitful avenue for understanding differences in consumer buying behaviour (Klein, 1988; Ford, Smith, & Swasy, 1990). Recently, Girad et al., (2004) and Korgaonkar et al., (2006) demonstrated that consumer online shopping behaviour is significantly influenced by product category. However, these differences have not been formally tested with respect to online decision-making styles.

Although conceptualized as enduring, this study proposes that consumers adjust their decision-making styles to the specific product context. The following decision-making styles are assumed to be more pronounced for intangible, non-standardized products such as accommodations: First, recreational and hedonistic shopping is expected to be more pronounced as tourism products are hedonic products and planning trips is often seen as a pleasurable activity. Second, brand consciousness is also expected to be more likely applied to accommodations since brands help when evaluating products which cannot easily be evaluated. Third, accommodations decisions are expected to lead consumers to be more confused by over-choice. While there might be only a few product choices for a consumer electronic device, there are often a myriad of options for accommodations, making comparison shopping and choice difficult.

In contrast, the following decision-making styles are assumed to be less prominent for accommodations: First, the perfectionism consciousness style is expected to be less prominent because it is harder to evaluate accommodations, making comparison difficult. Second, while novelty & variety seeking are pronounced for tourism destinations, the risk involved in choosing a new hotel is rather high. For the same reason, consumers who shop for accommodations are also expected to be less impulsive. No difference is expected in terms of price consciousness. It is assumed that due to technological advances, people can compare prices through a myriad of Web sites. Thus, people will become very price sensitive when shopping online, regardless of product type. For the same reasons, no difference is expected for habit and brand loyalty.

3 Methodology

Data for the study were gathered in April 2007 using a Web-based survey. The sample consisted of American graduate students enrolled at US universities. The sample was acquired in two ways. First, graduate students who study at a large university located in the Southwest United States were personally contacted via email and invited to participate in the Web-based survey. Second, professors were personally contacted via email and asked to distribute the URLs of this survey to their American graduate students. All contacted students were also asked to send the URLs to their friends and colleagues enrolled in graduate programs. Thus, this study mainly followed a snowball sampling technique, i.e. the sample acquisition relied on referrals from initial subjects to generate additional subjects.

To examine the hypotheses of whether product type influences online decision-making styles, two types of questionnaires (A & B) were created. Previous research suggests that consumer electronics are one of the best-selling items for online shopping (Rosen & Howard, 2000); thus, this product category was selected to represent tangible products. The type 'A' questionnaire asked about online purchasing styles in the context of consumer electronics while the type 'B' questionnaire asked about booking accommodations. Each questionnaire had its own URL and was randomly sent out to subjects. However, if subjects had no online buying experience with one product category, they were automatically referred to the other questionnaire. Each subject could only complete one type of questionnaire.

3.1 Subjects

The data collection effort resulted in a total sample of 104 graduate students who had purchased these product types online. These students represent 15 different US universities and 37 different majors. The total of 104 responses was equally split between questionnaire types (52 responses for each type of questionnaire). One-way MANOVA was performed to test the effect of the independent variable on the dependent variables.

3.2 Survey Instrument

CSI (Sproles & Kendall, 1986) items were adapted for measuring respondents' online decision-making styles. Thus, a total of 35-items for each product context (consumer electronics & accommodations) were constructed to examine whether consumer online decision-making styles are influenced by product type. The items only differed with respect to the product category to which they referred. These items were measured using a seven-point Likert scales, anchored by 1 (strongly disagree) and 7 (strongly agree). Subjects were asked to respond to the questions thinking of the specific product type. The final section of the survey addressed respondents' socio-demographic information such as age, gender, ethnic background, nationality, marital status, university name, major field of study and level of Internet use skills.

4 Results

4.1 Profile of Subjects

The average age of the respondents was 33, with ages ranging from 18 to 54 years. A total of 38 percent of the respondents were male and 62 percent were female. Almost all (96%) subjects indicated they had either intermediate or advanced Internet use skills. Table 1 provides a summary description of the survey respondents' characteristics in terms of age, gender, ethnic background, nationality, marital status, university name, major field of study and level of Internet use skills.

Table 1. Profile of Respondents

Number of Respondents	104
Age of Respondents	18-24 (20%), 25-34 (68%), 35-44 (9%), 45-54 (3%)
Gender	Male (38%), Female (62%)
Ethnic Background	Black/African American (29%), White (66%), Asian (3%), Prefer no to answer (2%)
Nationality	U.S. Citizen (100%)
Marital Status	Married (22%), Single, Never married (72%), Divorced (1%), Separated (1%), Widowed (2%), Other (2%)
Major Field of Study	37 different Majors
Internet Use Skills	Advanced (57%), Intermediate (39%), Beginner (4%)

4.2 Scale Development

Cronbach Alpha scores were computed to assess the reliability of the constructs. The Alpha scores ranged from 0.79 to 0.94, thus indicating that the reliability was high (see Table 2). Since previous studies had challenged the structure of the CSI factors, factor analysis using principal components and Varimax rotation was used to evaluate overlap between the scales and to test whether the constructs were also uni-dimensional. The exploratory factor analysis led to the extraction of the expected 8 factors. Additional factor analyses were then conducted for each factor to test the dimensionality. The results are presented in Table 2, showing that each of the factors is highly consistent with high factor loadings.

Table 2. Measurement Properties of Scales of Online Decision-Making Styles

Factor Name	Mean	SD	Factor Load.	Eigen Value	Var. Expl.	α
Price-Value Consciousness	**5.22**	**1.29**		**4.48**	**74.6%**	**0.93**
I look carefully to find the best value for my money.	5.29	1.51	.85			
I carefully watch how much I spend.	5.34	1.45	.87			
I am conscious about my economic condition when shopping online.	5.22	1.47	.87			
I always buy options that are useful to me and are of reasonable price.	5.24	1.43	.84			
I am willing to spend time to compare prices among Web sites in order to buy lower priced options.	5.14	2.96	.85			
I buy options with the best value for my money.	5.33	1.44	.91			
Perfectionism	**4.22**	**1.42**		**4.00**	**79.9%**	**0.94**
I make a special effort to choose the very best quality.	4.08	1.67	.92			
In general, I usually try to buy the best overall quality.	4.22	1.62	.93			
I try to get the very best or perfect choice.	4.44	1.55	.83			
Getting very good quality is very important to me.	4.25	1.64	.92			
My standards and expectations are very high.	4.01	1.54	.87			
Confusion by Over-Choice	**3.78**	**1.07**		**3.04**	**75.9%**	**0.89**
There are so many Web sites to choose from that I often feel confused.	3.62	1.42	.86			
Sometimes it's hard to choose which Web sites to shop.	3.89	1.43	.85			
All the information I get on different options confuses me.	3.33	1.38	.91			
The more I learn about books, the harder it is to choose the best.	3.32	1.45	.87			
Brand Consciousness	**4.28**	**1.27**		**3.03**	**75.7%**	**0.89**
The most advertised Web sites are usually very good choices.	4.71	1.49	.83			
I prefer buying from the best selling Web sites.	4.82	1.37	.91			
Nice and specialty Web sites offer me the best options.	4.48	1.38	.88			
Well-known branded Web sites are best for me.	4.25	1.36	.86			

Table 2 Continued. Measurement Properties of Scales of Online Decision-Making Styles

Factor Name	Mean	SD	Factor Load.	Eigen Value	Var. Expl.	α
Recreational Shopping	**3.61**	**1.48**		**2.94**	**75.5%**	**0.89**
Online shopping is one of the enjoyable activities in my life.	3.28	1.53	.89			
Online shopping is a pleasant activity for me.	3.62	1.55	.93			
I enjoy online shopping just for the fun of it.	3.53	1.66	.90			
I prefer to take my time when shopping online.	4.01	1.67	.70			
Habit, Brand Loyalty	**4.50**	**1.16**		**2.67**	**66.6%**	**0.83**
I have favourite Web sites from which I buy over and over.	4.71	1.49	.80			
Once I find a Web site I like, I stick with it.	4.82	1.37	.90			
I go to the same Web site each time I shop.	4.48	1.38	.90			
I regularly buy from the same Web sites.	4.25	1.36	.66			
Impulsiveness, Carelessness	**3.62**	**1.41**		**2.87**	**57.4%**	**0.81**
I should plan my shopping more carefully than I do.	3.95	1.34	.71			
I am impulsive when purchasing.	3.76	1.58	.82			
I often make careless purchases I later wish I had not.	3.32	1.52	.83			
I do not take time to shop for the best buy.	3.51	1.57	.62			
I usually buy without hesitation.	3.55	1.43	.79			
Novelty-Variety Consciousness	**4.09**	**1.26**		**2.11**	**70.3%**	**0.79**
It's fun to buy something new and exciting.	4.49	1.63	.88			
I like to try new options	4.32	1.58	.91			
I don't mind buying from Web sites from which I never bought before	4.05	1.50	.70			

Stability and discriminant validity of the eight-factor structure were then again assessed using the criterion suggested by Fornell and Larcher (1981). Corresponding to the analyses conducted to evaluate the online decision-making scales, the results suggest that the identified eight-factor structure has a high discriminant validity. In all instances, the average extracted variance for each factor was higher than the shared variance between factors (Table 3). Overall, the findings indicated again that the instrument is robust and reliable.

Table 3. Discriminant Validity Assessment of Online Decision-Making Styles

	AVE*	Price	Perfect	Confused	Brand	Recre	Habit	Impulsive
Price	.746	-	-	-	-	-	-	-
Perfect	.799	.293	-	-	-	-	-	-
Confused	.759	.013	.158	-	-	-	-	-
Brand	.757	.355	.323	.219	-	-	-	-
Recrea	.755	.130	.071	.183	.121	-	-	-
Habitual	.666	.275	.065	.316	.329	.394	-	-
Impulsive	.574	-.233	.084	.377	.184	.156	.139	-
Novelty	.703	.078	.400	.268	.226	.224	.135	.274

* The statistics in the second column are the average variance extracted (AVE) for each factor. The remaining statistics represent the correlation coefficient between two factors. Discriminant validity exists between two constructs if the average variance extracted of both constructs is greater than the variance shared bythe two (i.e., the correlation coefficient).

One way-MANOVA was run to examine the influence of product type on subjects' online decision-making styles. The analysis indicates that there is a significant effect of product type regarding perfectionism consciousness style ($F=7.0$, $p=0.010$), brand consciousness style ($F=9.3$, $p=0.003$), novelty and variety consciousness style ($F=6.9$, $p=0.010$), and confusion by over-choice ($F=5.2$, $p=0.026$). The specific directions of the influence are described in Table 4.

As expected, perfectionism was found to be less prominent for online purchases of accommodations, suggesting that it might indeed be difficult for consumers to evaluate and compare the quality of accommodation establishments. Novelty and variety consciousness were also found to be less prominent, meaning that consumers tend to stick to known products when purchasing accommodations. The results also show as hypothesized that consumers are price conscious shoppers regardless of whether they purchase consumer electronics and book accommodations online.

However, there were also some unexpected results. Brand consciousness and confusion by over-choice were more prominent for consumer electronics. This suggests that consumers are less likely to look for well-known brands when purchasing accommodation and actually enjoy having a lot of options. No differences were found for recreational shopping and impulsiveness. The mean values of the scales suggest that these are not very prominent styles for either product category.

Although some of the proposed hypotheses were not supported in the assumed direction, this study provided empirical evidence that online decision-making styles differ for tangible, standardized and intangible, non-standardized products.

Table 4. Summary of Results

Decision-Making Style	Hypotheses: Prominence for Accommodations	Confirmed	Significance Level
1. Perfectionism	Less	YES	p=0.010
2. Brand consciousness	More	NO - LESS	p=0.003
3. Novelty, variety consciousness	Less	YES	p=0.010
4. Price, value consciousness	No difference	YES	N.S.
5. Impulsiveness, carelessness	Less	NO	N.S.
6. Confusion by over-choice	More	NO - LESS	p=0.026
7. Recreational, hedonistic shopping	More	NO	N.S.
8. Habit, brand loyalty	No difference	YES	N.S.

5 Conclusion

The findings of this study showed a statistically significant effect for product type on the variables of perfectionism consciousness, brand consciousness, novelty and variety consciousness, and confusion by over-choice. There was no statistically significant main effect for product type on the variables of price- value consciousness, impulsiveness, habit and brand loyalty, and recreational shopping. Although some online decision-making styles were not significantly influenced by product type, this study showed that, overall, online decision-making styles were influenced by product type. These are important findings as they suggest that 1) the CSI is a useful instrument to understand online shopping behaviour; and, 2) consumers adjust their shopping styles based on the product type for which they shop online.

There are several limitations to this study. First, this study included only a rather small number of graduate student respondents, and generalizations of specific results to other audiences may not be valid. However, the sample has online purchasing experience and represents a variety of demographic characteristics. Most importantly, whether decision-making styles differ based on product type should not be influenced by such characteristics. Second, only two product types were compared in this study. Since there is clear evidence now that online shopping differs by product type, specific online shopping styles for various tourism products should be investigated. Third, the term "accommodations" may include many types of hotels, some of which might contain more standardized rooms than others. Future research should also test the relationships for a specific product (e.g. boutique hotels), not a product category.

This study provides insights for accommodation providers. First, consumers imply specific styles to accommodation purchases; thus, general findings regarding online shopping behaviours might not apply to accommodations. Rather, data specific to the product context is needed. Second, price is a determining factor and purchasers of accommodations do not seem to be very brand conscious. For online travel agencies, the findings imply that the comparison of accommodation options appears to be rather

difficult and technologies should be developed which facilitate this process. Further, online shopping in general does not appear to be seen as much fun and seems to involve a lot of deliberation. This suggests that there is a need for tools to better support online decision-making and also to add features which can instil the pleasure typically associated with shopping in the real-world.

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The Virtual Dimension in Tourism: Criteria Catalogue for the Assessment of eTourism Applications

Lydia Bauer[1], Philipp Boksberger[2], Josef Herget[1], Sonja Hierl[1], and Noelene Orsolini[2]

University of Applied Sciences (HTW) Chur
[1]Swiss Institute for Information Science
[2]Institute for Tourism and Leisure Research
Ringstrasse/Pulvermühlestrasse 57, 7000 Chur
{lydia.bauer, philipp.boksberger, josef.herget, sonja.hierl, noelene.orsolini}@fh-htwchur.ch

Abstract

Digitalisation can be viewed as the motor of transformation for the tourism industry in the age of the internet economy. While the increase of digitalised or completely virtualised products in tourism reflects this development, current eTourism applications are rather fragmented with regards to conceptualisation, structure and layout. However, in the increasing competitive internet economy, a systematic and methodical comparison of heterogeneous eTourism applications as a foundation for future developments is quintessential. This paper presents a classification scheme that is developed in the form of a criteria catalogue with a unified rating for assessment. The suggested criteria catalogue was tested on real cases resulting in a preliminary international benchmarking.

Keywords: eTourism Applications, Criteria Catalogue, International Benchmarking.

1 Introduction

As development trends evolved from industrialisation to that of an information generation, affecting most aspects of society, the most evident consequences were observed in the trade and service industries. These changes have significantly affected the global travel market and therefore it is essential that the application potential of the internet economy in tourism is fully exploited. The opportunities and threats of the virtual market place and related business networks can no longer be ignored by industry players as the combination of service and technology is one of the key factors of success for the tourism industry (Gratzer et al. 2004, WTOBC 1999). As many studies indicate, the importance of the online travel market will grow over the next few years resulting into escalating profits. This trend, according to the prognosis of PhoCusWright (2005) will further develop; as indicated by a forecast that the online travel market within Europe will reach 26% by 2008. This growing trend places enormous pressure on the tourism industry to change, with particular focus on "information bundling" (Buhalis 2003, EC 2005, Gratzer et al. 2002, WTOBC 2001). "Information bundling" requires the tourism industry actors to implement an alternative strategy which includes the use of an integrated network and mutual co-operation from all service providers. Furthermore the service providers will have to be able to access a central data bank which is actively managed and regularly updated. Essentially this application makes all the information of the service offers public, i.e. providing an optimal holistic marketing platform for tourism products (Joo 2002, Richtie & Richtie 2002, Scarnato 2003, Sussmann & Baker 1996).

This paper specifically analyses the subject of "information bundling" and describes the necessary steps and measures to be taken by tourism actors to adapt their current and future web presence to the requirements of an internet economy, whilst ensuring they remain competitive. Furthermore, an appropriate classification system in which all the possibilities existing in eTourism appliances are clarified and defined is presented. In this manner the salient features of the web presence of tourism actors are identified, from which conclusions may be drawn.. In the assessment, the current recommendable features of web tourism applications are put forward in the form of a comprehensive catalogue which includes the varying aspects and the necessary primary requirements for an eTourism application from different perspectives. User friendliness and customer support are the crucial prerequisites. In addition to technological support functions,, further aspects such as usability, the composition of information and the development of various new methods necessary for creating an "added value" for the tourist searching for information are focussed on. In closing, a case study presenting international examples within different categories from eTourism (and their classification thereof) is put forward. Sample applications used in leading destinations are assessed according to a three level benchmarking process and emphasise the innovative concepts within the fields of; information quality, infrastructure, technology development, marketing & sales, operations and service.

2 Internet Economy in Tourism

Digitalisation can be viewed as the motor of transformation for the tourism industry in the age of the internet economy. Digitalisation can further be defined according to various intensity levels: from pure presentation and information (website), to a sales channel function (ecommerce), to business process integration (ebusiness) up to new business models with virtual products or services (Gratzer et al. 2002, Scarnato 2003, Timmers 1998). The changes within the internet economy furthermore brought about changes within the tourism sector which have mainly focussed on four scientific developments and its drivers (Buhalis 2003, EC 2005, Watson et al. 2004).

Table 1. Development of the Internet Economy

Market Development	Drivers
Intensified competition	Increase of market transparency and the reduction of information industry market frictions. Reduction of switching barriers Break down of market entry barriers Disintermediation
Increased level of virtualisation	Increase level of virtualisation of most products and services Increase of virtualisation in most organisations
Increased complexity	Increased speed of innovation Fragmentation of markets
Change in consumer behaviour	Increase of power of demand markets Decrease of customer loyalty and increased problems with customer retention

Supporting this development is the gradual increase of digitalised or completely virtualised products in tourism. It is increasingly evident that more and more tourists are provided with information to facilitate service delivery, thereby ensuring it has a positive affect on the tourist's experience. Although no recipe for ebusiness in tourism exists, it is still considered an information business due to the intense flow of information of tourism products and services (WTOBC 1999). This presents a very good opportunity for tourism actors, as a well functioning, effective network allows tourism organisations to take full advantage of possible differentiation and discrimination strategies (Kanellopoulos & Panagopoulos 2006, Werthner 2003). Essentially an integrative process orientated towards a conceptual framework which considers the customer and the supplier perspectives must be achieved.

3 Assessment of eTourism Applications

Current eTourism applications display a hugely fragmented design, particularly with regards to conceptualisation, structure and content layout. For the systematic acquisition and methodical comparison of heterogeneous offers, a common framework as a foundation is quintessential. Such a classification scheme as for example the criteria catalogue, in which the aspects to be investigated are determined and a unified rating for the assessment is provided. The goals of the criteria catalogue, as the foundation of assessment, are:

- Implementation of the systematic course of action to be followed thereby providing a holistic acquisition and appraisal of current offers.
- The creation of a solid base for extensive ongoing assessments of eTourism applications, from which all relevant aspects can be documented.
- Categorisation of relevant criteria for the analysis
- Creation of a grid for the documentation and comparison of the ground principles of eTourism applications.

