

Brigitte Stangl
Juho Pesonen *Editors*

Information and Communication Technologies in Tourism 2018

Proceedings of the International
Conference in Jönköping, Sweden,
January 24–26, 2018

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Editors

Brigitte Stangl
School of Hospitality and Tourism
Management
University of Surrey
Guildford
UK

Juho Pesonen
Business School, Centre for Tourism Studies
University of Eastern Finland
Kuopio
Finland

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Preface

Organized by the International Federation for IT and Travel and Tourism (IFITT), ENTER2018 eTourism Conference takes place in Jönköping, Sweden, on January 24–26, 2018. The 25th annual international conference features cutting-edge research and industry case studies on the application of Information and Communication Technologies (ICT) in travel and tourism. The conference theme, “Digital tourism: engagement, content, and networks”, was an invitation to discuss the transformation and opportunities in travel and tourism due to the latest development in digital technologies.

The research track of ENTER2018 received a total of 93 submissions, covering a diverse variety of fields within the area of ICT and tourism. Each research paper submission went through a rigorous double-blind review process with members of the ENTER2018 Scientific Committee assigned as reviewers. Where issues remained, additional reviews were commissioned. As a result, 40 full research papers were accepted for presentation at the conference and are included in these proceedings.

While still maintaining a broad topic of ICT applications in travel and tourism, the papers presented in this volume advance the current knowledge base of digital marketing and social media, online travel reviews, mobile computing, augmented and virtual reality, gamification, recommender systems, online education and learning, and the sharing economy. Particular attention is devoted to the actual and potential impact of big data, data mining, and sentiment analyses. The papers presented in these proceedings bring new insights to the field and give promising evidence that the ICT and tourism will continue to contribute to our society. We hope these proceedings will serve as a valuable source of information on the state-of-the-art ICT and tourism research.

We greatly appreciate the considerable time put in by all members of the ENTER2018 Scientific Committee who helped us to ensure that the content of the research papers is of high quality. We are indebted to the panel of experts who

helped with additional reviews in order to select candidates for the best paper award.

We are also thankful to the ENTER2018 Overall Chairs—Marianna Sigala and Matthias Fuchs, the IFITT President—Lorenzo Cantoni, other ENTER2018 organizers, the IFITT Board, and all members of IFITT for their support and for accommodating the many inquiries made while managing the research track.

Finally, we would also like to thank all authors for their willingness to disseminate their latest research at ENTER2018. This conference would not be possible without their efforts.

Brigitte Stangl
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Part I
Virtual Reality and Gamification

Emotionalise Me: Self-reporting and Arousal Measurements in Virtual Tourism Environments

Julia Beck^(✉) and Roman Egger

Salzburg University of Applied Sciences, Salzburg, Austria
{jbeck.imte-m2014, roman.egger}@fh-salzburg.ac.at

Abstract. The technological developments regarding Virtual Reality (VR) are providing new opportunities for the tourism industry. This research investigates the application of fully-immersive VR systems in tourism marketing and analyses how it influences emotional responses and decision-making. During a laboratory experiment, subjective measurements were combined with physiological measurements of arousal. Study participants were exposed to a 360-degree destination marketing video, using either a head-mounted display (HMD) or a desktop-PC. Whereas the physiological parameters of heart rate and electrodermal activity showed a significant increase with the HMD-group, subjective evaluation of emotions and decision-making did not indicate any significant differences. These partly contradicting results suggest further investigation of emotions and arousal measurement, analysis and interpretation through field experiments. Nevertheless, from subjective opinions of participants and participant observations it could be concluded that VR as a marketing tool has the potential to increase positive emotions. Taken the enthusiasm and interest for VR in tourism into account, recommendations concerning investment in VR technology are given.

Keywords: Virtual reality · Tourism marketing · Emotional responses
Arousal · Electrodermal activity · Heart rate · Self-reporting measures

1 Introduction

Technological development has been constantly affecting the tourism and travel industry. The Internet and associated digital technologies have been influencing the whole customer journey for both tourists and tourism practitioners alike. The way travellers get inspired, book, plan and experience travel has changed (Neuhofer, Buhalis, & Ladkin, 2012) and the need for tourism marketers to develop new models to promote and market their destinations has been created (Huang, Backman, & Backman, 2012). One of the important contemporary technological developments influencing the tourism sector is Virtual Reality (VR) (Tussyadiah, Wang, & Jia, 2017), which is a computer simulated world that enables the viewer to experience it virtually (Desai, Desai, Aimer, & Mehta, 2014).