3.1 Alternative Approaches when Assessing eTourism Applications

In the context of our research we explicitly needed to acquire an evaluation framework for the analysis of tourism websites, identifying strengths and weaknesses from all current developments such as the Web 2.0 and innovative technical web applications. A lot of research on the evaluation of e-commerce application has already been made, but the various evaluation measures either don't focus on tourism websites or if they do so, they vary broadly in context, depth and focus. Therefore we conducted a thoroughly literature analysis as basis for afterwards integrating and supplementing the various approaches to form a kind of meta-catalogue with evaluation criteria.

Literature review reveals that for the assessment of online presence of websites and portals a variety of existing heuristics, checklists and criteria catalogues which generally focus on usability and user guidance have been applied (Shneiderman & Plaisant 2005). Literature further concentrates on criteria for good web designs (Beier & Gizycki 2002, Thissen 2003). The elaborated assessment approach in this paper measures the quality of the information (e.g. how the information is formatted, how

the information is presented graphically, if the information is easy for customer use, etc.). Since only general regulations and guidelines for the daily use and formation of such offers are common it is clear that the process orientated and the branch specific aspects are not taken into consideration. Moreover, the relevant literature in tourism pursues various objectives (Cox & Dale 2002, Wimmer & Rind 2006, Buhalis 2003, Adersberger 2005). For example the evaluation of the best tourism web sites of the year with focus on web design (Chrystal Webaward 2006) or the level of innovation and criteria required for the reduction of barriers (Destination 2004). Based on the arguments presented above the following abstracts present an integrative framework for eTourism applications.

3.2 Creation of a Criteria Catalogue for Assessment of eTourism Applications

Recommendations from literature advise that the formation of such a criteria catalogue must pay specific attention to the creation of added value for the tourist (Andersberger 2005, Ashkenas 1995, Porter 2000). The following suggested criteria catalogue is based on theoretical studies after which empirical findings from the field studies were analysed and adapted accordingly. The basic concept includes the following five categories:

- Basic information
- Classification
- Levels of interaction
- Information quality
- Value chain

The resulting criteria catalogue with over 30 criteria, offers a detailed analysis and assessment of eTourism applications based on a common foundation. Each main category is made up of various criteria and sub criteria which are in turn, broken down into further key elements which can be individually assessed. By means of the combined qualitative and quantitative assessments it is possible to assess the structure as well as the content of the various aspects thereby ensuring that none of the features are overlooked. In this way a single foundation for a holistic assessment of eTourism applications is possible.

Basic Information and Classification. The first step involves the collection of the basic information regarding eTourism applications. The second step classifies the offers according to the dimensions: eDestination, eTransport, eHospitality, eIntermediary, eActivity and eInformation (according to Buhalis 2003 and Scarnota 2003). This approach reduces the complexity and facilitates a comparison of the diverse eTourism applications. Herewith follows an explanation of the various dimensions:

- eDestination: Includes all the forms of activities which are supported by ICT (information communication technologies) and conducts all the planning, product-offer, lobbying and marketing functions a destination requires. Examples include; collaborative product commerce, enterprise resource planning, supply chain management, customer relationship management, etc.

- eTransport: Includes the special location fluctuations in tourism by means of information and communication technology assistance tools, taking into consideration the complete social, economic and technical institutions, structures or principles for which location adjustment are necessary. Examples include computer reservation systems, online travel plans and mobile ticketing.
- eHospitality: Refers to the fusion of information and communication technologies in eCommerce in commercial tourist accommodation. Examples include yield management systems and computer reservation systems.
- eIntermediary: Includes all the travel agencies and tour operators, who create a tourist product and sell it to the end user. Emphasis is on the horizontal and vertical integration of dynamic packaging taking into consideration the global distribution systems.
- eActivity: Includes all ICT support activities in tourism. Every feature of tourism consists of activities from people to leisure businesses or various other purposes that may be presented by the application of the global positioning system (GPS).
- eInformation: Refers to the interactive advisory and supportive functions offered to guests as well as the transfer of knowledge of current changing facts, these are dynamic and therefore change over time. For example the global information system (GIS) and the product data management (PDM) for FAQ's and/or call centers especially for these categories.

Table 2. Aspects and Assessment Principles of the Levels of Interaction

Levels of Interaction	**Aspects**	**Assessment Principles**
Information	General Information	General information about the advertised offer
	Customised Information	Advertised offers targeting the specific market.
Communication	Email	Existing contact or email addresses
	Discussion Forum	Opportunity for the website users to have discussions
Social Networking	Travel2.0 Collaboration	C2C, C2B or B2B possibilities to communicate with social software components
	User-generated Content	Website content (for example textual information, images, video) is contributed by users and not only by website provider
Transaction	Non-addressed Transactions	Opportunity for the users/customers to request quotes and make reservations
	Individualised Transactions	Possibility to save the personal details of the user once reservation is being made

Level of Interaction. The identification of the level of interaction of an eTourism application will be based on the model presented by the eGovernment initiative of the Federal Government (eVanti 2006). In the following structure the levels of interaction are categorised according to; information, communication and transaction. The detailed aspects of each category are differentiated and assessed.

Information Quality. In the category information quality the collection of summarised aspects of the preparation and presentation of the available information, the navigation quality and content layout assessment principles are individually supported and tested by means of the assessment principles. The underlying structure is based on the recommendations of Wimmer & Rind 2006, Harteveldt 2006 and Cox & Dale 2002.

Table 3. Aspects and Assessment Principles of Information Quality

Information Quality	Aspects	Assessment Principles
Preparation and presentation of Information	Comprehensiveness/ Accuracy	Extent of detailed information given and accuracy thereof.
	Clarity	Concise information presented in consistent fashion, understandable layout
	Amount of data	The amount of data evident in the offers and number of pages
Navigational Quality	Structure & Menu Guide	Consistent with the ergonomic design rules and menu guides.
	Search function	The type and degree of search function.
Content Layout	Loading times	Conforming to average loading time of pages with offers
	Ease of location, coverage, accessibility	Coverage of the application by means of extensive search engine
	Maintenance of standards	Consistency of the up keep of layout norms
	Text/ Graphics / Miscellaneous	Use of different media to transfer text, graphics, video

Value Chain. The last category is adapted from the value chain suggested by Ashkenas (1995) and Adersberger (2005) which is based on the much referred to value chain of Porter (2000), includes the following five primary activities:

- Infrastructure
- Technology Development
- Marketing & Sales
- Operations
- Service

With the integration of the value chain in the criteria catalogue many of the primary activities have to be taken into consideration since the supporting activities have no

affect on the layout of the eTourism applications. Based on the above mentioned activities the following structure presents the processed assessment principles upon which the eTourism applications may be analysed.

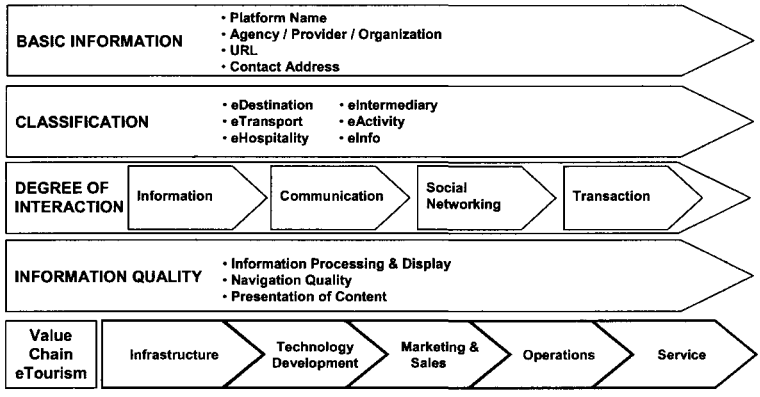
Table 4. Aspects and Assessment Principles of the Value Chain

Value Chain	Aspects	Assessment Principles
Infrastructure	Completeness/Up-to-date	Information which is current and accurate, i.e. the amount of „dead" links.
	Transitions & Links	Quality and symbolisation of links, the logic of the transfers, the differentiation between the internal and external links.
Technology Development	Applied Technique	The application of the latest technology
	Functions	Given functions and value added services
Marketing & Sales	Connection of pages	Integration of value added services
	Innovative Marketing Strategies	Dynamic Packaging, Guerilla Marketing, etc.
	Content arrangement for target markets	Content specifically developed and arranged for specific individual groups of tourists
	Use of several languages	The quality and the extent of languages offered.
	Information material	The availability of information in down loadable brochure format
Operations	Package offers	The availability of package offers
	Personalised packaged offers	The possibility of personalising the variety filled packages
	Reservation possibilities	Methods of making reservations and on-line payment
	Security features	SSL coding
Service	Communication Methods (C2C and C2B)	Feed back mechanisms, user recommendations, questionnaires
	FAQ personalised contact / on line assistance	Degree of availability
	Newsletter/Newsticker/personalised "push-info"	Degree of availability
	Gadgets, turnover cards/web miles	Degree of availability
	Documenting personal details.	Acquisition and maintenance of personal details and opinions.

3.3 Procedure of Evaluation

The criteria catalogue as described above was used in the evaluation process of tourist websites and consolidated the well-established lists of criteria and concepts as described in chapter 3.2. Furthermore it integrated aspects of Web2.0 and included the evaluation of current and future web technologies and applications. It also builds the basis for future expert reviews where usability professionals with knowledge on tourism may conduct a thorough evaluation. This evaluation covered both quantitative and qualitative data: For each aspect, explicit and concrete criteria was formulated and qualitatively evaluated on a three-step scale, where possible. The quantitative evaluation involved the comparison of criteria with recognised standard measures (for example loading times of websites or the quantity of navigation or menu items). Thus, both quantitative and qualitative aspects were regarded and scientific insights on the ideal design of websites along with interaction concepts .were incorporated. The whole concept is soundly supported by current research and integrates both state-of-the-art approaches (for example the category "Degree of Interaction").

Figure 1. Framework for the evaluation of eTourism websites



4 International Benchmarking of eTourism Applications

Based on the criteria catalogue an exemplary evaluation of international eTourism web pages was conducted in order to find valuable inputs to improve eTourism applications in Switzerland. The analysis was performed with a three-dimensional benchmarking approach, with special focus on the technology development (Web Technologies, Telecommunication, Media Technologies), services (Support, Marketing, Information Processing, Gadgets) and information quality (Content Structuring, Navigational Quality, Comprehensibility, Presentation of Information, Search) since these factors seemed to be crucial aspects for the success and the ease of use of eTourism applications (Lu & Lu 2004, Hepp et al. 2006, Doolin 2005). For each of the subcategories, exemplary applications or novel approaches were identified and overall 33 web pages could be identified. Their geographical allocation can be

summarized as follows: Mainly western European, North American and Australian features could be identified as trendsetters – overall Austrian and US American applications were the most innovative. When briefly introducing the most exemplary results of the assessment it needs to be considered that all identified features were located on individual web pages, yet no page offers a comprehensive combination. Not many pages currently implement a few of the features from the three dimensions successfully, as www.newzealand.com and www.aspensnowmass.com, for example does. Thus it can be deduced that the international standards in eTourism applications are still evolving.

Technology Development. Technological aspects and features of a website in particular enable new virtual and mobile forms of interaction, manipulation and experience for potential customers. The web technology *geotagging* (http://www.venividiwiki.eu) defines the process of adding geographical identification metadata to other applications like websites, images or RSS newsfeeds. Venividiwiki is a mash-up of Google maps and a Wikipedia to collect, tag and map attractions around the world. Anyone can provide so called POI (point of interest) on a map and add as much information (for example name, category, description, website, photo and video) as required. With this tool travellers can place their individual travel experiences while a website user can search information either by selecting categories or by browsing through the map. This web technology is highly interactive and simultaneously collaborative.

Pictures and especially videos transport more subtle messages and emotions than pure textual information. The media technology *TV over the web* offers live TV or recorded TV sessions, documentaries and local commercials to enrich a destination's website with audio-visual information (http://www.newzealand.com). Videos are a perfect way to visualise the complex variety of a destination. Furthermore they assist travellers to focus on their holiday interests and help them to decide whether they like a certain offer or not since their impression of their selected travel details become more realistic. Due to the increase of Web 2.0 platforms like www.youtube.com the usage of videos on the net has become more common than ever before, so the marketing surplus of IP TV for the tourism sector is highly evident.

Services. Service delivery has always been an important success factor in the Tourism industry hence virtual eTourism applications need to provide similar web based concepts to their customers like regular travel agencies. Most notably the support service *travel planer* can be described as an important online service application (http://www.newzealand.com). The "electronic concierge" provides a set of web based tools for travellers to plan their holidays. Their selected personalized travel information can be saved, a calendar and a map of the destination are also available to help structure the trip. The itinerary itself can be saved, enlarged later or printed. If the planning process is completed the travel planer completes the reservation transactions.

The marketing service *resource centre* (http://www.tq.com.au) makes a collection of data available concerning development strategies, business tools, industry information

and media assistance and fosters the B2B communication process. The main idea behind such a resource centre is the open access to the same information for all destination partners on the one hand and on the other to support research as well as the generation of new business knowledge. In general this web application serves as a comprehensive organisational destination knowledge base.

Information Quality. The growing importance of information as an input to all systems within economic sectors has been recognised in the context of increasing competitiveness in a globalised economy. It is crucial for eTourism websites to satisfy their user's information need, so therefore the structure, presentation and retrievability of information is highly relevant. An excellent feature on eTourism websites is an *interactive orientation card* (http://www.skiamade.at). This card especially helps tourists without any geographical knowledge about the destination to gain a better orientation. The orientation card is shown on each sub-page and connects the displayed information with geographical positions and details. The card itself should not cover too much space in the content area of the page since detailed information could be displayed with an enlarged interactive destination map with further functionalities like travel time calculator, weather information or the selection of different views of a destination.

The performance of search functions integrated into eTourism pages need to be highly efficient since most information on websites either create revenue by leading to a reservation process or contain relevant additional surplus values for the customer like GPS information for hiking tours, location plans or additional holiday attractions. The traditional usage of search engines is mostly based on textual query processing. Novel improvements promote new search concepts like *search engines with visualisations* (http://www.visitdenmark.com). The example from Denmark enables an accommodation search on a map where the tourist is able to select the destined part of the country to add it to the search query and the access to information becomes more intuitive.

Recapitulating, the international benchmarking indicated that not one ideal example of an eTourism website could be identified which incorporates all analysed innovations, only few websites offer a combination of some of the novel features from the three dimensions, i.e., information quality, user services and technology development. However it must be said that, a broad variety of good practises were identified. The authors would further highly recommend comprehensive integration into existing websites.

5 Future Directives

The virtualisation of tourism offers is advancing with great speed. As there are no physical barriers the internet economy offers new customer orientated services as well as the creation of a widespread destination service cluster. No longer is the focus on the creation of a tourism product, but it has widened to that of how knowledge of the tourism product, especially the design thereof has to be created in order to fulfil the needs of the target customer and how this information is transferred and presented.

Tourists do not accept media failures when selecting tourism products. Committed, reliable communication channels – on line, mobile, accessibility and transaction efficiency are required. However the future presents more challenges that should not be overlooked. One for example is the development of the so called "social software" this refers to the loss of the information monopoly by the suppliers of tourism products. The users inform themselves and trust information from like minded folk, more than the actual information on offer. The pages consisting of hotel guest assessments and recommendations are only a pre taste of what's to follow, i.e. tour recommendations, critique, travel reports, photos, audio and videos made by the users, placed on the web by means of blogs, flickr or youtube and randomly published, would require future suppliers of tourism organisations to integrate all the activities into one tourism product offer. Interactivity and the possibility of considering the "user generated contents" should be promoted. Guest experiences remain a future important source of gaining the best information on potential target markets. Further potential prospects regarding customer relations and connections are evident in the development of parallel worlds (e.g. Second Life). Hybrid concepts are in great demand, tourists want to be orientated as realistically as possible about the experiences on offer, for example they should be able to „pre-experience" the product if possible and test it virtually on a non committal basis and then be able to exchange views on the product with other users. The realization of the above mentioned potential prospects requires the creation of specialised means to ensure all activities are canalized as efficiently as possible thereby creating new challenges for most of the concepts currently in place by the industry suppliers. Action and reaction to this narrow spiral would define itself more clearly by means of international benchmarking which will gain more importance as competitiveness increases.

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Context-based Adaptation of Ubiquitous Web Applications in Tourism

Wolfram Höpken, Markus Scheuringer, Dirk Linke, and Matthias Fuchs

Etourism Competence Center Austria (ECCA)
{firstname.lastname}@etourism-austria.at

Abstract

The customer nowadays expects ubiquitous access to information exactly relevant to their current context during all trip phases. Information has to be provided in a highly personalised way and has to be accessible anytime and anywhere by any possible devices. Consequently, information systems have to adapt themselves to the current usage context. This paper presents an approach to dynamically adapt ubiquitous web applications in the dimensions of content, design and behaviour to the complete usage context (i.e. user, current situation and used device), making use of an XML-based neutral representation of the web application's user interface. The paper discusses existing approaches for adaptive systems, presents a general-purpose adaptation model and a corresponding IT-framework and introduces the application of the proposed approach within the Innsbruck.mobile web application.

Keywords: context awareness, adaptive systems, ubiquitous computing, mobile applications.

1 Introduction

Current trends in tourism towards shorter but more frequent vacations, more spontaneous and short-termed bookings and more critical and less loyal customers (Werthner & Klein, 1999) lead to an increasing demand of the customer to have access to relevant information anytime and anywhere. More precisely, the customer expects to have ubiquitous access to information, especially during his trip, supported by different access modes (e.g. web applications or SMS/MMS services) and access devices (e.g. PC/laptop, PDA or mobile phone). He expects that information is provided in a highly personalised way, adapted to his profile and preferences as well as his current situation (location, time, surroundings, etc.).

Tourism information systems have to show a highly adaptive and personalised behaviour in order to fulfil the above requirements. Filtering information (or tourism products and services) based on customer profiles and preferences as a kind of personalisation is typically dealt with by so called *recommender systems*. Such systems filter information by knowledge-based methods, taking into account product or customer similarities (Adomavicius & Tuzhilin, 2005; Ricci et al., 2005). Typical approaches either recommend products similar to products the customer liked in the past (*content-based filtering*) or products similar customers liked in the past (*collaborative filtering*) or combine different approaches (*hybrid recommendation*).

Recommender systems are a well-established research area within tourism and will not be further investigated here. Instead, this paper focuses on adaptive systems, i.e. systems dynamically adapting their content, design and behaviour to the usage context, i.e. the user, his current situation and especially the used access mode and device (Dey, 2004; Subramanian, 2002). Adaptive systems intend to increase information quality, the efficiency of the human-computer interaction and the overall usability of information systems.

The objective of the presented work is to develop a conceptual and technological framework for dynamically adapting ubiquitous web applications in the dimensions content, design and behaviour to the complete usage context. The focus lies on supporting mobile services by enabling an optimal adaptation of the service to all available mobile devices and facilitating multimodal access. The paper is structured as follows. Section two gives an overview of adaptive systems and discusses current approaches and applications. Section three presents an adaptation model, defining relevant adaptation dimensions applications are adapted in, and context dimensions applications are adapted to. Section four presents a framework for dynamically adapting web applications taking into account the adaptation and context dimensions defined in section three. A first implementation of the adaptation framework as part of the mobile tourist guide *Innsbruck.mobile* is presented in section five. Finally, section six summarises the results of the presented work and gives an outlook on future research activities.

2 Adaptive systems

Adaptive systems (or software systems) are characterised by their ability to adapt themselves to their environment or usage *context*, where context can be viewed as all information to characterise the current situation in which the user interacts with the system (Dey, 2004). A change in the context and therefore in the requirements to the system causes a change of the system itself, in order to fulfil the changed requirements (Subramanian, 2002). Here, adaptive systems have to be separated from *adaptable* systems. The latter can be extrinsically adapted, e.g. by the user changing the language or the font size, in contrast to adaptive systems which intrinsically adapt themselves. Adaptable systems will not be further investigated here.

The objective of adaptive systems is the increase of usability and usage efficiency. Individually adapting a system to the user and his usage context will increase the efficiency of the human-computer-interaction. A personalisation of the interaction flow will increase the overall usability especially in the case of an unknown or temporarily used system. A situation-conform style of interaction will facilitate the intuitive usability of the system. These objectives and advantages of adaptive systems are especially important in the area of mobile applications. Potential users are using a multitude of different mobile devices (e.g. mobile phones, smart phones, PDAs) and the application has to optimally adapt its presentation and behaviour to the device capabilities (like screen resolution, hot keys, touch screen, etc.). Additionally, the

ubiquitous usage of mobile applications in quite different situations and the potential unfamiliarity of the user with the concrete application, especially in the tourism domain, requires an intuitive and situation-conform human-computer-interaction.

Beside the above advantages adaptive systems face a couple of drawbacks and limitations. First, the overall effort for system development and maintenance will increase, due to a significantly higher system complexity. Especially the effort for system tests increases, as adaptive systems have to be tested for all context parameters and under all circumstances. Second, system adaptation can lead to a loss of trust and control of the user over the application (over-adaptation), blighting the intended increase of usage efficiency and usability. The implementation of adaptive systems therefore requires a profound evaluation of the positive effects of each single adaptation within the adaptation space. The following sections give an overview on typical adaptation dimensions and corresponding existing adaptive systems.

Device adaptation. The increasing usage of mobile devices (e.g. mobile phones, smart phones, PDAs) and a faster and cheaper access of such devices to the Internet lead to an increasing usage of web applications via mobile devices. The existence of a multitude of different types of mobile devices, significantly differing in their capabilities (e.g. display size, input modalities), enforces a dynamic adaptation of web applications to different device types. *The Monsec Web* (Sendin et al., 2002) and *DIWE* framework (Kerer et al., 2004) are two examples of adaptive systems, dynamically generating a device-conform user interface.

Multimodality. Multimodal systems include multiple senses into the human-computer-interaction, e.g. acoustic, haptic or visual senses. They intend to provide the optimal interaction modality depending on the situation of the user and the user itself. Acoustic interaction for example will be a more intuitive and efficient mode of interaction while driving a car or a bicycle, walking through a city or for visually impaired people. The multimodal tourism information system *AccesSights* (Klante et al., 2004) for example supports visually impaired users by an acoustic navigation and information output. The *ISlide* system (Bristow et al., 2002) enables user navigation by gesture recognition within a museum guide.

Activity adaptation. Adaptive systems often distinguish different activities or interaction phases which are supported by specific content, presentation and behaviour. The *AccesSights* system (Klante et al., 2004) for example distinguishes different interaction phases during a park visit (the orientation, movement and information phase) which are supported by a different depth and types of information.

User adaptation (personalisation). Personalisation describes the process of adapting a system to its single user, depending on his profile (demographic data and preferences) and usage history. Recommender systems are a well known type of personalised systems, concentrating on filtering content items relevant to the user. In general, personalisation also deals with adapting the content presentation (e.g. length and style

of textual information) and behaviour of an application (e.g. filtering of menu items based on usage history). *IMPS* (Bristow et al., 2002) is a mobile museum guide, adapting the provided presentations of artefacts to the user age and user type (differentiating between first time visitors, return visitors, systematic route followers, cruisers/browsers, artefact spotters and specific artefact searchers). *COMPASS* (Van Setten et al., 2004) is a context-aware mobile personal assistant adapting its offer to the user profile which is automatically generated due to the user's feedback.

Location adaptation. Mobile applications often provide location-based services, typically providing information relevant to the user's current location, e.g. hotels, sights or other points of interest nearby. X^3 (Bristow et al., 2002), *COMPASS* (Van Setten et al., 2004), *The Monsec Web* (Sendin et al., 2002), *CRUMPET* (Poslad et al., 2001) and *LoL@* (Anegg et al., 2002) are examples of location-based services, providing information about the user's current position and points of interest nearby and visualise them on a map or provide proactive information when they are reached.

To summarise, adaptive systems, especially in the tourism domain, mostly deal with the adaptation of information or content presented to the user (e.g. personalisation and recommender systems, location-based services etc.). Only a few systems deal with the adaptation of the user interface, i.e. the content presentation and application behaviour and more or less no approaches exist for a comprehensive application adaptation in all dimensions mentioned above. The present work therefore firstly defines a comprehensive adaptation model, consisting of all relevant adaptation dimensions, and then develops a framework for comprehensively adapting web applications in all adaptation dimensions triggered by all context dimensions, focussing on the adaptation of the user interface of web applications.

3 Adaptation model

As stated earlier, application adaptation means adapting different aspects or parts of an application (*adaptation dimensions*) according to different environmental and contextual variables (*context dimensions*). The adaptation model, described in this section, defines adaptation and context dimensions that are of relevance for adapting mobile applications especially in the tourism domain. Adaptation and context dimensions span an *adaptation space* of all possible adaptations shown in **Table 1**.

The columns of **Table 1** represent adaptation dimensions, extracted from existing adaptive applications as well as corresponding literature (Galinski, 2006; Sendin et al., 2002; Kerer et al., 2004; Klante et al., 2004; Bristow et al., 2002; Van Setten et al., 2004; Anegg et al., 2002). The *content* of an application and how it is presented can vary related to several aspects (Galinski, 2006). First of all, the content can be optimised to the user's needs and interests and filtered by specific *topics*. Furthermore, the content presentation is limited by the capabilities of the device. Not every device can display long text passages or large images in full size. Texts may be shown as summaries, important text passages or characterising keywords. Finally, in

case of low memory resources or bandwidth, data volume optimisation (e.g. by smaller images) can help to avoid performance problems. The *interface design* of the web application, its dialogs and navigation, the layout and structure of its pages and the supported interaction modalities are important adaptation dimensions in order to meet the personal wishes of the user as well as device-dependent limitations. Some kinds of dialogue elements may not be displayed by every class of device and small display size (or resolution) will require a sequential representation of content and structures like tables and lists. Supporting different interaction modalities, like voice in-/output, can improve comfort and safety (e.g. car navigation systems) or enable specific user groups like disabled persons to interact with the application. In addition to content and interface design, adaptive *behaviour* can essentially improve the usability of ubiquitous web applications. Specific *interactions* like word proposal for input dialogues especially on devices which are not equipped with a full keyboard will improve usage efficiency. *Assisting* functionality like sounds or visual alerts can be adapted to the specific usage context (e.g. during a concert, in a bar, within the car) and phonetic search options and spell checking services can be switched on or off depending on the device type or user type (e.g. novice or advanced user).

The rows of **Table 1** represent the context dimensions which are of relevance to trigger the adaptation of ubiquitous web applications in the tourism domain (Schilit et al., 1994; Adorini et al., 2006; Liebermann & Selker, 2000; Tarasewich & Campbell, 2004; Tazari et al., 2003; Dey, 2004). The dimension *time context* is of high relevance for ubiquitous applications in tourism as such applications are typically used during the trip or destination stay where content, design and behaviour of the application depend on the current *time* (day time, date) and *season* (e.g. descriptions and pictures of a destination). *Device context* is actually the dimension which most of all influences the characteristics of the user interface of an ubiquitous application. How content is represented (e.g. text length, picture size), the dialog design, navigation and page structure, the supported interaction modalities as well as the behaviour of the application strongly depend on the used device - it's hardware resources (e.g. size of memory), available interfaces (e.g. keyboard, screen size), network capabilities (e.g. bandwidth) and client technology (e.g. browser). The *user context* (Adorini et al., 2006), i.e. his *demographic data* and *preferences*, influences the content presented to the user as well as the interface design or behaviour of the application, e.g. a preferred interface modality like voice in-/output for handicapped users. The *spatial context,* consisting of the current *location* (Adorini et al., 2006), the *weather* and the local *environment* mainly influences the presented content (location-based services). The local environment (noise level, lighting conditions, etc.) may also trigger the interface design and behaviour of the application, e.g. voice in-/output in an outdoor environment with inappropriate lighting conditions. Within the *travel context* the *purpose* of travelling, i.e. the *travel intention* (e.g. cultural journey, recreation or education) and *travel type* (business trip or leisure trip, further divided into single trip, family trip, group trip, etc.), mainly influences the presented content. The travel *itinerary* enables content to be filtered based on already consumed or planned tourism services or activities (e.g. avoid repeated or overlapping activities).

Logistics subsumes factors like kind of available transportations, length of stay or size of tour group, influencing for example whether a specific location within the destination is reachable during the stay.

Table 1. Adaptation space

Adaptation dimensions / Context dimensions		Content				Interface design				Behaviour		
		Topic	Textual content	Images	Multimedia content	Language	Dialogues & navigation	Layout & structure	Modality	Interactions	Assistance	Fault tolerance
Time context	Time	2	1	1	1	0	0	0	0	0	0	0
	Season	2	1	1	1	0	0	0	0	0	0	0
Device context	Hardware resources	0	1	1	2	0	1	1	2	2	2	1
	Interfaces	0	2	2	2	0	2	2	2	2	2	2
	Network	0	0	1	2	0	1	1	1	0	0	0
	Client technology	0	1	1	1	1	1	2	2	2	2	0
User context	Demographic data	2	1	1	2	2	1	1	1	1	1	0
	Preferences	2	1	2	2	2	1	1	2	1	2	1
Spatial context	Location	2	0	0	0	0	0	0	0	0	0	0
	Weather	2	0	0	0	0	0	0	0	0	0	0
	Environment	2	1	1	2	0	1	1	2	1	1	1
Travel context	Purpose	2	1	1	1	0	1	1	0	0	0	0
	Itinerary	2	1	1	1	0	0	0	0	0	0	0
	Logistics	1	1	1	1	0	0	0	0	0	0	0

As mentioned in section 2, each adaptation leads to additional application complexity and has to justify itself by a significant increase in usability and usage efficiency. Therefore, not all combinations of adaptation and context dimensions, i.e. not all elements of the adaptation space are equality important or meaningful, depending on the specific application or application domain. **Table 1** specifies the relevance of each single adaptation concerning ubiquitous web applications in tourism ranked on a scale between 2 (very important) and 0 (not relevant). The priorisation in **Table 1** is the result of an analysis of existing adaptive applications in the tourism domain (Schilit et al., 1994; Adorini et al., 2006; Liebermann & Selker, 2000; Tarasewich & Campbell, 2004; Galinski, 2006; Tazari et al., 2003; Dey, 2004; Brown et al., 2000; Sgouros, 2005). Different adaptation scenarios within existing mobile tourism applications were assigned to single elements of the adaptation space and the

frequency of their occurrence determined their relevance. A value of 0 has been assigned in the case of no occurrences at all, a value of 1 if the adaptation occurred at least once and a value of 2 if the adaptation occurred several times or has been a key functionality of an adaptive system.

4 Adaptation framework

The objective of the presented adaptation framework is to provide a mechanism enabling the definition and execution of application adaptations in a flexible way with minimal development and configuration effort. Adaptations should be dynamic, i.e. their definition should be separated from the application code and should be possible without changing the application itself. This paper presents an adaptation mechanism based on a strict separation of content, design and application logic, based on techniques like XML and XSLT (www.w3.org/tr/xslt [Sep. 4, 2007]). The content and general structure of the application is stored in a neutral format, independent of the concrete presentation, and the presentation and behaviour of the application is dynamically generated based on transformation instructions. Following the principle of separation of concerns, the overall adaptation is composed of independent transformations corresponding to the single adaptations of the adaptation space (e.g. language transformation, transformation to display size, etc.), enabling an easy and efficient definition of adaptations by flexibly composing single transformations.

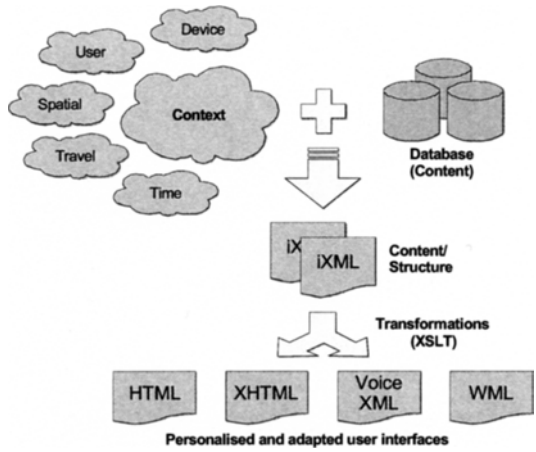

Fig. 1. Adaptation mechanism

Fig. **1** illustrates the adaptation mechanism. Content is stored in a database in a presentation and application-behaviour independent way, annotated with contextual information where necessary. Based on specific user requests and depending on the current context, suitable content is selected from the database. The content and

general dialog structure together with relevant context parameters is provided in the form of an intermediary format, based on XML (iXML). Depending on the context parameters, a series of transformations (corresponding to the single relevant adaptations of the adaptation space) is performed, based on XML style-sheet transformations (XSLT). Depending on the used device or interface modality, the concrete user interface (i.e. dialog or web page) is finally generated in the appropriate language (e.g. HTML, XHTML, VoiceXML, WML, etc.). This approach allows an easy system extension (e.g. the integration of new devices, new content, etc.), highest flexibility, task division and optimal servicing and maintenance.

In the last couple of years many different approaches to XML-based formats for user interface descriptions have been developed. Within the presented work the following formats have been analysed according to their suitability as an intermediary XML format: The *Extensible Application Markup Language* (XAML), the *User Interface Markup Language* (UIML), the *USer Interface eXtensible Markup Language* (UsiXML, www.usixml.org [Oct. 28, 2006]), the *Device-independent MultiModal Markup Language* (D3ML, www.snow-project.org [Nov. 03, 2006]), the *XML User Interface Language* (XUL), the *eXtensible Interface Markup Language* (XIML, www.redwhale.com [Oct. 27, 2006]), and the *Transformation Environment for inteRactivE Systems representAtions* (TERESA, http://giove.cnuce.cnr.it/teresa.html [Sep. 30, 2006]). Based on these XML formats and their different approaches, a specific intermediary XML format, making use of XHTML and XForms, has been developed within the presented project, especially suitable for adaptive mobile applications in tourism.

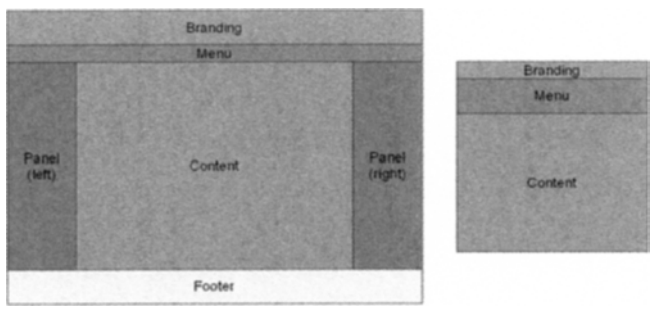

Fig. 2. Different layout structures of a web page (PC vs. PDA/smartphone)

As an example of the general approach of the intermediary XML format, Fig. **2** illustrates the construction of a web page out of several contentual sections. The sections and their content are defined by the intermediary XML format but the exact graphical representation (e.g. fixed positioning) are left open and fixed at transformation time when decisions of where and how to display the individual content sections can be made, according to the device used or other context parameters. Fig. **2** compares a usual layout structure for desktop PCs with a layout

structure suitable for personal digital assistants (PDAs). Differences can not only be seen in the size of the displayed sections but also in their positioning or their appearance (e.g. panels and footer).

Listing 1 shows the corresponding structure of an iXML document. The *<page>* element is the topmost element of an iXML file. It contains two direct child elements *<head>* and *<body>* which are quite similar to the corresponding HTML elements. The *<head>* element holds information like language, title of the page, etc., while the *<body>* element is the area where the actual content is placed in the form of *<section>* elements. Sections can be anonymous or typed (denoted by the *type* attribute) meaning that they may be used for plain structuring (grouping) purpose or as semantically meaningful containers like the different layout sections in Fig. **2**. A semantic differentiation of sections is crucial to be able to decide how to adapt content and layout when specific user preferences or device capabilities have to be taken into consideration. In general, the intermediary XML format provides all semantic information about elements of a web page which are of relevance for the context-dependent adaptation. The attribute *speech* of the element *paragraph,* for example, specifies whether the paragraph has to be considered in case of speech output.

Listing 1:

```
<?xml version="1.0" encoding="UTF-8" ?>
<page>
   <head> ... </head>
   <body>
      <section type="branding"> ... </section>
      <section type="menu"> ... </section>
      <section type="content">
         <heading>This is a heading</heading>
         <paragraph name="para1" speech="true">A paragraph can
contain text in any combination with in-line links or in-line
images.
         </paragraph>
      </section>
   </body>
</page>
```

5 Innsbruck.mobile

Innsbruck.mobile is a mobile tourist guide for the destination of Innsbruck, supporting customers in all trip phases by providing relevant information, such as accommodation, attractions & sights, events, gastronomy and weather forecasts. The customer can search for information (pull service), is automatically provided with relevant information (push service) and can give feedback (blogging). Innsbruck.mobile is technically based on the $_{et}$Planner framework (Höpken et. al, 2006), providing technologies like recommendation, rule-based push service and

location-based services. The adaptation framework, presented in section 4, is an important component of the etPlanner framework and has been implemented and validated within Innsbruck.mobile. Innsbruck.mobile thus contains a mechanism to dynamically adapt itself to different context parameters and to configure and change concrete adaptations based on XSLT specifications rather than changes of the application code.

Supporting different devices (e.g. PC/laptop, PDA, smart phone, etc.) with different capabilities like screen size, interfaces, etc. is an important prerequisite for ubiquitous mobile applications. The adaptation framework within Innsbruck.mobile therefore currently concentrates on adapting the application to all possible access devices. Based on WURFL (http://wurfl.sourceforge.net/ [Sep. 2, 2007]), an online repository of all available mobile devices and their capabilities, Innsbruck.mobile detects the exact capabilities of the used device and adapts itself especially in terms of the dimensions content (textual representation like text length and image type and size) and interface design (dialog & navigation, layout & structure and interface modality). Fig. **3** illustrates the adaptation process by showing the same dialog of Innsbruck.mobile adapted to two different devices.