A lot of travel related information has been offered on a 2-dimensional (2D) level either offline with commonly used tools such as brochures or catalogues, or online in

the form of web pages, providing text, images and videos. Particularly the offline tools for tourism promotion are often perceived inauthentic and hence, a change in tourism marketing is needed. More recently, websites offer the opportunity to discover a destination in a 3-dimensional (3D) way (Pakanen & Arhippainen, 2014; La Valle, 2016), which helps to better get customers emotionally involved. This further influences the travel decision process (Pawaskar & Goel, 2014). 2D media can be enhanced with sensory experiences or multiple sensorial multimodal media content that can be displayed with current VR technology, such as VR headsets that are also known as head-mounted displays (HMDs). HMDs enable viewers to virtually visit places that are far away (La Valle, 2016) and are used to mimic real life situations and provide users with novel experiences (Egan, et al., 2016). The ability to offer extensive sensory information is particularly interesting to the tourism industry (Guttentag, 2010), as the unique nature of tourism products does not allow the consumers to have a direct trial experience (Cho, Wang, & Fesenmaier, 2002). Hence, VR has great potential to impact the inspiration and information phase, by providing the opportunity to engage with richer information (Disztinger, Schlögl, & Groth, 2017; Marchiori, Niforatos, & Preto, 2017).

There has been little discussion about virtual tourism experiences displayed with fully-immersive VR systems, such as HMDs. However, research on tourism-related marketing VR applications is of importance, as tourism marketers need to decide which marketing strategies to invest in. Hence, it is crucial to understand how customers respond to various marketing stimuli (Tussyadiah, Wang, & Jia, 2016; Tussyadiah et al., 2017). Even though marketing research deals with an extensive degree of emotions triggered by text and images (Trommsdorff, 2009), little research has been conducted to understand consumers' emotional responses to advertising stimuli in tourism marketing (Li, Walters, Packer, & Scott, 2016). Therefore, this paper aims to explore the effects of VR in tourism marketing on the intensity of triggered emotions, as indicated by the level of arousal. It is recommended to combine self-report questionnaires, that are only capable of capturing the subjective perception, with physiological parameters (Li, Scott, & Walters, 2015; Li et al., 2016). Furthermore, underlying potentials that impact the travel decision process should be analysed and relationships between experienced emotions and decision-making should be identified. Analysis of results gained by a laboratory experiment required preceding detailed investigation of existing theories in the field of emotions and arousal in marketing, measurement of emotions and VR. This research aimed to answer the following research question with accompanying sub-questions:

Does the technology of fully-immersive VR intensify triggered emotions in tourism marketing?

RQ1: Does a 360-degree tourism marketing video representation with a HMD lead to greater emotional reactions than a desktop-PC representation?

RQ2: Does a 360-degree tourism marketing video representation with a HMD lead to greater impact on the decision-making than a desktop-PC representation?

RQ3: To what extent do the intensity of experienced emotions and decision-making show a correlation?

2 Theoretical Background

2.1 Emotions and Arousal in Marketing

Emotions play an essential role in consumer behaviour and their understanding is crucial for marketing (Santos, Ramos, & Almeida, 2014), and also tourism marketing. The objective of marketing activities is often to impress and fascinate the customer as well as to draw positive attention to the product or service, which can result in emotions and feelings that are characterised by a highly positive valence combined with a high level of arousal. Events that affect someone emotionally are more likely to be remembered and shared with others (Stürmer & Schmidt, 2014), and also leads to costumers willing to pay a higher price (Häusel, 2012). Therefore, marketing practitioners aim to emotionalise consumption with experiential marketing or emotional advertisements (Liu & Chen, 2006; Schmitt, 2010; Kroeber-Riel & Göppel-Klein, 2013; Kumar & Raju, 2013). Experiential marketing (or experience marketing) is defined by Schmitt (2010, p. 63) as “any form of customer-focused marketing activity that creates a connection to customers.” Experiences occur already during information collection or decision-making stages and not only during consumption (Schmitt, 2010), which explains the need to already focus on the pre-experience stage (Tynan & McKechnie, 2009), especially in the tourism context (Kim & Fesenmaier, 2014; Li, et al., 2015). During the pre-travel phase, prospective travellers explore and seek inspiration (Neuhofer et al., 2012) and marketing stimuli have the potential to elicit fantasies and lead to emotional arousal in consumers (Goossens, 2000). Kumar and Raju (2013) argue that the main goal of communication messages is to first create product awareness in potential customers’ minds and then to positively impact the purchase behaviour. Travel decisions—taken by travellers of all types, independent of gender, travel company or purpose of travel—are often influenced by momentary emotions or moods (Walls, Okumus, & Wang, 2011). Hence, marketing campaigns and communication tools should focus on ways to “dazzle the senses, touch the hearts and stimulate the minds” of customers (Schmitt, 1999, p. 57). This is supported by Bigné and Andreu (2004), who suggest that the objective of experiential marketing is to positively excite the consumer or to trigger positive consumption emotions. Also according to Kroeber-Riel and Gröppel-Klein (2013) experiential marketing can be applied to convey arousal, by providing emotional and sensual experiences, which leads to differentiation. Hence, advertising, as a subset of promotion, and marketing in general should combine informational with entertaining, emotional (Raab & Unger, 2005), sensory, utilitarian, relational or social elements to design sources of value for customers (Tynan & McKechnie, 2009).