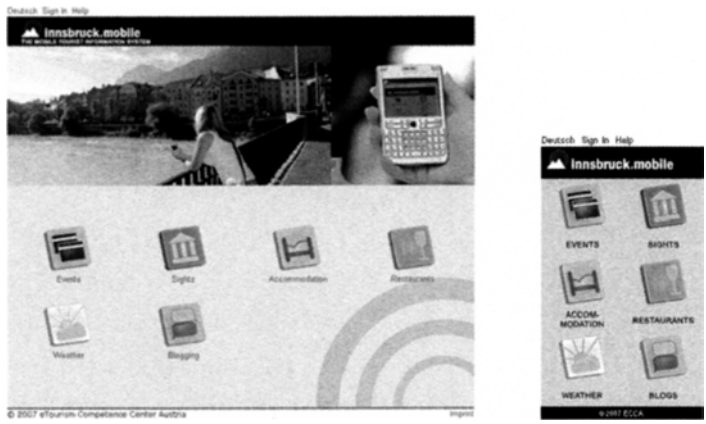

Fig. 3. Device adaptation within Innsbruck.mobile (PC vs. PDA/smartphone)

Different usage contexts are typically correlated with different optimal interface modalities and speech in-/output is a natural form of interaction in many usage contexts of a mobile application (e.g. while driving a car, walking through a city, etc.). Therefore, speech in-/output has been prototypically implemented within Innsbruck.mobile based on *XHTML+Voice* (X+V). *XHTML+Voice*, a combination of VoiceXML and XHTML, is a multimodal markup language standard that provides a way to create multimodal web applications (http://www-306.ibm.com/software/pervasive/multimodal [Sep. 20, 2006]). *VoiceXML* is an XML-based standard using speech recognition and touch-tone (DTMF keypad) for speech input, and pre-

recorded audio and text-to-speech synthesis (TTS) for speech output (www.voicexmlreview.org [Sep. 20, 2006]). Which elements of the interface are relevant for speech in-/output can be specified within the intermediary XML format (see section 4).

The presented adaptation approach proved to be suitable for mobile tourism applications during its implementation and pilot test within the mobile tourist guide Innsbruck.mobile. Due to adapting the application to the used mobile device, user acceptance and satisfaction, collected by user surveys during the pilot phase, emerged as quite high compared to mobile access to traditional websites. At the same time, the flexible approach of dynamic application adaptation, defining concrete adaptations as XSLT specifications, enabled the support of more or less all existing mobile devices with comparatively low effort for developing or changing the application.

6 Conclusion and outlook

This paper presents a conceptual and technical framework for adapting ubiquitous web applications to the complete usage context. The adaptation framework suggested enables a dynamic adaptation of web applications along adaptation dimensions and triggered by context dimensions, both defined within an underlying adaptation model. The adaptation framework has been implemented within the mobile tourist guide *Innsbruck.mobile*, focussing on the dynamic adaptation of mobile applications to the context dimensions *access device* and *access modality*.

The adaptation framework enables application adaptation in all relevant adaptation and context dimensions. In the future, the implemented adaptation mechanism within *Innsbruck.mobile* will be further extended especially by context dimensions like *user* and *spatial* or *temporal context*, respectively. The mobile application can then react to the time of day, the user profile (e.g. gender, age, etc.) or the surroundings (indoor, outdoor, etc.) and optimally support the user in all situations and under all circumstances. As a second important research activity, profound acceptance studies of adaptive applications in the context of mobile tourist guides will be executed. The complete adaptation space, spanned by the adaptation dimensions on the one side and context dimensions on the other side, will be analysed according to the increase of usability and user acceptance. The adaptation space is then populated by the adaptation relevance as perceived by the final user.

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Acquisition and Relevance of Geotagged Information in Tourism

Astrid Dickinger[a], Arno Scharl[a], Hermann Stern[b]
Albert Weichselbraun[c] and Karl Wöber[d]

[a] Department of New Media Technology
MODUL University Vienna, Austria
astrid.dickinger@modul.ac.at, arno.scharl@modul.ac.at[b]

Knowledge Management Institute,
Graz University of Technology, Austria
hermann.stern@tugraz.at

[c] Institute for Information Business,
Vienna University of Economics and Business Administration, Austria
albert.weichselbraun@wu-wien.ac.at

[d] Department of Tourism and Hospitality Management
MODUL University Vienna, Austria
karl.woeber@modul.ac.at

Abstract

In the case of tourism applications, it is particularly evident that geography is emerging as a fundamental principle for structuring Web resources. Recent improvements in semantic and geographic Web technology, often referred to as the *Geospatial Web*, acknowledge the relevance of adding location metadata to existing databases and accessing the vast amounts of information stored in these databases via geospatial services. This paper outlines the acquisition of geospatial context information, describes usage scenarios and real-world applications in the tourism industry, and presents an automated software tool for annotating large collections of Web documents automatically. The quality of this tool is tested based upon Web pages from the Austrian National Tourism Organization. Initial results are encouraging and help define a roadmap for further improving the automated tagging of tourism resources.

Keywords: geotagging, text mining, information retrieval, tourism information systems.

1 Introduction

Travel decisions require a large amount of information and encompass a number of information search, evaluation and integration tasks and activities (Hwang et al, 2006). Due to the nature of the service industry with intangibility of products and in particular in travel, consumption at a later point in time, information search has been a critical factor in the decision process in order to reduce travellers' risk (Lewis & Chambers 2000). The Internet emerged as a medium that provides travellers with relevant information and is slowly emerging as a booking platform (Gursoy & McLeary, 2004; Klein, Köhne & Öörni, 2004).

For travellers location and the destination are of particular relevance. Typically questions in tourism are where is the airport, where is the castle, where are nice restaurants. This indicates that providing information on a map that allows the searcher to immediately filter the relevant spots can drastically improve the information search experience. While the Internet provides some location indicated information, it does not, however, do so to the extent desirable for tourists. However, there is the emerging trend of including maps in web portals. Furthermore, the geospatial web, representing the integration of geographic and semantic information will fuel this development (Scharl & Tochtermann 2007). A simple Google search for *hotel* and *Munich* for instance yields just below three million results. The tourist searching for information now has to identify the pages that in fact deal with hotels and above that are located in Munich. Carrying out the same search on Google Maps arrives with 26,568 results. These are located on the map of Munich and easily found marked with a flag. This illustrates the usability of the system and the improvement of the actual search results.

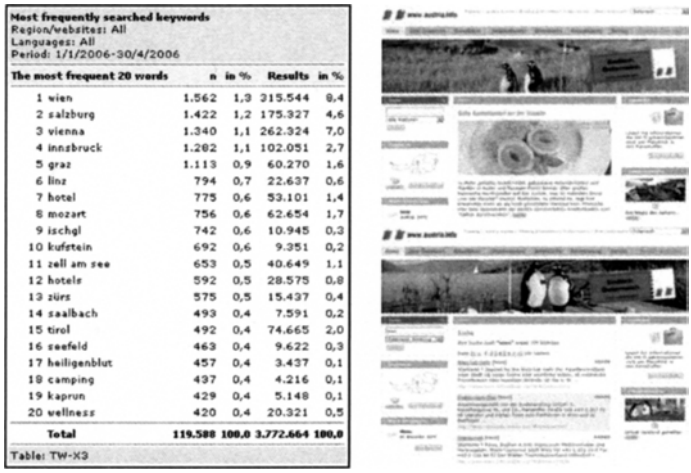
The aim of this study is to present and discuss methods for automatically creating geotagged knowledge repositories (Scharl, 2007) in the tourism domain, to evaluate the accuracy of the resulting annotations, and to provide guidelines for further improvements of geotagging components. The article proceeds as follows. First manual and automated forms of tagging are presented, and then tourism applications of geotagged information are presented to provide some real world examples. The next section presents the automated tagging procedure, followed by an evaluation. The paper closes with conclusions and future research avenues.

2 Geo-Based Information in the Tourism Industry

There are attempts in the travel and tourism industry to use location information to provide better services to travellers. This type of information is primarily exploited for location-based services using Global Positioning Systems (GPS). One such example is a tourist guide for travellers along the river Danube (Dickinger & Zins 2006). Based on the location of the ship the travellers are provided with video clips, information on events, the surrounding area, pictures, and historical information on an interactive map. Location-based services, rather innovative even in the maritime market (Maglogiannis, Kormentzas and Panagiotarakis, 2004a), use the current position of the ship to provide richer information to the customer. These services were primarily push based, the user is located and the content is pushed to a device such as computer, mobile phone or personal digital assistant, to name a few. Other services allow the user to search information in the context of the location he or she defines. This means that maps are provided and the information is location indicated or geotagged.

A geo-based information platform for tourism includes *TrustedPlaces.com* which provides recommendations by users. They can inform their peers about restaurants, pubs, clubs points of interest, sights etc. This information is then linked with Google maps to locate the specific place. *Tupelo.com* has a similar concept with users posting their experiences with restaurants, cafes and bars. However, the initial aim was not to provide information for tourists but people who live nearby.

The project *Personal Experience with Active Cultural Heritage (PEACH)* enhances cultural heritage appreciation by using moves and gestures of visitors to a museum as implicit input for guiding him/her through the building and for hinting the person to specific paintings (Stock et al. 2004). The system combines geo-based information (the location of the visitor as well as the paintings) with persuasive communication tools in order to provide personalized and anticipated content for museum visitors.



Most frequently searched keywords
Region/websites: All
Languages: All
Period: 1/1/2006-30/4/2006

The most frequent 20 words	n	in %	Results	in %
1 wien	1.562	1,3	315.544	9,4
2 salzburg	1.422	1,2	175.327	4,6
3 vienna	1.340	1,1	262.324	7,0
4 innsbruck	1.282	1,1	102.051	2,7
5 graz	1.113	0,9	60.270	1,6
6 linz	794	0,7	22.637	0,6
7 hotel	775	0,6	53.101	1,4
8 mozart	756	0,6	62.654	1,7
9 ischgl	742	0,6	10.945	0,3
10 kufstein	692	0,6	9.351	0,2
11 zell am see	653	0,5	40.649	1,1
12 hotels	592	0,5	28.575	0,8
13 zürs	575	0,5	15.437	0,4
14 saalbach	493	0,4	7.591	0,2
15 tirol	492	0,4	74.665	2,0
16 seefeld	463	0,4	9.622	0,3
17 heiligenblut	457	0,4	3.437	0,1
18 camping	437	0,4	4.216	0,1
19 kaprun	429	0,4	5.148	0,1
20 wellness	420	0,4	20.321	0,5
Total	**119.588**	**100,0**	**3.772.664**	**100,0**

Table: TW-X3

Fig. 1. Top 20 search terms entered on www.austria.info between January and April 2006 (left); screenshots of the domain-specific search engine (right).

The *Austrian National Tourist Office* (www.austria-info.at) is continuously improving technologies for human-to-machine communication. A domain-specific search function was introduced in 2006, for example. A comprehensive analysis of user inquiries for information on all Austrian provincial Web sites simultaneously hints at the potential of geo-enriched information and search features, as the vast majority of search terms entered by the users refer to notations of Austrian regions (see Figure 1). A different platform in collaboration with the *Austrian National Tourist Board* is Coolaustria.com. Its aim is to provide a portal for users that want to post their holiday experience, photos, and recommendations of places in Austria. Above these tips and information, also the travellers are shown on the map. It is possible to contact them in case they are experts for a trip or activity one plans to do.

3 Identifying and Annotating Geospatial Context Information

Efforts are under way to annotate existing tourism resources with geospatial metadata. This process, usually referred to as *geotagging,* assigns geospatial context information, ranging from specific point locations to arbitrarily shaped regions. Geotags are crucial to build advanced tourism information systems and have a wide range of possible applications. They can be used to identify and match users with similar interests, facilitate their communication and collaboration, and provide them with intuitive

search support as shown in Figure 2 – not only considering topical similarity, but also on the location of an information object relative to the user's actual location. Examples include *Jobloft.com,* which enables users to search for retail jobs, food services jobs and hospitality jobs in their vicinity, and *Housingmaps.com* to find out the location of apartments and houses via Google Maps.

Fig. 2. List of articles related to the term 'vacation' within the geo-referenced archive of the IDIOM Media Watch on Climate Change (www.ecoresearch.net/climate)

Sources of Geospatial Information. Different sources of geospatial context information for annotating Web resources often complement each other in real-world applications (McCurley, 2001):

- Annotation by the author, manually (Daviel & Kaegi, 2003) or through location-aware devices such as car navigation systems, RFID-tagged products and GPS-enabled cellular handsets. These devices geotag information automatically when it is being created. Tagging by the author allows the inclusion of different views and associations with specific text fragments or photos. Within small virtual communities, collaborative manual tagging is still predominant.
- Determining the location of the server – by querying the *Whois* (www.whois.net) database for a hotel's domain registration, monitoring Internet traffic, analyzing the domain of a Web site for additional cues (e.g. www.austria.info), or by using dedicated services such as the *Geo IP Tool* (www.geoiptool.com), which returns longitude and latitude of specific IP addresses.
- Automated annotation of existing documents. The processes of recognizing geographic context and assigning spatial coordinates are commonly referred to as *geoparsing* and *geocoding*, respectively.

Once geospatial context information becomes widely available, any point in space will be linked to tourism-related information such as hotel descriptions, movie programs, exhibitions, or personal stories and preferences. Even locative spam will become a common phenomenon (Erle, Gibson, & Walsh, 2005) with the widespread introduction of location-based services.

At present, however, many initiatives to provide geographically referenced tourism information suffer from the chicken and egg problem, wishing that existing content was retrofitted with metadata (McCurley, 2001). This "capture bottleneck" results

from the beneficiaries' lack of motivation to devote the necessary resources for providing a critical mass of metadata (Motta, Shum, & Domingue, 2000). Geotagging projects are no exception. Acknowledging calls to automate the semantic annotation of documents (Benjamins, Contreras, Corcho, & Gómez-Pérez, 2004; Domingue & Motta, 2000), the following sections focus on the third category, the automated geoparsing and geocoding of existing tourism resources – information published by national tourism offices, regional information, hotel descriptions, blogs of travellers during and after their holidays, and other types of unstructured textual data found on the Web.

Geoparsing. All human artifacts have a location history, which commonly includes a creation location and a current location (Spohrer, 1999). Given the availability of geographic references, Web applications can map the whole life cycle of such artifacts. Tourism resources are particularly rich in explicit or implicit geographic references. This includes references to physical features of the Earth's surface such as forests, lakes, rivers and mountains, and references to objects of the human-made environment such as cities, countries, roads and buildings (Jones, Alani, & Tudhope, 2001). Addresses, postal codes, telephone numbers and descriptions of landmarks also allow us to pinpoint exact locations (Ding, Gravano, & Shivakumar, 2000; McCurley, 2001). At least 20 percent of Web pages contain easily recognizable and unambiguous geographic identifiers (Delboni, Borges, & Laender, 2005). Web-based tourism resources are particularly rich in such identifiers – e.g. discussing a destination, reviewing accommodation options, or discussing a region's attractions and highlights.

Identifying and ranking spatial references by semantically analyzing textual data is a subset of the more general problem of *named entity recognition*, which locates and interprets phrasal units such as the names of people, organizations and places (Cowie & Lehnert, 1996; Weiss, Indurkhya, Zhang, & Damerau, 2005). As with most named entity recognition tasks, false positives are inevitable – e.g., documents that quote addresses unrelated to the their actual content (Morimoto, Aono, Houle, & McCurley, 2003). Ambiguity, synonymy and changes in terminology over time further complicate the geoparsing of Web documents (Amitay, Har'El, Sivan, & Soffer, 2004; Kienreich, Granitzer, & Lux, 2006; Larson, 1996). Identical lexical forms refer to distinct places with the same name (VIENNA refers to the capital of Austria as well as a town in Northern Virginia, USA) or have geographic and non-geographic meanings: TURKEY (large gallinaceous bird; bi-continental country between Asia and Europe), MOBILE (capable of moving; city in Alabama, USA), or READING (processing written linguistic messages; town in Massachusetts, USA). Geoparsers also need to correctly process references to identical or similar places that may be known under different names, or may belong to different levels of administrative or topographical hierarchies (Jones et al., 2001).

Geocoding. Once a location has been identified, precise spatial coordinates – latitude, longitude and altitude – can be assigned to the documents by querying structured geographic indices (gazetteers) for matching entries (Hill, Frew, & Zheng, 1999; Tochtermann et al,1997). This process of associating documents with formal models is also referred to as document enrichment (Domingue & Motta, 2000; Motta et al.,

2000). Examples of formal geographic models are the Geographic Names Information System (geonames.usgs.gov), the World Gazetteer (www.world-gazetteer.com), the classifications of the United Nations Group of Experts on Geographical Names (unstats.un.org/unsd/geoinfo), the Getty Thesaurus of Geographic Names (www.getty.edu) and ISO 3166-1 Country Codes (www.iso.org/iso/en/prodsservices/iso3166ma/index.html).

While simple gazetteer lookup has the advantage of being language-independent, advanced algorithms consider lexical and structural linguistic clues as well as contextual knowledge contained in the documents; e.g., dealing with ambiguity by removing stop-words, identifying references to people and organizations (Clough, 2005) and applying contextual rules like "single sense per document" and "co-occurring place names indicate nearby locations". Each identified reference is assigned a probability *P(name, place)* that it refers to a particular place (Amitay et al., 2004). The location that receives the highest probability is then assigned a canonical taxonomy node such as EUROPE/AUSTRIA/VIENNA; 48°14' N, 16°20' E.

4 Implementation of a Geotagger

The geotagger module outlined in the following section annotates documents, sentences, or even single terms with tags describing their geographic context. In contrast to methods which determine only the source geography of a Website – i.e., the location of the content provider – based on the host name or its IP address, a geotagger provides additional information about geospatial references in an article's content. For example, a promotional Web document describing the beautiful lakeside of the Wörthersee will be tagged with a geographic focus on Carinthia, Austria.

Leveraging the latest version of the GATE framework – the General Architecture for Text Engineering; http://www.gate.ac.uk (Cunningham, Maynard, Bontcheva & Tablan 2002) – the part-of-speech tagger identifies locations by using a gazetteer – a dictionary containing all relevant terms, referring to a particular location. The tagger's performance and accuracy is highly dependant on the number of gazetteer entries. Thus, the best strategy is to provide localized versions of the gazetteer covering different regions with customized scales and accuracy, and the functionality to switch between them. For a tourism use case in Austria the result may include Austrian villages, mountains, lakes, rivers and points of interest like castles, museums and other sights, however, in a world wide context only cities above a certain number of inhabitants are relevant. To keep the geotagger language independent, dictionaries in different languages are used. Common software applications select the gazetteer language and region by using a combination of ISO 639-1 (International Organization for Standardization 2002) language and ISO 3166 (International Organization for Standardization 2007) country codes. The gazetteer for Austrian locations in German corpora therefore is selected by using the code "de_AT", "en_AT" in contrast refers to Austrian locations within an English speaking text.

Free geographical databases like GeoNames.org provide detailed information about geographic entities, including their names in different languages, their geographic

position (latitude and longitude), administrative divisions, populations, the location's timezone, etc. in an easily parseable format. Refining these data yields the language and region specific geo-database used in the geotagger.