Most emotional processing happens subconsciously. Hence, in order to influence and direct customers’ emotional responses, measurement and analysis of emotional reactions to marketing stimuli is recommended. Standardised measurements and parameters can be applied and interpreted (Stürmer & Schmidt, 2014), but the emotional life of consumers is complex and so is its measurement. As there is no method which is capable of drawing a holistic picture about triggered emotions, multivariate measures are proposed. Their application leads to a more valid, holistic, and profound

interpretation of the complex emotional world of consumers (Ravaja, 2004; Stürmer & Schmidt, 2014). Physiological parameters are neither commonly applied in marketing research nor in VR research. Egan et al. (2016) and Felnhofer et al. (2015) applied a combined approach of subjective self-report measures with physiological measurement of EDA to study VR. Marchiori et al. (2017) explain that biophysical reactions can facilitate a greater understanding of users experiencing a VR tourism application and their related emotions. Characteristic metrics to research the impact of marketing stimuli on arousal and behaviour are heart rate (HR) and electrodermal activity (EDA) (Ravaja, 2004; Stürmer & Schmidt, 2014; Marchiori, et al., 2017). Micu and Plummer (2010) found in their study, examining TV ads by means of HR and EDA, a positive relation between an increase in positive emotions and attitude toward the ad and attitude toward the brand. They argue, the higher the level of arousal, the more efficient the marketing message is processed and the greater is the marketing success. In general it has been argued that an increased level of arousal can be depicted with higher levels of HR (Lang, 1990; Meehan, Razzaque, Insko, Whitton, & Brooks, 2005) or higher levels of EDA (Kroeber-Riel & Gröppel-Klein, 2013; Li, et al., 2015).

2.2 Virtual Reality

Constant development of VR hard- and software as well as emerging research areas and fields of application lead to an inconsistent use of the term ‘VR’ (Dörner, Jung, Grimm, Broll, & Göbel, 2013). Desai et al. (2014, p. 175) explain that VR is “a computer simulated [3D] environment that gives the user the experience of being present in that environment.” Guttentag (2010), who reviewed VR in tourism research, defines VR as “the use of a computer-generated 3D environment—called a ‘virtual environment’ (VE)—that one can navigate and possibly interact with, resulting in real-time simulation of one or more of the user’s five senses.” The underlying concepts of VR are the concepts of immersion and presence. Immersion refers to the physical configuration that is objective, whereas presence is a subjective construct. Concerning the concept of immersion, VR systems can be categorised in non-, semi- and fully-immersive. The less the user can perceive from the real world on the outside, the more immersive the system (Kim, 2005; Gutiérrez, Vexo, & Thalmann, 2008). Non-immersive systems are also referred to as desktop-based VR systems and are characterised by low costs as well as ease of use and ease of installation. Semi-immersive systems are equipped with large projection screens, provide 3D sound and are generally designed as a multi-user experience. Fully-immersive systems, such as VR headsets, isolate the user completely from the real world and are often designed as a single user experience (Gutiérrez, et al., 2008; Dörner, et al., 2013). Latest developments arising from the smartphone industry have led to the emergence of high-resolution, low-cost, portable VR headsets with built-in head tracking (Munster, Jakel, Clinton, & Murphy, 2015; Disztinger et al., 2017; Marchiori et al., 2017). Regardless of the VR system, two different construction approaches for VEs can be differentiated, namely synthetic and captured virtual worlds. For a long time, VR has been dealing with synthetic computer generated virtual worlds, whereas recently this trend has changed and real-world 360-degree images and videos

are captured and then embedded into VR experiences (La Valle, 2016). The other fundamental concept of VR, presence, is a product of the mind rather than bound to any specific technology and describes the feeling of 'being there' (Ijsselstein & Riva, 2003). Once external stimuli are processed by the sensory system, they are transformed into a mental model which results in the illusion of being immersed in another space (Kim, 2005). Study results indicate a correlation between presence and emotions, but there is no consensus about causality. However, it is argued that the notion that high presence implies strong emotions may be supported (Felnhofer et al., 2015). The greater the level of experienced presence, the more similar the experienced feelings are to those evoked by the corresponding real environment (Rooney, et al., 2012).