Figure 1 describes the tagging process: The tagger identifies geo-locations based on the selected gazetteer. A focusing algorithm selects the most suitable locations for documents containing multiple possible geographic foci. Based on the information in the geo-database a tree is built, aligning locations hierarchically (for example Austria is a child of Europe, Vienna a child of Austria, etc.). This tree can have any number of levels, including for example states, areas, points of interest and so on.

Based on weights assigned to all locations present in the text, the weights of parent nodes are derived providing a list of geographic places sorted by their importance. Factors like the locations population, the number of occurrences in the text, and the tagger's default settings determine the assigned weights. Depending on the use cases, the tagger can return only the most relevant result and it's probability or a list of all possible matches (taking an article about a number of countries in the European Union as an example, the focus "Europe" is not satisfying – providing all found countries would do a quite better job).

The number of occurrences is only one indicator for the significance of the found location, in the case of ambiguities (two or more locations found the same number of times), the location tree is used to derive the most suitable candidate. At standard settings, one occurrence of Vienna and one of Graz deliver "Austria" as result, because that is the smallest location including both found terms. This behaviour, however, can easily be changed by modifying the algorithm's parameters. A more detailed description of the focusing algorithm can be found in Amitay, Har'El, Sivan, & Soffer (2004).

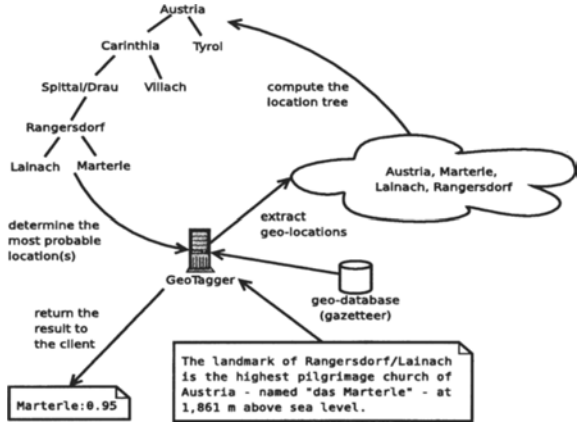


Fig. 3. Automated geo-tagging process

Publishing the tagger as Web Service running as a Tomcat Servlet (http://tomcat.apache.org) facilitates interoperability and easy integration into third

party applications. Most popular programming languages like Java, Perl, Python, PHP, C, C++, and even many content management systems as for instance Drupal offer this functionality. This setup also allows us to combine multiple geo-tagger installations into service clusters, providing higher throughput and availability.

The current implementation of the tagger is capable of annotating 1,000 text documents with a gazetteer comprising over 6,000 locations in 2:30 minutes on a Dual-Intel Xeon 3.2 GHz machine with two tagger threads. The tagger's performance can be improved considerably by clustering or using a higher number of tagger threads.

5 Evaluation of the Geo Tagger

Following the above procedure, a sample of tourism web sites from national and regional tourism organizations (NTOs, RTOs) were included. The webLyzard crawler (Scharl et al. 2004) was used to mirror and store the documents of the tourism sites and then automatically geo-tagged them. A random sample of 104 tagged documents were then chosen and analyzed. The data file included an URL of the target document, the automatically identified locations with latitudes, longitudes and the location name. Criteria to manually analyze the accuracy of the tagger were identified.

Each of the pages was visited and the actual city, village, or region the document is dealing with was identified. Furthermore, information provided on the web site such as subdomain, content of the title of the page, local area code, mentioning of phone numbers, frequency of the city name in relation to the amount of text that may hint at ways and indications to improve the tagging procedure was collected.

In a first step the general information of a city or region was collected, also the longitudes and latitudes of the real place were identified. The results indicate that 22% of the documents deal with cities, 78% with regions. This allowed for a comparison of the distance between the automatic tag and the actual location. The average distance between the real place and the automatic tag is 80km, for 50% the distance is only 44km. A total of 49% of the tags were correctly assigned to a city within a region, 34% of the documents were identified to deal with Austria and 17% showed the wrong place. A further analysis of the wrong classification showed that in the majority of cases (66%) the correct name of the place was not mentioned frequently enough. This is followed by 20% of the cases where two places were mentioned equally often and the wrong one was picked by the tagger. The last source of wrong classification is ambiguity of the location. In 15% of wrong classifications the name of the place has multiple meanings and could not be correctly identified.

As a next step the correct location was compared with the subdomain, this revealed that in 65% of the cases the subdomain matched the correct location. Furthermore, in 78% the title of the page matched the location and the imprint showed the correct location in 58% of the cases. However, it needs to be mentioned that the imprint might not be the ideal source for improvement of the tagger. The information mentioned there has to be used cautiously because often the web master or a company providing web services is mentioned, not the tourism office or the relevant sight/place. The area code and the place matched the actual location in 68% of the cases and the prefix was

correct in six out of ten cases. In addition, the pictorial elements on the web pages were included in the analyses. Eight out of ten times the picture matched the place.

The number of times the city was mentioned was measured (on average 4.3 times in one document) as well as whether the tag was correct. As expected a significant ($p<.05$) positive correlation of .25 between number of mentioning and correct tagging was identified. This implies that the more often a place is mentioned the more likely the tagger identifies the correct place. Analysis of the mentioning of the federal state and the accuracy of the tag yielded a correlation of .564 ($p<.01$). The same accounts for the region with a correlation of .384 ($p<.01$). A region is mentioned on average 3.4 times in one web document. A further analysis included the amount of text on a page in relation to the number of times a place is mentioned. The results show that there are on average 4,564 characters on a web page. A significant positive relation was identified between the frequency of the city name in relation to the text and the accuracy of the tag ($r=.239$; $p<.05$).

The results imply a couple of improvements for the tagger. Since the correct name of the location is included in the subdomain and the title of the page (86%) this information could improve the tagger. A total of 84% of correct tags would be reached. The inclusion of the area code and the prefix would improve this by 11% and arrive at a proportion of 95% of correct tags.

6 Discussion and Conclusion

The commonly foreseen intelligent mobile systems that are embedded, personalized and adaptive, and which anticipate user needs, require methodologies for filtering, weighting, and sorting of content. This paper has examined the opportunities and limitations of geo-tagging. The study tested an automated tagging procedure. The results show that the first implementation of the tagger works well but can be improved to arrive with even more accurate results. The inclusion of information from the website which is included in the crawling process can be used to arrive with an improved tagging procedure.

The complexity of today's information society is correlated with the overabundance of data caused by the Internet and other information technology accomplishments. In this sense, technology increases complexity as well as uncertainty for the users. However, it appears that technology is also the only means to reduce uncertainty, which implies even more information technology applications. This paper presented automatic geotagging as one of these approaches, which could help users to better manage this paradox development.

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Employing 'Social Network Analysis' to Influence Tourism Events Decision-Making: A Pilot Study

G. Michael McGrath

Centre for Hospitality and Tourism Research
Victoria University, Melbourne, Australia
michael.mcgrath@vu.edu.au

Abstract

A major feature of the emergence of Web 2.0 is the proliferation of 'consumer-generated content' (CGC) websites, often established as alternatives to corporate or 'official' sites. Nowhere has this had as great an impact as in the travel and tourism industry. In this paper, we report on a preliminary study designed to demonstrate how techniques drawn from 'Social Network Analysis' (SNA) might be employed to develop an understanding of the influence relationships and hierarchies within these websites. Armed with this knowledge, tourism companies and authorities may be able to develop strategies as to how they might best co-exist and deal with relevant sites. The focus of this initial study is on tourism events; specifically, the Australian Football League Grand Final.

Keywords: events, Web 2.0; Travel 2.0; consumer-generated content; Social Network Analysis; influence strategies.

1 Introduction

The implications of the emergence of Web 2.0 have very significant implications for the travel and tourism industry (where it is often referred to as Travel 2.0). Reactive (2007: 3) describe Web 2.0 as follows:

> *"--- [it is] the second generation of Web-based services that have gained massive popularity by letting people collaborate and share information online in previously unavailable ways. Examples of the use of Web 2.0 are social networking sites, wikis, blogging and podcasting. With more than 9.5 million citations in Google, Web 2.0 is clearly generating tremendous interest online and must be taken seriously by anyone managing a Web strategy."*

The authors of this report go on to state that websites are now becoming gathering places where relationships are formed in a virtual space and where content, previously published mostly by business or other organizations, is now increasingly being created by users. These virtual spaces are often referred to as user or *consumer-generated content (CGC)* websites. Examples include *TripAdvisor* (www.tripadvisor.com), Yahoo's *Trip Planner* (http://travel.yahoo.com.trip) and, with an Australian focus, the restaurant review site, http://www.meetmethere.com.au/, and another website dealing with hotel reviews, http://www.virtualreviews.com.au/. The latter two may be viewed as alternatives to similar content in 'official' State Tourism Authority (STA) sites – such as http://www.visitvictoria.com/.

From a tourism company or authority viewpoint, the downside to the CGC phenomenon is that online content is much more difficult to control and, thus, there is a much greater chance that negative or adverse comment will appear online. This becomes more critical in light of increasing evidence that visitors tend to view CGC sites as more impartial and trustworthy than corporate (or official) websites (Reactive, 2007: 4). Consequently, forward-thinking organizations need to develop strategies as to how they might influence the direction of relevant CGC discussions to their advantage.

A precursor to this, however, is developing an understanding of the online network with which one is dealing and it is our contention that long-established *Social Network Analysis (SNA)* techniques (Wigand, 1988) can assist here. Thus, our aim in this paper is to demonstrate this by means of a pilot study (dealing with a proposal to move the staging of a major sporting - and tourism - event from the afternoon to the evening). Specifically, our research objective was to illustrate how power structures within a relevant CGC website can be identified and modelled – a necessary antecedent to applying influence strategies (for some excellent examples of where this approach has been employed in a non-online setting, see Pfeffer, 1981: 97-135).

Our paper is organized as follows: background to our study is presented in the following section and this is followed by a brief introduction to the research design and the relevant CGC website – www.bigfooty.com, a site devoted to discussion of Australian football. Data analysis results are then presented. The final section contains concluding remarks.

2 Background

2.1 CGC Websites

Travel and tourism companies and organizations everywhere are relying increasingly on the Web to market their products, services, attractions and events. Unfortunately, however, more and more of these organizations are also discovering that this exciting new information medium is something of a double-edged sword: i.e. it might be easier than ever to reach one's target audience but, equally, purveyors of alternative products can get their message out just as expeditiously! Moreover, the highly-democratic (and even anarchic) nature of the Web means that even large and powerful organizations find it much more difficult to exercise control over this communication channel than was the case with more traditional media (Prestcott, 2006).

An instance of this phenomenon is the CGC website (Reactive, 2007: 7). Here, individuals with a common interest contribute their own experiences and views (e.g. on hotels or restaurants) to an online forum that, oftentimes, is established as an alternative to an official website – or a professionally-run and managed site established by some commercial entity. Users of these sites see them as offering the following benefits:

- Trust! – a factor consistently rated as one of the most critical in eCommerce in general and website evaluations in particular (McKay and Marshall, 2004: 287). Many CGC sites have no obvious connection with

a commercial entity or other special-interest group. As such, contributors' views are seen as independent, genuine and not tainted or modified by some overarching vested interest;

- Simplicity. Participation is generally much easier than with commercial or other highly-controlled websites; and
- Traditional websites are often seen as sterile, stagnant, unexciting and dominated by advertising content. Updates also tend to be relatively infrequent and controlled. In contrast, CGC sites revel in the controversial, content is highly-dynamic (with new threads and posts ready for viewing upon each new visit) and the range of content sources is (almost by definition) extremely wide and varied.

Naturally, there is also a downside to CGC sites. For the most part, their design and presentation is not as polished as official sites. In addition, many contributions are poorly-expressed and their content is often of very dubious veracity (to say the least!). A further significant problem is that posts are sometimes obscene, libellous or may infringe copyright laws. Larger and more popular CGC sites use moderators (often volunteers) as a means of filtering out the more dubious content and controlling problem users.

Despite the above, all the indications are that tourism and travel Web users, in increasing numbers, have decided that CGC benefits substantially outweigh the downside and this is reflected in dramatic increases in the number of these sites, their membership and site hits over recent years (Reactive, 2007: 4). For example, Yankelovich (2006) reported that, in the preceding 12 months, more than a quarter of internet users visited a blog to review information about a destination or travel service supplier. As such, sponsors and owners of official sites have been forced to develop strategies to cope with this. It would seem that most tourism organizations have come to the realization that it would be folly to compete directly with CGC sites or to attempt to put them out of business (Brier & Neisser, 2006). Instead, the emerging consensus seems to be that some form of partnership or alliance might be the ideal. In turn, through a process of cooptation (Pfeffer, 1981: 166-177), key parties on the CGC side might be influenced to conduct their activities in a way more to the liking of those managing official sites.

2.2 Social Network Analysis

To accomplish this, however, key influence sources (and influence structures) must first be identified. It is our belief that SNA techniques (Scott, 1991) might well be used to good effect here. SNA has long been used within the social sciences (see e.g. Radcliffe-Brown, 1940) to analyse phenomena such as links between ethnic groups within neighbourhoods, and the identification of cliques, power structures, norms and information flows within social groupings. Within SNA, the interaction patterns describing social structures can be viewed as a network of relations. The central tenet is that parties' beliefs, feelings and behaviour are driven not by attributes of the

aforementioned parties, but by the relationships between them. The network paradigm is ideal for examining organizational, wider-industry and social phenomena because it refocuses attention away from parties acting in isolation to a much wider view that sees these parties as nodes in an interconnected set of interdependent relationships embedded within wider organizational, industry and social systems (Zack, 2000).

As a simple example, assume that we wish to analyse communications patterns within a CGC website. We could analyse several hundred posts and declare that one party communicates with the other if the former posts more than 5 messages in response to the latter. We might then end up with the communications pattern illustrated in the *sociogram* presented in Figure 1.

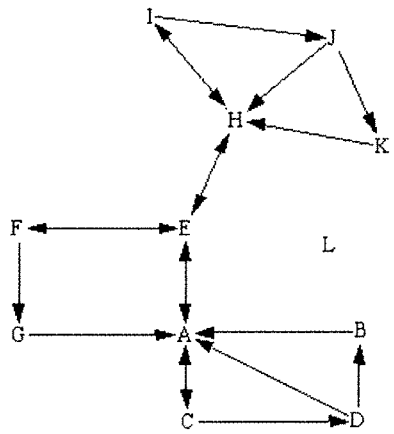

Fig. 1. Example of a *sociogram* – representing communication within a CGC website

A quick glance at Figure 1 tell us that there appear to be three distinct *cliques* within the network *({A,B,C,D}, {A,E,F,G}* and *{H,I,J,K}).* In addition, *A, E* and *H* all appear to be situated at vital points within the network: and, in fact, *A* is called a *cut-point* (because its removal would create two disconnected components) and *E-H* is called a *bridge* (because the link provides a bridge between clearly-distinct network components. *L* is described as an *isolate* (for obvious reasons) and *F,* among others, performs the role of a *conduit* (for messages from *E* to *G).* A further point to note is that this graph is *directed* (i.e. it contains directional arrows). If we were interested in something like 'friendship' relations (rather than communications), we would only require an *undirected* sociogram (because friendship is necessarily mutual). Finally, we could annotate each link in Figure 1 – to indicate, for example, the number of posts (strength of the link) or the overall tone of the directional communication (positive or negative).

Sociograms often provide a very useful, visual representation of the interactions within a social network. As networks increase in size though, graphical representations often become unwieldy and difficult to manage. Consequently, it is often preferable to work with various, underlying matrix representations. There are different types of these but the *adjacency matrix* is probably the most common and this particular specification of our example is presented in Table 1.

Table 1. Adjacency matrix representation of the sociogram presented in Fig. 1

Party-Id	A	B	C	D	E	F	G	H	I	J	K	L	Out-degree
A	-	0	1	0	1	0	0	0	0	0	0	0	2
B	1	-	0	0	0	0	0	0	0	0	0	0	1
C	1	0	-	1	0	0	0	0	0	0	0	0	2
D	1	1	0	-	0	0	0	0	0	0	0	0	2
E	1	0	0	0	-	1	0	1	0	0	0	0	3
F	0	0	0	0	1	-	1	0	0	0	0	0	2
G	1	0	0	0	0	0	-	0	0	0	0	0	1
H	0	0	0	0	1	0	0	-	1	0	0	0	2
I	0	0	0	0	0	0	0	1	-	1	0	0	2
J	0	0	0	0	0	0	0	1	0	-	1	0	2
K	0	0	0	0	0	0	0	1	0	0	-	0	1
L	0	0	0	0	0	0	0	0	0	0	0	-	0
In-degree	5	1	1	1	3	1	1	4	1	1	1	0	20

A "1" in row *X*, column *Y* indicates the presence of a link from *X* to *Y*. The *out-degree* (row sum) is a measure of how active a party is in initiating communications with other parties, while the *in-degree* (column sum) measures the extent to which a party is in receipt of messages from other parties in the network. Obviously, parties with high in-degrees are at critical positions in the network and, in this instance, we can see that this applies to both *A* and *H. E,* on the other hand, is reasonably active as both an information *source* and *sink.* More detailed examination of network centrality may be undertaken and this, together with other important types of analyses, will be addressed later in the paper.

2.3 The Event: The AFL Grand Final

The issue addressed was a proposal to move the *Australian Football League (AFL)* Grand Final from the afternoon to night.

The Grand Final is one of the major, annual sporting events conducted in Australia. Held at the end of September in Melbourne (Victoria), it is always a sell-out (with 90,000+ people attending) and the purpose of the game is to determine the winner of the AFL Premiership Cup (i.e. premier team for the season). From a tourism

viewpoint, the event is very important to the local economy. Tourism Victoria (1998) estimated that the 1998 Grand Final generated around 76,000 additional visitor nights and that, in summary, its economic impact was as follows:

- Gross benefit of $31.3 million;
- $33.9 million in private consumption expenditure;
- $10 million in business investment;
- $2.2 million in Victorian State Government tax receipts; and
- The creation of 840 full-time annual equivalent employment positions.

Significantly, this report went on to estimate the television audience for the event at 170 million in 72 countries and that the event *"generated significant exposure for Melbourne"* (p.2). As a result, it is hardly surprising that the proposal to change the timing of the event to night (when television audiences are almost invariably larger) has recently been floated. Stakeholders with a vested interest in this move include the television networks, advertisers (and the companies they represent), the AFL Executive and, quite possibly, the Victorian State Government and its STA, Tourism Victoria.

The problem for these key stakeholders, however, is that the fans (probably the most significant stakeholder group of all) appear to be very much against the idea (BigFooty, 2006). How this group might be influenced to adopt a more-positive attitude to the proposal (using SNA) is the central issue addressed in the remainder of the paper.

3 Research Approach

The broad research question addressed was *to what extent can SNA and related techniques be employed to analyse power and influence within CGC networks?*

The CGC website analysed for this study was www.bigfooty.com. It is devoted to Australian Football, a football code that is played professionally only in Australia. The sport originated during the 1850s (Dunstan, 1973: 217-219) and, while the precise details of its evolution are a matter of some debate, the consensus is that its roots lie in the Rugby and Gaelic football codes. Despite the fact that it offers no international competition of any consequence, the code has thrived to a point where it is now Australia's most popular sport – certainly, in terms of attendance at major-league matches. The premier competition is controlled by the AFL and 16 teams, covering all Australian mainland states participate in the league.

AFL fans are passionate about their game and, in particular, the clubs they support. *BigFooty.com* was established as a forum designed to allow fans to discuss and debate issues associated with the game. Its owners are *Big Internet Group LLC* and the site was developed and is maintained by *Jelsoft Enterprises Limited.* All content (apart from some links to some mainstream media articles and other AFL sites) is user-generated. Membership is free and whatever revenue is generated appears to come from advertising. The site has a comprehensive set of forum rules and is moderated

(one suspects, by volunteers) fairly intensively. Offenders initially receive a yellow card (a warning) and, upon further infractions, a red card (a ban).

A search of the main board revealed that, from 1/1/2006 to 25/7/2007, 6 threads were devoted to the topic of moving the Grand Final from day to night. (The issue was raised in many other threads but was not the principal discussion topic. Consequently, posts in these threads were excluded from analysis.) In all, the 6 threads generated 501 posts and an analysis of these revealed that: 16.4% were in favour of the move; 72.6% were against; and 11.0% of posts were equivocal or irrelevant. This confirmed our belief that most fans were against the proposal but, because the views of most contributors to the discussion were so consistent, it also meant that the application of SNA techniques to these particular threads was highly-unlikely to produce much of significance (particularly in terms of influence networks and hierarchies). Consequently, we then searched the site for a more controversial issue.

The issue we settled upon was playing list quality as, for any team, whatever the sport, the quality of its playing list is a matter of vital interest and, generally, a major topic of discussion among its supporter group. More specifically, we settled on discusiions related to the Collingwood club as, between 1 January and 30 June 2007 (the analysis period), 10 threads on its BigFooty board were devoted to this topic. 320 posts were made by the 20 contributors judged to be *significant.* A contributor was designated as 'significant' if he or she posted more than 5 messages to the 10 relevant threads. This was done purely to keep the data analysis manageable (and, we believe, is reasonable within the context of a proof-of-concept, pilot study).

In contrast to the example presented earlier, we were interested here not so much in communications per se as in CGC members' *attitudes* to each other. Every post could be interpreted as a positive or negative *response* to some other contributor; either the thread initiator or some later respondent. In almost every case, it was very clear as to whom the post was addressed but, in the few cases where this was not evident, the thread initiator was designated as the respondent. In a small number of cases, a single post was clearly directed at more than one contributor and, in these situations, the relevant message was broken down into the individual responses.

In all, 340 responses were generated from the 320 posts analysed and, after examination, each response was assigned a *response attitude score;* on a 0-10 scale, with 0 indicating an extremely negative attitude to the target, 10 indicating an extremely positive attitude and 5 a neutral attitude. Multiple posts between pairs of contributors were averaged to produce *attitude scores* for that pair (i.e. one for each relationship direction). In cases where there was only a single post, the response attitude score was taken as the attitude score. In some sociogram representations, attitude scores above 5 are indicated with a "+", scores below 5 with a "-" and a score of 5 by "0". Finally, for convenience, each contributor was assigned a numerical identifier in the range 1-20 and these are used in the sociograms and matrices presented in the remainder of the paper (in lieu of the contributor pseudonyms actually employed in the original posts).

4 Centrality, Power and Influence

The social network derived from the analysis exercise is presented in Figure 2 below.

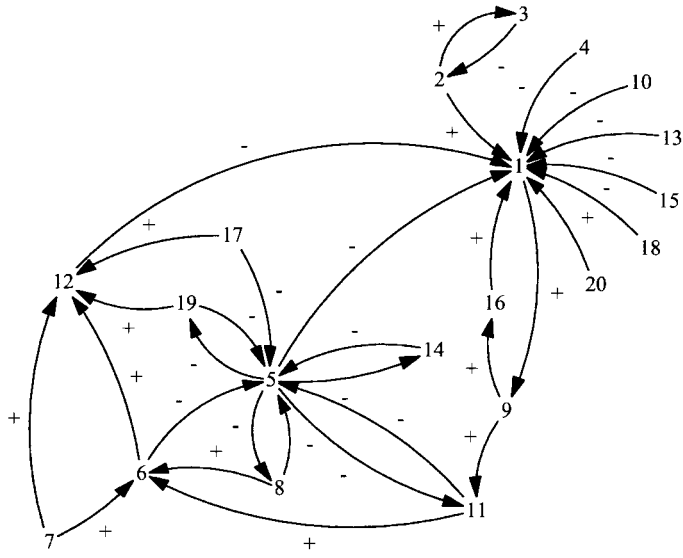

Fig. 2. Party-party attitudes – sociogram representation

A perusal of this sociogram readily reveals several important features, including: i) the network is clearly divided into two distinct components, connected mainly by the bridge anchored by parties 1 and 5; ii) a clique of like-minded individuals (in relation to the issue) seems to have formed around parties 6 and 12; iii) the parties that anchor the main bridge (1 and 5) both appear to have attracted a good deal of direct negative comment; iv) the thread initiator (party 1) has largely abstained from replying to responses to his initial post; and v) by way of contrast, party 5 appears to be considerably more feisty and has actively taken on his critics. (Note that it is generally possible to make a reasonable guess at the sex of a party through the pseudonym used and message context.)

Issues of vital interest within any network are influence and power and these, in turn, are a natural consequence of *centrality* (Scott, 1991: 85-102). *Local centrality* can be derived simply by calculating the total degree (in and out) of each network member. However, *global centrality* is generally considered to provide a better indication of the true centres of influence within a social network and this can be established by: i) calculating the *geodesic* (the minimum path length) for each pair of network nodes; and ii) summing the geodesics for each node. The smaller this value is, the more central the node. Results of applying this algorithm to our network are presented in Figure 3 below.

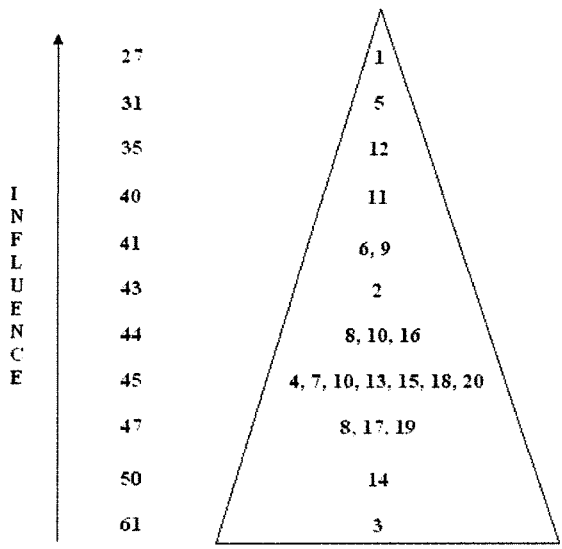

Fig. 3. 1st cut at influence hierarchy

According to this 1st-cut analysis and, assuming that power and influence are indeed natural consequences of (global) centrality, parties 1, 5 and 12 have the most influence and party 3 is clearly the least influential. However, this analysis fails to take into account the exact nature of the relationship between network parties and, hence, positive and negative responses have been given equal weight. Thus, we might wish to restrict our analysis to that portion of the network dealing with positive attitudes only and a view of this component is presented in Figure 4.

In this case, we focus on a revised measure of global centrality. Specifically, for a party, *A,* we: i) look for each instance of where a path exists from some other party, *X,* to *A* (Referring to Figure 4, there is a path (of length 5) from 2 to 12, but not from 12 to 2.); ii) assign that path a value of *1/path-length;* and iii) sum the values arrived at for all paths to *A* to find its revised global centrality. The higher this measure is, the more influential the party.

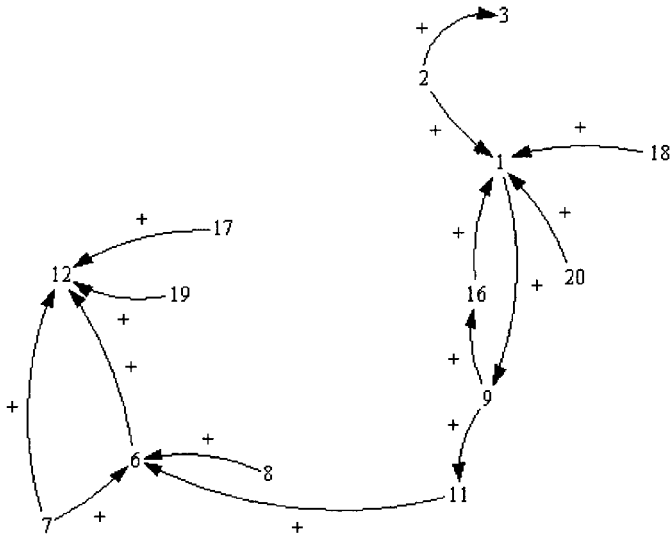

Fig. 4. Network component restricted to positive attitudes

Results of applying this approach to the network in Figure 4 are presented in Table 2. It is immediately evident that our original influence hierarchy has been modified somewhat, most notably with: i) parties at the extremities of the network being eliminated (if those with a score of zero are excluded); ii) party 5 no longer even appearing in the hierarchy, let alone ranked second; and iii) the most influential member of the network (by a considerable margin) now being party 12, with parties 6 and 1 also exercising some influence. Note that it is hardly surprising that party 5 has lost his position in the influence hierarchy: i.e. Figure 2 clearly reveals that, while party 5 is the centre of much attention, the attitude toward him is universally negative.

Consequently, any external attempts to sway the thinking of members of this portion of the BigFooty CGC website on this issue should focus primarily on parties 12, 6 and 1. Precisely which influence strategies and tactics should be adopted (and how to employ them) are critical issues but are beyond the scope of this paper. The reader wishing to pursue this further is referred to Pfeffer (1981: 137-177; 1992).

Table 2. Global centrality (revised) path length calculations

Party-Id	1	2	3	6	7	8	9	11	12	16	17	18	19	20
1	-			.33			1	.5	.25	.5				
2	1	-		.25			.5	.33	.2	.33				
3			-											
6				-					1					
7				1	-				1					
8				1		-			1					
9	.5			.5			-	1	.33	1				
11				1				-	.5					
12									-					
16	1			.25			.5	.33	.2	-				
17									1		-			
18	1			.25			.5	.33	.2	.33		-		
19									1				-	
20	1			.25			.5	.33	.2	.33				-
Path-length	4.50	0	0	4.83	0	0	3.00	2.83	6.88	2.50	0	0	0	0

Nevertheless, our example does serve to illustrate the potential for the application of SNA in the tourism domain. As noted earlier, with the emergence of Web 2.0 CGC websites have emerged as serious competitors for official sites: whether these be for hospitality, activities or events. The example above demonstrates that structured and rigorous analysis of CGC websites (employing SNA) may yield insights that can be used to advantage.

5 Conclusion

The internet revolution continues unabated and, with it, more and more consumers (and other Web users) are indicating that they are no longer prepared to act as passive receivers of information transmitted through traditional communications channels. Instead, for receipt *and dissemination* of information, they are relying increasingly on online networks of friends, colleagues, like-minded individuals and others with interests in common. Moreover, they often view these networks as more trustworthy and impartial than corporate and traditional, commercial media outlets.

Smart organizations have recognized that there is little point in trying to compete with these networks and, instead, they need to work with – and within – them. To do this, they need an understanding of the relevant network structures; particularly influence hierarchies and key influence nodes. The principal contribution of this study is that we have demonstrated how this understanding might be acquired – principally through the application of proven SNA methods, technologies and tools.

Naturally, much remains to be done. In particular, the external validity of the preliminary results generated to this point is very much an open question: e.g. can similar influence structures be established for different types of CGC website; for hospitality, activity and travel sites (as well as events); for websites of different designs and degrees of usability; and for sites subject to various degrees of control (or moderation). These are all issues for further studies.

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Capability Maturity Models for SMEs and Collaborative Networked Organisations in Tourism

Mike Peters [a], Josef Withalm[b] and
Walter Wölfel[b]

[a] Department of Strategic Management, Marketing and Tourism, Innsbruck School of Management, University of Innsbruck, Austria
mike.peters@uibk.ac.at

[b] Siemens IT Solutions and Services PSE
Siemens AG, Austria
josef.withalm@siemens.com
walter.woelfel@siemens.com

Abstract

Experiences in applying results from ECOLEAD on Collaborative Networked Organisations (CNOs) in real life have shown that the maturity level of SMEs (Small and Medium Enterprises), who joined these networks, are highly different. Soon it was found out that there are different process areas in which SMTEs have strengths and weaknesses. This paper will introduce the essential process areas which should be assessed by standardised and well established assessment methods to be able to establish improvement programs out of the results. The process areas and the assessment methodology are derived from CMMI, which is nowadays the prevailing assessment method in the software development area. Typical tourism domain specific process areas are Quality Management, Yield Management, Human Resource Management, Product Development, and eCommerce. While classical process areas of CMMI (Capability Maturity Model Integrated) will be analyzed insofar, if they are appropriate for CNOs and how they should be extended or modified.

Keywords: CNO (Collaborative Networked Organisations); CMMI (Capability Maturity Model Integrated); DMO (Destination Management Organisation); Semantic Web; SMTE (Small and Medium Tourism Enterprise)

1 Introduction

SMTEs have huge improvement potential both in domain and in collaboration capabilities. Before implementing respective improvement measures it's necessary to assess the performance in specific process areas which we divide in domain (tourism) and collaboration oriented ones.

Competitiveness of tourism enterprises and tourism destinations has become the most dominant issue of the tourism industry in the past decade. As a corollary, management excellence and flexibility in adjusting to changing environments remain the most important challenge for competitive tourism enterprises. Typical constraints or barriers blocking organisational changes in small and medium sized enterprises in the tourism industry result from sub-optimal sized configurations with respect to economies of scale and scope, low level of professional competence, combined with a high ratio of owner managed firms. As a consequence, the diffusion of information and communication technologies (ICT) is more difficult. Based on the notion that market imperfections, market externalities, and myopic behaviour of owner managed

firms prevent an optimal diffusion and use of up-to-date management practices, particularly with respect to ICT, intervention instruments are needed which will help overcome these hurdles. This paper presents the first attempt to introduce tourism process areas - basing strongly on CMMI – to be able to assess SMTEs and start improvements in these organisations.

According to tourism research (e.g. Weiermair & Kneisl, 1996; Bieger et al. 2004) SMTEs lack especially all collaboration issues and networks initiatives to improve business performance- be it as they are competitors or they fail all concepts and technical premises for building CNOs. In ECOLEAD (ECOLEAD, 2004) reference models were developed for companies, which are interested in joining a collaborative network depending on its characteristic (i.e. VBE (Virtual Breeding Environment), PVC (Profession Virtual Community), VO (Virtual Organisation)), in which this organisation may reside actually. These reference models encompass checklists, templates, interfaces (to exist in software), tools, specifications, architectures, SW components or services. These artefacts may be applied to facilitate the agreement concerning business strategies, business models and above all business processes for organisations which are due to join a collaborative network. If business strategies are mentioned, subtasks (i.e. legal issues, trust building (overcoming the competition issue)) must be covered too. Each company is then empowered to configure / implement essential business processes to join a collaborative network in the respective phase. To assess this claimed collaboration behaviour the process areas of CMMI are evaluated insofar, if they are appropriate or should be extended / modified concerning collaboration issues.

2 Theory

In the following section, the theoretical background of the paper will be presented on the one hand to understand the basic principles of the CMMI® and on the other hand to point out why the small business dominated tourism industry might be an ideal playground for CMMI® applications.

2.1 Capability Maturity Models

Primarily CMM® (Humphrey, 1989) was developed at the SEI (Software Engineering Institute) on behalf of the Department of Defence (DoD) in the U.S.A. in order to establish a model that identifies mature and capable enterprises in the market that are able to manage SW projects for the DoD. In the meantime the original intention of CMM® changed: it can now be interpreted as an instrument to find strengths and weaknesses of organisations in specific process areas where appropriate improvement measures should be implemented (Carnegie Mellon, 2006).

In the current marketplace, there are maturity models, standards, methodologies, and guidelines that can help an organisation to improve business operations. However, most available improvement approaches focus on a specific part of the business and do not take a systemic approach to the problems that most organisations are facing. By focusing on improving one single area of a business (e.g. such as marketing or

distribution), area focused models unfortunately have perpetuated the stovepipes and barriers that exist in organisations (Carnegie Mellon, 2006).

Capability Maturity Model® Integration (CMMI®) provides an opportunity to avoid or eliminate these stovepipes and barriers through integrated models that transcend disciplines. CMMI® for Development consists of best practices that address development and maintenance activities applied to products and services as well as product's lifecycle conception, delivery and maintenance. Its main emphasis is on 'building' and maintaining the overall product and service bundle.

CMMs focus on improving processes in an organisation. They contain essential elements of effective processes for one or more disciplines (such as quality management or yield management) and describe an evolutionary improvement path from ad hoc, immature processes to systematic, well-structured mature processes with improved quality and effectiveness (Carnegie Mellon, 2006).

2.1.1 Constellations

This improvement framework can also be applied to other areas of interest, where the framework groups best practices into what is called "constellations." A constellation is a collection of CMMI components that are used to build models, training materials, and appraisal documents.

Recently, the CMMI® model architecture was improved to support multiple constellations and the sharing of best practices among constellations and their member models. Work has begun on two new constellations (see Fig. 1): one for services (CMMI® for Services) and the other for acquisition (CMMI® for Acquisition).

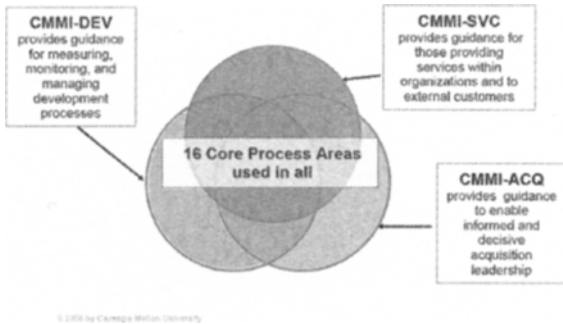

Fig. 1. CMMI® Constellations (Carnegie Mellon, 2006)

2.1.2 Representations

Continuous representation enables organisations to select a process area (or group of process areas) and improve related processes. This representation uses capability levels to characterize improvement relative to an individual process area.

The *staged representation* uses predefined sets of process areas to define an improvement path for an organisation. This improvement path is characterized by maturity levels. Each maturity level provides a set of process areas that characterize different organisational behaviours (Carnegie Mellon, 2006).

2.1.3 Process Areas

A process area is a cluster of related practices in an area that, when implemented collectively, satisfy a set of goals considered important for making improvement in that area.

Table 1. CMMI® Process Areas

Causal Analysis and Resolution	Project Monitoring and Control
Configuration Management	Project Planning
Decision Analysis and Resolution	Process and Product Quality Assurance
Integrated Project Management	Quantitative Project Management
Measurement and Analysis	Requirements Development
Organisational Innovation and Deployment	Requirements Management
Organisational Process Definition	Risk Management
Organisational Process Focus	Supplier Agreement Management
Organisational Process Performance	Technical Solution
Organisational Training	Validation
Product Integration	Verification

There are 22 process areas, presented in Table 1 in alphabetical order by acronym (see Carnegie Mellon, 2006).