Emerging information and communication technologies, such as VR, are capable of re-engineering the way tourism products are managed, placed and promoted on the market (Guttentag, 2010). VR distinguishes itself from other media, as it offers not only information but also an experience to the consumer. Virtual experiences provide rich perceptual and cognitive information as well as the opportunity to immerse oneself within an interactive multimedia environment that enables one to gain 'experiential' information. As a consequence, it is argued that users of VEs can make better informed decisions than non-users, as a virtual presentation could make the marketing experience more realistic and hence more closely resembles the direct onsite experience, which will reduce the level of perceived risk (Cho & Fesenmaier, 2001; Cho, et al. 2002; Liu & Chen, 2006; Lui, et al. 2007; Wan, Tsaur, Chiu, & Chiou, 2007; Huang, et al. 2012; Huang, Backman, Backman, & Chang, 2015). Suggested advantages of VR applications in tourism are the creation of destination awareness (Guttentag, 2010) as well as the creation of curiosity and willingness to view the promotional experience (Marchiori et al., 2017), the possibility of a try before you buy experience (Tussyadiah, et al., 2017), a positive impact on the intention to visit the real place (Huang, et al., 2012; Huang, Backman, Backman, & Moore, 2013) as well as on the tourists' information searching and travel decision-making processes (Huang, et al., 2015), and an impact on the destination image in tourist's mind (Pantano & Servidio, 2009).

Tussyadiah et al. (2016) suggest that the creative presentation of tourism destinations in 360-degrees can result in high levels of arousal as well as positive valence. However, Cho et al. (2002) highlight the fact that different types of media allow virtual experiences and Huang et al. (2015) stress that results from studies examining VEs for semi-immersive systems may not be applicable to other VR systems. Hence, concluding the theory about emotions and arousal in marketing as well as VR, it is suggested that a tourism marketing stimulus presented with a fully-immersive VR system leads to greater emotional reactions than the same stimulus presented with a non-immersive system, whereby emotional responses and arousal can be measured with different metrics (Hypothesis 1). Additionally, it is investigated if VR influences the decision-making process that can be further divided into product interest and purchase immediacy (see also Sect. 3 Methodology). Recent developments in VR technology propose an investigation whether the impact of fully-immersive VR systems differ from non-immersive VR systems (Hypothesis 2). The following hypotheses are posed:

H1: The 360-degree tourism marketing video representation with a HMD shows greater overall emotional reactions (self-reported-, HR- and EDA-measure) than with a desktop-PC.

H2: The 360-degree tourism marketing video representation with a HMD shows greater impact on the decision response scale (product interest and purchase immediacy) than with a desktop-PC.

3 Methodology

The primary aim of this paper is to explore the effects of VR in tourism marketing on the intensity of emotions and arousal and its' influence on the decision-making. Hence, an experimental research design was adopted to answer the research questions and to validate the hypotheses. An independent group design with two levels of the independent variable was used. The posed research questions imply that the chosen stimulus (independent variable) influences the intensity of triggered emotions and arousal (dependent variable). Random assignment of participants, as well as the presence of a control group, eliminate rival explanations, which contributes to the internal validity of the study (Field & Hole, 2003; Bryman, 2015). The experimental group views the chosen 360-degree destination marketing video with a HMD, the control group with a desktop-PC. Dependent variables are physiological measures of arousal (HR, EDA) as well as self-reported emotions and decision response. The study employed convenience sampling, which is described as a sample that is "available to the researcher by virtue of its accessibility" (Bryman, 2015). The sample comprised of students from the Salzburg University of Applied Sciences (SUASS), who participated on a voluntary basis. Undergraduate and graduate students are considered an appropriate target group for VR studies in a tourism marketing context, representing the group of customers most likely to experience VR and be influenced by it (Tussyadiah et al., 2017).