2.2 SMEs in Tourism: the Need for CMMI® Solutions

As mentioned above, CMMI® can support the improvement of management processes. This also holds true for service enterprises: However, the majority of leisure and tourism businesses are small or medium-sized and a large number of them are family businesses (Buhalis & Peters, 2006).

Table 2. Strategic advantages of SMTEs (Buhalis & Peters, 2006, p.124)

Entrepreneur's Motivation	Determination to succeed, backed by hard work and personal, family, social sacrifices
Market niche advantages	Market niches often ignored by large enterprises, offer growth chances for small businesses. Small businesses identify customers' wishes and produce tailor-made niche products for specific segments through customisation.
Personal relation-ship with enterprise stakeholders	Personal relationships with customers, suppliers, distributors and employees can be a main source of competitive advantage as favourable terms and conditions negotiated and support is offered at difficult times.
Family involvement	Family involvement ensures human resources are used flexibly to meet demand variations whilst ensures commitment and trust
Flexibility and reaction	SMTEs are flexible to respond to client requirements and changes to the external environment. Due to a generally flat hierarchy they can decide quickly and react immediately to market changes
Continuity	The continuity of family businesses ensures strong social values

This paper highlights the characteristics of these enterprises to derive peculiarities for CMMI® solutions in small size structures industries. Small and medium-sized enterprises in tourism (SMTEs) have specific management characteristics, which can be described as advantages or disadvantages. These advantages and disadvantages affect the SMTEs' competitiveness, growth and profitability. Advantages often relate to the small size and independence that allows entrepreneurs the flexibility that often larger organisations lack (see Table 1).

Table 3. Strategic disadvantages of SMTEs (Buhalis & Peters 2006, p.124)

Lack of economies of scale	High overheads and costs per unit make SMEs unable to compete on price and to lack the benefits of mass production
Informal Management	Most SMTEs lack a strategic long-term plan and very rarely formalise strategic business plans. This leads them to continuously fire-fight and to neglect strategic developments.
Traditional approaches/ reluctance to change	Although in theory SMTEs should be innovative and flexible, they often adopt traditional lifestyle-driven approaches and are reluctant to change
Knowledge and qualification hurdle	Strategy development, quality management and technology adoption are often deficit areas of SMTEs due to knowledge gaps, lack of education and qualifications. Attracting and financing qualified personnel is difficult. Education of entrepreneurs and key employees can support small business growth (Johnson et al, 1999).
Delegation and leadership hurdle	When small businesses become more formalised the founder has to find ways to plan, organise and delegate main tasks. Entrepreneurs are often reluctant to give-up control and to delegate whilst they often lack leadership skills to motivate others
Finance hurdle	SMTEs find difficult to attract start up capital and raise capital for expansion as they have small assets. At the development or survival phases cash-flow arise when expansion expenditure exceeds cash flows.
Personal relationships	Personal relationships can also be a burden if incapable family members play an active role or when uncompetitive suppliers are used.
Family involvement	While large enterprises act anonymously and autonomously, SMTE owners often interpret their enterprise as heritage for following generations. SMTEs are closed to investors and potential shareholders as family businesses display different growth strategies. Family values, systems and situation as well family unity often prevail SMTE business decisions. For example family members cannot easily be made redundant. Nevertheless family business success is heavily dependent upon the support structure within the family.

The majority of disadvantages of SMTEs exist because small enterprises suffer from lacking economies of scale and scope. This results to high fixed costs and relatively high costs per unit. However, it seems obvious that SMTEs find difficult to achieve overall cost leadership, which requires efficient-scale facilities, tight cost and overhead control. Economies of scope can be generated by internalising and sharing services and products which cannot be produced by the market at the same price or quality level. SMTEs often attempt to raise economies of scope through co-operations in tourism destinations and across regions and nations. But literature shows that SMEs

in general and in tourism in particular avoid co-operations or close linkages with other enterprises (Pechlaner et al., 2004), e.g. because family enterprises do not want to have non-family members as co-owners (Gibbons & O'Conner, 2005). Beside these basic size disadvantages, small businesses also typically face a number of additional problems or growth hurdles (Table 2).

These advantages and disadvantages contour strategy alternatives for small- and medium-sized tourism enterprises. Thus possibilities to reduce cost of production hardly exist, while on the other hand differentiation strategies often fail due to SME owner/managers' short term (myopic) thinking and lack of market research capabilities. In times of falling profits, such as today, short term thinking pushes owners/mangers to cost-cutting efforts (in terms of human resources, facility design etc.) instead of investing into productivity and quality enhancing activities (in terms of a professionalisation of customer contact, personnel, etc). Prerequisites for managing sustainable tourism are: the existence of long-term strategies, and new qualifications, thought processes and attitudes of SME owners and/or managers. It should therefore be possible to communicate the benefits (efficiency and effectiveness) of strategic co-operations within given destinations among small- and medium-sized enterprises and entrepreneurs with respect to these new forms of management (Pechlaner & Raich, 2004). Advantages of local, interregional and / or national co-operations could provide for additional resources, reduced costs and risks in product development, new markets, improved qualifications and/or increased competitiveness.

When having a closer look at the knowledge and qualification hurdle recent industry developments revealed gaps in special SMTEs' knowledge areas. Much of the differences in the innovation behaviour between industrial and service sectors are associated with the different nature and characteristics of services-production and – marketing. Six aspects of services production/marketing in the tourism sector stand out in particular, i.e.:

- Intangibility of services and the associated quality uncertainty of customers,
- Simultaneity of production and consumption of services,
- Non-storability of services,
- High risks/cost associated with fluctuations in the rate of capacity utilization,
- Difficulty in correctly forecasting consumer needs and preferences for hospitality and tourism services and
- Sensitivity of services production to increases in labour cost on account of labour intensity of services production (Fitzsimmons & Fitzsimmons, 2000, p. 25f)

These characteristics of tourism services lead to an increasing demand for entrepreneurial and managerial qualifications in the following management areas:

- *Quality management* covering the following management tasks: service and quality management analysis; measuring quality in tourism; understanding and influencing tourists' decisions; quality strategies in tourism management; the implementation of quality-instruments in small- and medium-sized tourism enterprises, etc. (Kunst & Lemmink, 1992).

- *Capacity Management* covers a variety of actions to smoothen demand. E.g. Yield Management covers a range of management and marketing activities in service industries - particularly in the airline and hotel industry. The goal of Yield Management is the maximisation of revenue through appropriate market segmentation and the optimal allocation of perishable assets (Mulvey & Dzidonu, 1999). Its use is suitable for application in the small and medium-sized structured tourism and hospitality sector. The overall aim is to develop an understanding of Capacity/Yield Management and illustrate applications in the tourism and hospitality sector.
- *Product development*: It is necessary to understand and to be able to manage the complexity of the tourism product. Furthermore, there are several stages in the process of product development in tourism, which require different types of management know-how. For example, the development of new products/services, the generation and screening of ideas, which requires the capability of preliminary evaluation and volumetric estimation. Other stages in product development processes, such as concept testing and commercialisation require management techniques/methods like customer surveys, focus group interviews, product-use tests and the collection / evaluation of information (Moutinho, 1989).
- *Human resource management* includes subjects such as: standards for recruitment methods in order to meet market qualification requirements; motivation and empowerment instruments in tourism; managing the contact personnel in the service encounter; innovative forms of employment in tourism enterprises, etc.
- *eCommerce*: Tourism SMEs gain critical awareness of the main current and emerging issues/challenges when planning their eCommerce strategy. Thus, SMEs should be able to make strategic and tactical decisions about the use and deployment of IT for SME networks, as well as to follow guidelines required to improve IT enabled business performance and to avoid potential pitfalls. SMEs should be encouraged to apply eCommerce tools in their daily business (Buhalis, 1999).

3 Methodology

For adapting the CMMI® theory we will follow a two step approach with special focus on determination of *collaboration oriented* as well as *tourism oriented process areas*.

3.1 Determination of Collaboration Oriented Process Areas

In the first step the compatibility of the 22 process areas of CMMI® (see 2.1.3) with the CNO will be analyzed. Especially it will be analysed, if they are appropriate or they should be extended or modified.

ECOLEAD (Withalm et al., 2005) addresses the two most fundamental and inter-related focus areas that are the basis for dynamic and sustainable networked organisations: Virtual Breeding Environments, and Dynamic Virtual Organisations.

Concerning the CMMI® process areas Dynamic Virtual Organisations behave more or less like distributed projects and hence the most process areas of CMMI® may be applied. Completely different is the situation in the case of Virtual Breeding

Environments. In this case every process area must be evaluated individually. The most concerned areas are listed in Table 4.

Table 4. Relevant Process Areas for CNOs

Causal Analysis and Resolution	Organisational Process Performance
Configuration Management	Organisational Training
Decision Analysis and Resolution	Process and Product Quality Assurance
Measurement and Analysis	Requirements Development
Organisational Innovation and Deployment	Requirements Management
Organisational Process Definition	Risk Management
Organisational Process Focus	Supplier Agreement Management

Exemplary the extension respectively modification of one process area will be discussed more detailed. Thereto the process area Configuration Management (CM) was selected.

The Configuration Management process area supports all process areas by establishing and maintaining the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits. The work products placed under configuration management include the products that are delivered to the customer, designated internal work products, acquired products, tools, and other items that are used in creating and describing these work products. Examples of work products that may be placed under configuration management include plans, process descriptions, requirements, design data, drawings, product specifications, code, compilers, product data files, and product technical publications.

In Fig. 1 the following bubbles will be skipped: *Create a Release Baseline* and *Track Change Requests*. This means that *Change Requests* and *Change Request Database* will be omitted.

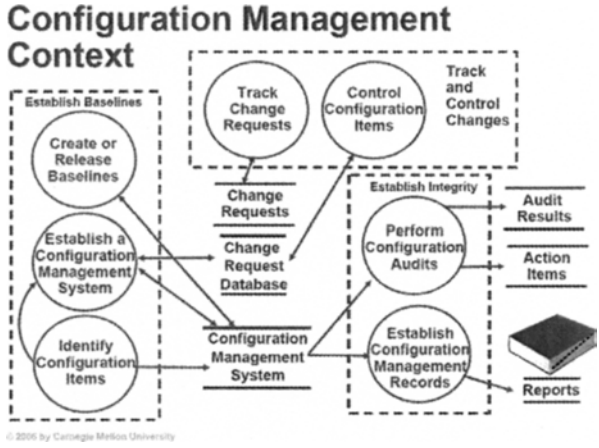

Fig. 2. Process Area Configuration Management (Carnegie Mellon, 2006)

Whereas in Configuration Items the following work products: code, compilers, product data files, and product technical publications should be removed by these ones: Profile, the History, the Evidence, the Bag of Assets, the VBE Governance, the VBE Values System, and the Trust. Moreover also Strategic Alliance and the Opportunity-based CNO should be taken into account.

Furthermore the process areas Configuration Management and Requirement Management are more strongly interlinked. Especially Requirement Management's focus will shift from "classical" functional requirements (competences of the network partners) to non-functional requirements concerning social competences and trust.

3.2 Determination of Tourism oriented Process Areas

The pilot project SMART-UP cut in on the weaknesses of SMTEs as described above and developed an internet learning and know-how transfer platform for (owner) managers in the tourism industry (Peters et al., 2002). Four modules have been developed according to market-research on qualification needs of SMTE entrepreneurs: Quality Management, Yield Management, Human Resource Management, Product Development and eCommerce. In the following, the area of quality management serves as a case study example to adapt a CMM process in SMTES.

In a first step SMTEs have to identify needs to select a process area by a mode of representation. For SMTEs both forms of representation are challenging, as in the case of continuous representation the SME owner or entrepreneur should be aware which qualification areas can be chosen as process areas. In addition, owner manager have to understand the dependencies between various process areas. For many SMTEs staged representation can be recommended because many owner managers do not really know where they can start with process improvements.

One of the main qualification areas for SMTEs identified in the SMART-UP project is quality management. Referring to Fig. 2 we can highlight a number of process tasks for the SMTE:

1. The SMTE has to establish baselines for their process area quality management: It is of utmost importance that management and service contact personnel is aware of quality principles and rules within the service firm. In this phase management or owner managers develop strategic goals in the area of quality management. For example, the service concept has to be created and entrepreneurs should develop answer to strategic questions (see also Heskett, 1986, p.8), such as:

    - How do we define quality in our company? What are the main elements of service quality?
    - What are the most important elements of the service and how should they contribute to the overall quality perceptions of guests?
    - How do various target segments perceive the service concept?
    - How are these elements perceived by the market (e.g. competitors)?

2. While in the second step actions are defined which should lead to the fulfilment of the above developed goals, the SMTE itself has to define change requests when experiencing gaps or problem in the process area quality management (e.g. quality measurement action are customer satisfaction surveys or blueprint and internal quality evaluation). The service encounter can be seen as the process, which during various phases will deliver a number of change requests. These requests have to be reported and tracked to control configuration items.
3. Another challenge for SMTEs is the establishment of integrity: here the enterprise has to be able to perform configuration audits and to establish configuration records. In our example an audit has to be installed based on the measurement of quality initiatives' output that results in an audit record. In a next step actions can be recommended to improve the quality management in the tourism firm. Unusual but important for small businesses is the implementation of a report system. Literature states that small (especially family) businesses are reluctant to report internal progresses or problems in a written form (Peters & Buhalis, 2004, Upton et al., 2001).

For small businesses many of these requests force them to radically change common patterns of management: constant learning has to be reported and discussed and an open as well as strategic and long-term oriented learning process is a prerequisite for the implementation of CMM in SMTEs.

4 Expected Results

At the ENTER 2007 (Withalm et al., 2007) it was shown that ECOLEAD concepts especially those of VBE, can be applied to Destination Management Organisations (DMOs) and hence improve their performance. DMOs tasks are to bundle and provide all tourism services in a region/destination. Therefore many organisations should cooperate, and the DMO should build a Virtual Breeding Environments (VBE). The basic idea of supporting DMOs in building VBE will be continued, as was announced at ENTER 2005 (Withalm et al., 2005). The following approach will be applied to DMOs of the specific region, which is involved in oncoming projects (as for instance Olympic Games, Ski Championships, EURO2008). Within the proposed DMO the building of virtual organisations is intended, providing ticketing, entertainment, travelling, and transportation, together with all organisations, which could be involved in such a mega event.

First experiences with demonstrators in different domains - when applying these ECOLEAD results in trials and take-ups (ECOLEAD 2004, http://www.ecolead.org) - have shown that the maturity level of SMTEs is extremely different. So the best approach seems to develop the presented CMMI® approach and to support SMTEs to implement the required concepts and solutions.

Afterwards the project team together with the DMO will be involved in preparation endeavours, and in the first phase all results how to build a breeding environment will be realized. In this phase, many of the formerly developed guidelines, checklists, tools can be applied in that sense that especially all questions concerning the business strategies – above all trust buildings and legal issues – and business models will

accelerate the decision process, which organisations should/could participate. Especially applying rules for trust building and business models will be facilitated after having assessed those SMTEs in the tourism destination that should be considered. Not until the maturity level is assessed and the improvement measures are implemented negotiations by collaboration agents with all of them may be initialized as was presented in the ENTER 2007 (Withalm et al., 2007) conference. Then it will become clearer, which organisations are appropriate to join the network?

Further research in the field of SMTE should answer the following questions:

- Are SMTEs ready for the recommended assessments?
- Are SMTEs able to implement the improvements?
- Is it possible to standardize the assessment procedure?
- Are there experienced experts both for assessments and improvements available?
- Is it possible to establish certification bodies for assessors?

5 Conclusions

The process to start the definition of a new constellation has already started within the ECOLEAD. Both, ECOLEAD partners, EU project officer, and reviewers, all agree that CMM represent the ideal framework to disseminate innovative and challenging results to those SMTEs who demand and need this knowledge to better face future business management challenges.

Hence in ECOLEAD a prior goal is the adaptation and the concurrent examination of these process areas in collaboration with SMTEs. However, in ECOLEAD it was an essential insight that domain specific process areas play a crucial role for the success of CMM applications. Therefore this modified CMMI® should be applied on SMTEs. However, it seems to be an illusion to assume that a new constellation of CMMI® can be defined in short term. Ongoing trials of these assessments on existing SMTEs will enable a very pragmatic implementation process and prevent the establishment of scientific but non-practical process models which will not be applicable for SMTEs.

Parallel to those activities initiatives regarding standardization are taken up. Experiences in the area of IT industry confirm that organisations are ready for these assessments not until a certification is available (e.g. ISO 9000).

Together with CMMI® following activities have the potential to improve the performance of SMTEs:

- Tourism process areas are partly developed in SMART-UP (Peters et al., 2002).
- Core Process areas of CMMI® will be extended concerning collaboration behaviour in the course of ECOLEAD and its presumable successor COIN.
- Capability maturity assessments enable SMTEs a position fixing and consequently to an improvement of their business performance.
- Accomplish better profits in SMTEs and indirectly in the whole destination.
- Experts from universities and consultants have the possibility to become a certified assessor.
- Enabling new business opportunities for SMTEs.

- Both collaboration-oriented and tourism oriented process areas will assess the IT competences of the SMTEs.

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e-Destination Structure: a Network Analysis Approach

Joana Miguéns and Adriana Corfu

[a] Department of Management, Economics and Industrial Engineering
University of Aveiro, Portugal
joana.miguens@ua.pt, acorfu@ua.pt

Abstract

This study analyses the connectivity of tourism attractions in a destination as a unique product marketed online. An online search is empirically performed to characterize the city of Lisbon as an e-destination. This study presents a quantitative methodology to study e-destination using network analyses. Methods applied reveal that information about tourism attractions is very heterogeneously distributed on different online sources. The way tourism attractions are connected show that highly connected attractions connect the less connected ones. This property is known as disassortative mixing, and is typical of technological and biological networks. This study suggests a need for an online strategy based on the integration of tourism attractions and entertainment, directly influencing tourist to receive more information and their propensity to stay longer in the destination.

Keywords: Network Analysis; e-destination; Social Networks.

1 Introduction

Tourism destinations are probably one of the most difficult products to market (Palmer 2005). When a consumer decides upon a tourism destination, his decision is exclusively made based on information. Internet-based marketing and e-commerce are two major, interrelated, areas of development impacting tourism destinations. The former reduces information asymmetry between tourists and service providers within destinations. The latter was predicted to eliminate intermediaries who act either as information brokers or guarantee services at the destination (Corfu et al., 2003). Authors such Buhalis and Main, 1998; Lang, 2000; Buhalis and O'Connor, 2006; and Buhalis, 2003 refer to disintermediation as a consequent phenomenon of Internet's use in the tourism sector. This is all the more true in an environment where tourism is a global industry, with some part of the value chain in the country of origin of the tourist and the remaining in destinations (Corfu & Kastenholz 2005).

However, even though largely available through the Internet, information about tourism destinations is very much inflamed by the means that the Internet makes it available (Doolin, Burgess et al. 2002). Having a Web site is an absolute no-brainer to embark on, but it also creates a hurdle: without relevant, understandable and up to

date information, Web site data is like all the books in a library, dumped in one big pile on the floor. All the information is there – you just can't find or use it (Corfu et al., 2003). However, in recent years we have seen growing interest in delivering methods to guide individuals through the enormous range of destination options available (Palmer 2005), making travel a "natural fit" with interactive media and the Internet (Kierzkovski et al., 1996). Moreover, travelling is one of the most popular online activities (Kierzkovski et al., 1996; Jonkheer, 1999; Pröll & Retschitzegger, 2000), with online travel sales increasing by as much as 31% from 2005 to 2006 and reaching EUR 38.3 billion in Europe in 2006. A further increase of about 22% during 2007 to about EUR 46.8 billion may be expected (Marcussen, 2007).

An e-destination in this context refers to a tourism destination (from small towns, to regions and whole countries or group of countries) as a network of independent companies, tourist attractions and public organizations that constitute and market themselves through the Internet. It means that Web sites should be linked together so that a visitor to one site would easily be able to find out about services, entertainment and resources of the entire destination. This concept is adapted from Palmer (2005) who refers to it as a virtual destination management system.

The variety of information about tourism attractions on a specific destination and the way they appear in different web sites is the main focus of our study. The goal is to measure to which extend tourism attractions and entertainment are mapped online as a unique product, which can contribute to the tourist's decision on destination and longevity of their stay. Through an online search, how attractions are integrated and dependent on each other is explored. The connectivity of tourism attractions is analyzed using network analyzes, focusing on the relation between tourism attractions and how the structure of the destination functions as a unity.

This paper is organized as follows. Theory is presented in section 2, methodology in section 3, focusing on the cohesiveness of tourism attractions, their tendency to have a central position online, the disparity of information on different online sources, and the propensity of tourism attractions to be connected with others with the same centrality. Results are outlined in section 4 and conclusions are drawn in section 5.

2 Background

Tourism destinations are characterised by multiple actors, sharing a common product and mutually dependent on a network system. Due to the interdependency among actors, their connections are considered a main competitive factor for a tourism destination. Tourism network systems have been researched mainly from two

perspectives, inter-organizational and multi-destination. From a inter-organizational side, Lynch (2000, p. 95) observes that, "the term (networks) describes the interactions of the firm with the external environment, and offers potential insights into such areas as business relations, industrial organization, regional agglomeration, strategic management of small firms and the culturally induced outlooks and behavior of small firms." Like organizations, tourism attractions and resources are also linked into a common product. In this sense, a multi-destination network (Shih, 2006; Mathews, 2000; Morrison et al, 2004) conceptualize a set of different destinations or sights as a single product, or by other words, visiting more than one destination as a one trip. Network analyse has been proposed in tourism research to quantify the structure of a multi-destination that functions as a single product. This product can be a set of different cities visited by airplane (Hwang, Hwang, Gretzel & Fenmaier 2006), a grouping of different tourism attractions on a single city (Krame, Modsching & Hagen, 2006) or a set of cities around a hub main city visited by car on a single trip (Shih, 2006).

In the same way that tourism destinations can be conceptualized as a networked system, their electronic image can also be percept and used as a networking strength. Network analysis focuses on the structure of relations between given actors, and applies techniques to produce relevant indicators and results for studying the properties of the network as a system. Previously applied to relationship in destinations, the concept of networking to compete and market can now be applied to an e-destination. The use of new technologies can change the perspective of a destination and new challenges emerge. For example, the use of mobile system as tour guides increases the amount of information obtained by the tourists and result in a longer stay at each tourism attraction (Krame, Modsching & Hagen, 2006). This is achieved because more integrated information is delivered and easy to access. Web pages, mobile devises and GPS are new ways of connecting, whether it is connecting organizations, tourism attractions or any other dependency of the product chain. In this way, new technologies increase the integration of tourism attractions into a single product, whether it is at the destination or on its online image, e-destination.

In a tourism destination, companies have become conscious that in order to compete globally, they have to interconnect tightly with the surrounding local environment in order to become more efficient in their operation. The growing adoption and evolution of new communication channels places the internet on a primary importance for tourism destinations. A common strategy online may benefit all the actors. Faloutsos et al. (1999) reported on the first study on how the internet map looks like. Internet and www are valuable objects because modern society increasingly depends on large communication networks. The need for information

spreading pervades our lives, and its efficient handling and delivery, is becoming one of the most important practical problems. Pushed by this practical need, developing a realistic e-destination network and understanding the basic mechanism of the formation of such networks are crucial for online positioning, cost optimization and efficiency. Many of the tools currently used to analyse networks have their origin on sociometry, like centrality, clustering and integration. These describe different social systems such as friendship, affiliation and collaboration. In this study an e-destination is represented using network analysis, which encompasses methods to study social structures, providing techniques and indicators to analyse information integration on tourism attractions, and their properties.

3 Methods

The increasing availability of real network data and the current capacity to be able to analyse large data sets has enhanced analytical methods to characterize networks, extending our knowledge on the description of these systems. Networks are a fashionable topic on many other real world systems, such as airline connections, financial relations, companies, partnerships, ecological networks, movies actors, world trade, citations, metabolic, neural, WWW, food webs, email networks, human acquaintance patterns, among others (Dorogovtsev & Mendes, 2003; Strogatz, 2001). The network approach facilitates a holistic, rather than a focalized, perspective on the destination .

On the WWW each page contains information and accessing that information without a search engine can be a difficult task! The function of a web search engine is to retrieve information on the majority of the Web pages and to categorize them according to their information. The approach of an online destination can consider the hyperlinks between Web sites, or even links between pages in Web sites. The use of search engines to categorize information about a destination directly influences its online image. A search (on Google and Yahoo!) was performed to obtain a list of the fifty Web sites using the keyword "Tourism Lisbon". The first fifty unique sites on tourism attractions, were selected alternatively from both search engines. On each Web site, Lisbon tourism attractions that appear on at least 10% of the Web site were selected. The study was geographically limited to the city of Lisbon, Portugal.

This study explores how information about tourism attractions is hard to find and how different information can be available on different Web sites. Network theory is specifically adapted for this study because it focuses on relational systems, where relation between nodes prevail the individual characteristics of nodes. The network of the tourism destination, e-Lisbon, is represented as a bipartite graph, whose nodes can

be divided into two disjoint sets, on the following way. One set is the Web pages and the other set is the tourism attractions. In this way, each Web site from the first set connects to the tourism attractions from the other set (nodes) – forming a network where all the nodes are connected to each other (complete graph). We defined that two attractions were connected if they both had information in the same Web site. The same analysis was performed on all Web sites.

Considering that more than one Web site can relate to two attractions. the connection between two attractions on the network representation is labelled with the number of times (weight) they are in a common Web site. Therefore, each pair of tourism attractions, *i* and *j*, are weighted link, w_{ij} (see Figure 1). Many real networks also weighted networks. In the case of social networks (Wasserman, Faust, & Iacobucci, 1994) it is often relevant to assign a weight (strength) to each edge, measuring how good or strong is a relationship.

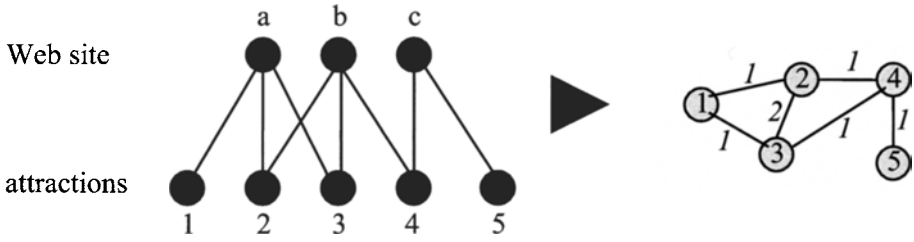

Fig. 1 e-destination, a bipartite graph representation of tourism attraction on a destination through an online serach.

The resulting network is analyzed using network analyses methods explained in the following subsections: centrality (section 3.1), disparity (section 3.2) and assortativity (section 3.3).

3.1 Clustering

The cluster coefficient is one of the main measurements in social networks. The natural formation of clusters in real world systems, both social and economic, gives rise to the discussion on how can we measure the propensity of a node to well-connect with its neighborus, members of the community. This concept was explored for a long time in sociology (Wasserman et al., 1994; Scott, 2000) by the notion of cliques and transitivity, considering the property of triads to form patterns. The clustering coefficient, for the e-destination network, is an attempt to measure cohesiveness, as the probability that two tourism attractions that are directly connected to a third attraction are also directly connected to each other.

The measurement of clustering cohesiveness is as follows:

$$c(i) = \frac{E}{k_i(k_i - 1)}, \quad (1)$$

where i is the tourism attraction, k its connectivity and E is the number of connections between neighbours of the tourism attraction i. $C(i)$ belongs to the interval $[0,1]$ and gives the local connection of the network. $C_i = 0$ if any of the neighbours of node i are connected, and $C_i = 1$ if all the neighbours are connected. Averaging the nodes over the network with the same connectivity we obtain $C(k)$. The cohesiveness of information is an indicator of how well integrated is the image of the destination as a unity, as a integration of all the resources into a single product.

3.2 Centrality

The centrality of a tourism attraction in online search is an indicator of its importance, influencing the way tourists localize and perceive tourism destination prior to their trip. Centrality (Freeman, 1979) is one of the most used measures of node (in this case, tourism attraction) prominence and equals the number of connections the node has to other nodes. In this case it represents the number of connection a tourism attractions has to other attractions. Several measures of centrality have been proposed and applied on a wide variety of applications over decades, like degree centrality, closeness, betweenness, eigenvector centrality, information centrality, among others. Centralization refers to the extent to which a network revolves around a single node, and also to the propensity of the node to diffuse information or knowledge.

The centrality of tourism attractions in online search can be measured in two different ways. At first we evaluate the connectivity of the attraction, by counting the number of connections, k, to other attractions. Doing so we obtain a measure of how well connected, or centralized, is a tourism attraction. Beside connectivity, the frequency of connection between two attraction is also a measure of centrality. For example, if there are two web pages citing A and B, and only one web page citing C and D at the same time, then A and B are twice more connected than C and D. The strength centrality (Barrat, Barthelemy, Pastor-Satorras & Vespignani, 2004), $s(i)$, equal the sum of the frequencies (weights, w_{ij}) connected to the node:

$$s(i) = \sum_{j \in v(i)} w_{ij}, \quad (2)$$

where $\upsilon(i)$ represents the neighbour nodes of node i. Therefore, centrality results on an indicator of how well connected is a tourism attraction, and how strong are the connections.

3.3 Disparity

In this study tourism attractions display a network structure in a sense that they are connected to each other in terms of information. The closer they are, the more information they jointly displayed. Each tourism attraction, besides being connected to many others, may have most of the connection with a few dominant attractions. In this sense, the diversity measures how well distributed are the frequencies and weights around one attraction. In this way, disparity quantifies if there are dominating connections around a tourism attraction or if all connection play an important role (Barrat, Barthelemy, Pastor-Satorras, & Vespignani, 2004):

$$Y(i) = \sum_{j \in \upsilon(i)} \left(\frac{w_{ij}}{s_i} \right)^2 , \tag{3}$$

The average was calculated in order of the degree to obtain the $Y(k)$. This quantifies nodes for which the weights on its neighborhood are all of the same order, $Y \sim \frac{1}{k}$, and the situation where a few weights dominate, $Y \sim \frac{1}{n}$ and $n << k$. Disparity is an indicator of how well distributed are the flows of information around an attraction.

3.4 Assortativity

An important property of network is its propensity for the nodes to be connected with similar ones (Newman, 2001). The assortativity of tourism attraction means the propensity to be connected with other attractions with the same centrality. On a web search, this quantifies if the most central tourism attractions have a very high connection among themselves or, by if they play an important role on connecting the less connected tourism attractions. Social networks are typically assortative, as individuals tend to connect to the most similar ones. On the other hand, on technological networks the most central nodes tend to connect the otherwise disconnected small nodes.

Mathematically assortativity is quantified as (Newman, 2002):

$$r = \frac{M^{-1} \sum_{\phi} \left(w_\phi \Pi_{i \in F(\phi)} k_i \right) - \left[\frac{M^{-1}}{2} \sum_{\phi} \left(w_\phi \sum_{i \in F(\phi)} k_i \right) \right]}{\frac{M^{-1}}{2} \sum_{\phi} \left(w_\phi \sum_{i \in F(\phi)} k_i^2 \right) - \left[\frac{M^{-1}}{2} \sum_{\phi} \left(w_\varphi \sum_{i \in F(\phi)} k_i \right) \right]}, \tag{4}$$

where $F(\phi)$ denotes the set of the two vertices connected by the ϕth link and M is the total number of edges in the network. This measure r is positive (negative) for assortative (disassortative) networks (r=0 for a random graph).

For weighted networks the assortativity coefficient, r^w follows the same meaning, being positive for weighted assortative networks, and negative for weighted disassortative networks (Newman, 2002; Leung and Chau, 2006). Mathematically:

$$r^w = \frac{H^{-1}\sum_\phi \left(w_\phi \Pi_{i\in F(\phi)} k_i\right) - \left[\frac{H^{-1}}{2}\sum_\phi \left(w_\phi \sum_{i\in F(\phi)} k_i\right)\right]}{\frac{H^{-1}}{2}\sum_\phi \left(w_\phi \sum_{i\in F(\phi)} k_i^2\right) - \left[\frac{H^{-1}}{2}\sum_\phi \left(w_\varphi \sum_{i\in F(\phi)} k_i\right)\right]}, \quad (5)$$

where H equals the total weight of all edges in the network. r and r^w belong to the interval $[-1,1]$ and $r = r^w$ if all the weights are equal. A network is assortative if it tends to connect nodes with similar connectivity, and disassortative for dissimilar connectivity. Assortative networks are resilient to simple target attack, like disease propagation, social networks are more vulnerable than technological and biological networks against attacks or propagations. Assortativity is an indicator of the propensity of tourism attractions, in online search, to connect with similar ones.

4 Results

The empirical analysis characterizes Lisbon as an e-destination. Fifty Web sites were analyzed and 39 tourism attractions were selected. The resulting network displays a symmetric, undirected and weighted graph which data is used to build the corresponding adjacency matrix. The network is represented on Fig 2.

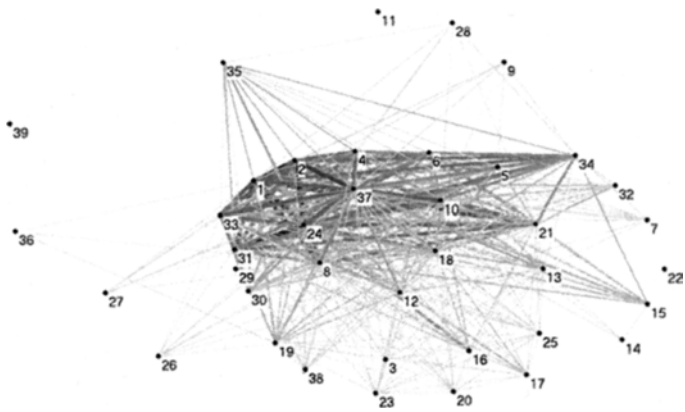

Fig 2. e-destination network, Lisbon. Tourism attractions (nodes) are linked and weighted equal the number of common Web sites where both are referred. Network representation using (http://vlado.fmf.uni-lj.si/pub/networks/pajek/,[2007]) PAJEK Program.

The network has weak cohesiveness, with an average clustering coefficient of c(k) = 0.93 (equation 3.1), which results from a weak integration of tourism attractions. The

clustering coefficient, for the e-destination network, shows the low probability of two tourism attractions that are directly connected to a third attraction are also directly connected to each other. The network has a low connectivity on three nodes cycles, influencing the low cohesiveness and weak integration of the e-destination image.

The online search places some sights more visible than others, depending on the easy is to find the information and how well connected it is to other resources. Centrality was calculated on each sight, as defined in section 3.2. On the strength centrality, $s(k) \approx k^{\theta}$, $\theta > 1$ (see Fig. 3(a)) meaning that strength centrality grows faster than connectivity. On this sense we conclude that the centrality of tourism attractions particularly benefits from varying the connections to other tourism attractions not yet connected. This means that the new placement of information about a tourism sight in other web pages, connecting to previously not connected sights, significantly increases strength centrality.

The disparity is an indicator of how similar are flows of a node neighbourhood. The results are shown in Fig 3(b). The *out* flow weight disparity displays a fit approximately $k \times Y(t) = k^{\theta}$, where $\theta = 0.35$. These results mean that weights are very heterogeneous and have few dominant connections with lower weights. This means that some information connections between tourism sights are much stronger than others.

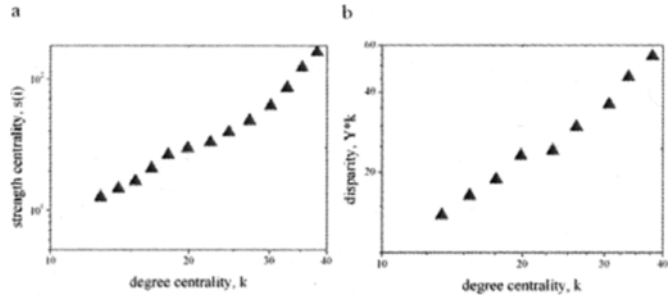

Fig 3. Centrality of tourism attractions. a strength centrality over degree centrality (log-log plot). b disparity over degree centrality (log-log plot).

We turn now to question in which sense do tourism attractions couple with one another. Is it in some sort of random choice, or is there a preference on the way they link with each others, meaning a choice that makes some connections more probable than others. In a social context is usually observed an assortative mixing, observed when the nearest neighbours of nodes with high degree also have high degree. In an economic, technological or biological context, disassortative mixing is generally observed, when the nearest neighbours of nodes with high degree have low degree.

The assortativity measured over connectivity is $r = -0.2$, displaying a disassortative behavior. The measurement on the network considering the frequencies between

tourism attractions, weights, is $r^w = -0.24$. The weighted correlation is also disassortative, confirming the connectivity assortativity measurement. The weighted versus topological analysis shows that low (high) degree nodes have their edges with large weight directed to nodes with low (high) degree.

5 Conclusions

In this paper was studied the way tourism attractions on a destination are structured online. Information about tourism attractions is very much depending on the way the Internet makes it available. Therefore, an online search on two search engines was performed to retrieve the way information appears online, allowing the analysis of how the integration of the tourism attractions forms a unique product.

The results revealed strong dissimilarity on tourism attractions advised on different Web sites. Disparity measurement shows some dominant connections among attractions, increasing decentralization (disintegration) of information. The dissimilarity may confuse the tourist and its decision on a destination. A strategy to place attractions more integrated on the e-market place would improve the capacity of attracting tourists. The centrality of information measurement was performed on the number of connections per attractions, and on the strength of these connections. The placement of information about a tourism attraction on more Web sites increases more than linearly, its importance on the online search.

On the other hand, the network is disassortative. Interestingly, this pattern follows the technological and biological networks, positioning e-tourism among economic network structures rather than social ones. The same disassortative behaviour was previously showed in tourist arrivals flows and over world international flows (Miguéns, Mendes & Costa, 2007). The economic approach of tourism and e-tourism systems may prompt some important questions on whether social relations on tourism are strongly dependent on economic ones. On the other hand, disassortativity reveals the importance of connecting online central tourism attractions with less connected ones.

Analyses of tourism attractions positioning and integration is considered a key factor in e-tourism. The online strategy of the destination as a unique product is crucial for its attractiveness. Individual stakeholders much have to gain with a common online placement, which may increase tourists stay and their information about the destination.

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