For the purpose of the experiment a hardware and a software tool was developed. The hardware tool combined a Grove GSR sensor for EDA, a sensor for room temperature and humidity, and an external power bank. Room temperature and humidity were recorded, because they should be kept as constant as possible, as changes can lead to a variance in EDA (Boucsein, et al., 2012). Both sensors were connected to an Arduino microcontroller, which transferred the data via Bluetooth to a computer. A 3D-printed case in a phone case worn on the upper arm consolidated all hardware components into one entity, which enabled participants to freely move their hand. The software tool recorded the different parameters simultaneously and combined the data in one output file. Physiological parameters are EDA in %, HR in beats per minute, and RR interval, which is the time between two consecutive heart beats (Stürmer & Schmidt, 2014), in milliseconds (ms). Room temperature was measured in °C and humidity in %. A POLAR H7 heart rate sensor with a textile strap was used to measure HR and RR intervals. For the detection of EDA, finger straps for electrodes were connected to the Grove GSR Sensor and attached to the index and middle finger of the non-dominant hand. The experiment started with a baseline measurement, as physiological reactions are not only dependent on the stimulus, but also on the individual

base-arousal (Stürmer & Schmidt, 2014). In a next step, a 360-degree promotional destination video ('The Winter Within: Whistler Blackcomb 360 Ski Video' by Destination BC) was shown to the participants, either with a HMD (Samsung Gear VR headset) or a desktop-PC. Constant monitoring of real-life recording allowed the authors to notice any problems immediately. After the completion of the video, participants were asked to fill in an online questionnaire that was designed to capture self-reported emotions and decision response as well as general attitude towards VR and demographic information. All participants were tested individually and the same procedure was applied for both groups. A possible novelty effect was eliminated by ensuring that every participant had experienced a VE with a HMD before.

For the subjective evaluation the proposed questionnaire by Walters, et al. (2012) was chosen, as it explores emotional responses to presented stimuli in destination marketing and further examines the impact on decision-making in terms of product interest and purchase immediacy. The suggested emotional response scale (ERS) consists of nine items and includes statements such as "This video makes me feel good" or "I think this is a wonderful video". The decision response scale (DRS) measures product interest (PRI) with five items (i.e., "I would like more information about this destination") and purchase immediacy (PUI) (i.e., "I am confident that this vacation is the right choice for me") with four items. All items are measured on a 7-point Likert scale, with 1 representing high levels of agreement (strongly agree) and 7 representing low levels of agreement (strongly disagree).

4 Results

A total of $n = 122$ experiments were conducted. Defined criteria, such as the duration of data recording or room temperature, and erroneous data (e.g. no change in EDA for the whole recording period), a total of 21 cases had to be excluded. The final sample ($n = 101$) comprised $n = 46$ participants for the experimental and $n = 55$ for the control group. 58.4% of participants were females ($n = 59$) and 41.6% males ($n = 42$), who had an average age of 25.13 years ($SD = 3.719$). 41.6% of participants were undergraduate and 58.4% graduate students. Students from eight different study programs joined the experiment. However, the majority belonged to the study program 'Innovation and Management in Tourism' (52.5%). More than half of study participants were already familiar with HMDs, the other 42.6% therefore had to attend a pre-test run of the device to eliminate a possible novelty effect. In order to verify if the measure, in this case the applied questionnaire, completely and consistently represents the constructs that it attempts to measure, a reliability analysis was conducted. Cronbach's Alpha α is considered the most common measure of scale reliability. The α value lies between $\alpha = 0$ and $\alpha = 1$, ideally around $\alpha = 0.9$. In general, values substantially lower than $\alpha = 0.7$ indicate an unreliable scale (Field, 2013). The minimum value of $\alpha = 0.7$ is reached in all dimensions, hence proved to be internally consistent, presenting $\alpha = 0.90$ for ERS, $\alpha = 0.91$ for PRI and $\alpha = 0.85$ for PUI.

4.1 Comparison of Groups

A statistical significance at the 5% level ($p < 0.05$) was defined. Differences in physiological reactions and questionnaire responses between the two groups were analysed with the Independent t-test (t -test) for parametric and the Mann-Whitney-U-test (U-test) for non-parametric tests. Measurements of ΔRR intervals, ΔEDA , PRI and DRS indicate normally distributed data, whereas values for ERS and PUI do significantly vary from normality, thus suggesting to apply the U-test instead of the t -test. Hence, all hypotheses were tested using the t -test and additionally in a second step the U-test. Furthermore, to interpret the results, it is essential to also calculate and interpret the effect size (r), as a significant difference between two groups does not automatically imply that the measured effect is of importance. Cohen (1988, 1992) established standards that define large and small effects, defining three ranges: $r = 0.10$ indicates a small effect, $r = 0.30$ a medium and $r = 0.50$ a large effect (Field & Hole, 2003). The subsequent paragraphs depict the results for each hypothesis.

H1: The 360-degree tourism marketing video representation with a HMD shows greater emotional reactions (self-reported-, HR- and EDA-measure) than with a desktop-PC

Regarding the self-reported emotional response, no significant difference $t(99) = -0.927$, $p = 0.356$, $r = 0.09$ was found between the experimental ($M = 2.76$, $SD = 1.24$) and the control group ($M = 2.98$, $SD = 1.16$). This is confirmed by results from the U-test, showing no significant difference between the VR ($Mdn = 2.62$) and the PC group ($Mdn = 2.75$) ($U = 1101$, $z = -1.120$, $p = 0.263$, $r = 0.11$). Analysing the mean values in more detail, it can be stated that the difference ($\Delta M = -0.22$) between the two groups is small, indicating that the use of a HMD did not lead to greater, subjectively experienced emotions. Furthermore, the HR measure was assumed to increase to a greater extent for the VR group. This is supported with both the parametric as well as the non-parametric test. Results of the t -test show significant differences $t(99) = -3.95$, $p < 0.001$ between the experimental ($M = -3.62$, $SD = 5.53$) and the control group ($M = 0.52$, $SD = 5.01$). The effect size $r = 0.37$ indicates a medium effect, implying that 14% of the differences for HR values can be ascribed to the treatment with the HMD. Also results of the U-test propose that differences between the VR ($Mdn = -3.43$) and the PC group ($Mdn = -0.12$) are significant ($U = 710.50$, $p < 0.001$, $z = -3.781$, $r = 0.38$). Lastly, there is a significant difference $t(64) = 6.26$, $p = 0.000$ between the experimental ($M = 20.89$, $SD = 15.18$) and the control group ($M = 5.46$, $SD = 7.63$) regarding the EDA measurement. The effect size of 0.62 represents a large effect, implying that 38% of the variance of the EDA values can be attributed to the HMD application. Results of the U-test again confirm that there are differences between the two groups ($U = 395$, $z = -5.93$, $p < 0.001$, $r = 0.59$) of HMD ($Mdn = 21.95$) and desktop-PC ($Mdn = 3.89$). The assumption that the physiological measure of EDA is higher for the VR group is supported by both the t -Test and U-Test. H1 can therefore be partially accepted as the video representation with a HMD shows greater emotional reactions for the physiological parameters of HR and EDA, but not for the subjective self-report measure.

H2: The 360-degree tourism marketing video representation with a HMD shows greater impact on the decision response scale (product interest and purchase immediacy) than with a desktop-PC

Analysing product interest and purchase immediacy, no significant differences ($\Delta M = -0.11$) between the experimental ($M = 4.01$, $SD = 1.21$) and the control group ($M = 4.12$, $SD = 1.22$), $t(99) = -0.432$, $p = 0.666$, $r = 0.04$ were found, suggesting to reject H2. Results of the U-test test confirm that there are no significant differences between the two viewing conditions ($U = 1164.50$, $z = -0.69$, $p = 0.493$, $r = 0.07$), of HMD ($Mdn = 3.99$) versus desktop-PC ($Mdn = 4.20$).

4.2 Correlation

In order to outline possible relationships between the different parameters and constructs (RQ3), data was further investigated. The constructs of the subjective questionnaire for the experimental group show significant positive relationships among themselves ($p < 0.01$). With a value of $r = 0.70$ the ERS shows a strong correlation with PRI and $r = 0.37$ a weak correlation with PUI. Similar results were obtained for the control group, indicating a strong correlation for ERS and PRI and a weak correlation for ERS and PUI. However, no significant correlations between subjective and physiological parameters are found.

5 Conclusion

Recent VR developments provide opportunities for tourism marketers to communicate with prospective travellers in a new and engaging way. Real-world captured 360-degree footage of destinations can be displayed in fully-immersive VR, enabling prospective travellers to take a sneak peek and transform experiential attributes into searchable attributes. For marketing purposes, it is crucial to understand emotional responses to stimuli, as products or services that are unable to trigger any emotions are not valuable to the brain and the intensity of triggered arousal can indicate the excitement over a given product or service. Subjective and objective measurements can be applied to examine triggered emotions and the level of arousal. Thus, this study is of relevance for both tourism researchers and professionals. The study provides empirical support to literature, suggesting first the importance to understand the consumer's emotional responses and second the role of VR as a tourism marketing tool. Tourism professionals can gain a greater understanding of the underlying challenges and opportunities of applying VR as well as draw conclusions whether to invest in VR or not.

The goal and overall research question of this study was to investigate whether a fully-immersive VR system elicits more intense emotions than a non-immersive system, as so far mainly used in tourism marketing. As indicated by the results, fully-immersive VR clearly has the potential to meet this goal. Nevertheless, it is also shown, that the human perception of stimuli is not as straightforward as it seems.

Physiological measures of HR and EDA increased, but subjective measures were not necessarily correlated. Since most emotional processing happens subconsciously, it can be argued that customer value was created for the experimental group, despite not being immediately perceived by the participants during the subjective measurement. Study participants' reactions during and after the experiment were observed and it can be stated that the statistical data can only partially reflect the expressed excitement for fully-immersive VR. Information gathered from the additional questionnaire section support the observed enthusiasm and the proposition that tourism marketers should invest in VR is given, even though existing interest in VR cannot be necessarily translated into PRI or PUI. More than 80% of participants do believe that VR is the future of tourism marketing and more than 90% would consider VR as a source of travel information. This demonstrates the challenge for tourism marketers, which lies in the exploitation of the excitement for VR and connecting evoked positive emotions to their destinations, touristic products and services, which is a clear aim of marketing campaigns. In conclusion, it can be said that the underlying potentials of VR are supported by this research, as it has been shown that higher levels of arousal can be triggered and secondly, there is a generally widespread acceptance of VR as a tool in tourism marketing.

While this research contributes to the field of literature concerning VR as well as emotions in tourism marketing, it only constitutes a starting point for further research. Tourism researchers as well as practitioners alike could take advantage from further studies. The study is based on a laboratory experiment with graduate and undergraduate students from one university, which means that results can hardly be generalised. Future research should include a wider range of participants to test the generalisability of findings. Moreover, study participants were not in a real-life situation, considering a winter holiday in Canada. Hence, the stimulus might not have been appropriate during the pre-purchase phase and tourism motivation was neglected. Furthermore, also to investigate if VR can be applied to justify higher prices, it is suggested that studies, presenting content that matches interests and desires of prospective travellers, are conducted directly at the point-of-sales. Qualitative studies might reveal more insights behind subjective reactions to VR as a tool in tourism marketing and could be applied to research the effectiveness of VR. If more intense physiological reactions elicited by VR result in higher evaluations of the subjectively experienced emotions and consequently in greater PRI and PUI, it would be highly recommendable to use target group tailored VR content in tourism marketing. Informal statements by study participants support this suggestion, as for some the 360-video increased their desire for skiing. Furthermore, it would be advised to also investigate other constructs, such as attitude towards the ad and brand or influences of destination image and complexities of decision-making, to get a holistic picture. Other relevant theories and concepts, such as the Technology Acceptance Model, flow, or effects on memory could be integrated as well in future studies. As presence is one of the underlying theories of VR, future research should take this concept into account and investigate correlations as well as causalities with triggered emotions and arousal.

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Empirical Study About the PokémonGo Game and Destination Engagement

Chulmo Koo, Kyuwon Choi, Juyeon Ham, and Namho Chung^(✉)

College of Hotel and Tourism Management, Kyung Hee University, Seoul,
South Korea

{helmetgu, qonell22, juyeon.ham, nhchung}@khu.ac.kr

Abstract. This research will take PokemonGo, as a case of a location-based augmented reality (AR) mobile game, and explore the existence of its links to tourism. By illuminating the aspect of AR mobile games which wholly immerse with the real geographic space, the study attempts to categorize the immersion environment into two constructs, reality (offline) and virtual (online). In addition, based on balance theory the study model examines the relationship between destination satisfaction and game play satisfaction. The hypotheses were tested using 228 Korean PokemonGo players who had experience in visiting a location to play the game. The findings show AR immersion can be a combination of two dimensions and game play satisfaction has a positive effect on destination satisfaction. Thus identifying AR mobile game's potentially influence tourism behaviour.

Keywords: Augmented reality (AR) · Mobile game · PokémonGo
Immersion satisfaction · Balance theory

1 Introduction

Last year a software development company Niantic, Inc. and the affiliate of Nintendo, Pokemon Co., in which Nintendo owns a share of 32%, produced “PokemonGo”. By March 2017, Nintendo scored 20 billion JPY (Japanese Yen) worth of profit and the company is preparing more videogame franchises for the mobile app game market. Evidently the mobile app versions of the existing Nintendo games account for the company's revenue boost, exposing them to a mass market of casual game players unlike before (Mochizuki, 2017). Nonetheless, Pokemon Co. is coming up with another mobile game app of the already existing physical Pokemon card game.

The limitless possibilities of mobile app games are getting acknowledged with the addition of Augmented Reality (AR) features in the designing of games. Azuma et al. (2001, p. 34) defines AR as “a system which supplements the reality with virtual (computer-generated) objects that appear to coexist in the same space as the real world”. The characteristics of AR is categorized to be a mix of real and virtual items parallel or coexisting on a reality setting, and being interactive as in real live. Due to the advancement in geo-tracking and computer power, the development of the ‘mobile’ category of AR applications is accelerating (Azuma et al., 2001).

AR mobile games, such as PokémonGo, go by a game design where users (players) engage in actual physical activities to visit specific places in reality, breaking down the barriers of conventional game environment. Owing to the location based gameplay of PokémonGo and an unexpected glitch in the mapping system, Sokcho province in South Korea, experienced a rapid rise in the number of tourists before the game's official release in the country. All transportation to Sokcho and accommodation were fully booked on the weekends and tour buses packed with pokémon trainers rolled into the city which was before a quiet beach getaway. The serendipity of PokémonGo and its effect on the tourism of Sokcho gives perspective into the field of tourism research. Nevertheless, despite the significant relationship between games and tourism, as shown in the Sokcho example, research focusing on this issue is scarce.

Thus, the purpose of this study is to examine the relationship between destination and game experience by applying the PokémonGo case. Moreover, the construct of mixed (physical and digital) environment via AR characteristics are examined. Conclusively leading to whether an AR game with the feature of 'location based and mobile' has the potential of influencing a destination to be perceived as a tour destination.

AR mobile games are leading the trend of evolution with location based services thus, proposing a new spectrum in destination marketing, tourism behaviour, and motives. This study points out that the start of the mobile AR game era does not end after finishing off the boss at the last stage of the game, but rather expands to recreating and nourishing tourism and leisure in the real world.

2 Literature Review

2.1 PokémonGo

PokémonGo is a mobile online game, featuring Location Based Service (LBS) and AR technology. The player, referred to as Pokémon trainer, is given a mission to catch and collect fictional monsters which are characters in the animation 'Pokémon'. The unique game layout, due to AR and LBS, amuses players and encourages them to physically participate in playing the game which creates a vague boundary between the real world and the virtual world.

To catch the 'Pokémon' monsters, players must go to certain locations by foot. At the location the Pokémon would appear on their mobile screens. Depending on the location, certain types of Pokémon would appear more than elsewhere or have a higher distribution of pokéstops, which are item distributing places that exist on AR and overlap real landmarks. Stadiums are another AR site situated on landmarks where players can battle with other player's Pokémon and mark their territory. With regards to the game features, players put emphasis on the location for gaming and information about game play locations are the main topic in gamer communities.

Clark and Clark (2016) describe PokémonGo as 'the first mass market app that fully transcends the virtual, the spatial, the social, and the physical.' Within this context the study seeks to examine the multiple dimensions of AR mobile games from a tourism perspective.

Regarding the unique new paradigm of integrative gaming technology, research on the effects of a mobile AR game, such as PokemonGo, is currently available in the fields of medical science, (cyber) psychology, geography, and education. Yet studies of LBS AR applications in the tourism and leisure field is rare. Existing literature focuses on tour guide AR applications (Chou & ChanLin, 2012; Casella & Coelho, 2013; Han et al., 2013; Aluri, 2017; Chung et al., 2017). Zach and Tussyadiah (2017) examined the effects of PokemonGo on the players from a tourism perspective and found the game affects travel motives.

2.2 Immersion Satisfaction

The development of technology has brought a shift in the gaming industry with augmented reality as one of the major game design changing catalysts. McMahan (2003) spotted the trend of virtual reality in video games and noticed the need to reconsider the concept of immersion that has become more vague and comprehensive. As for many online game players the motivation for playing was found to be due to enjoyment through immersion in the fantasy world provided by the game (Yee, 2006).

The term to define the game player's sensed presence in an AR game environment has not yet been independently established. Therefore in this study, the concept of spatial presence and the extent to perceiving the presence, in other words 'immersion', are derived from prior literature that addresses presence theory (Wirth et al., 2007; Lombard & Ditton, 1997).

In the technical literature field, papers about the application of science in virtual reality employ the term "presence" (McMahan, 2003). Heeter (1992) and Shim et al. (2003) introduce the definition of immersion, presence, or telepresence as the extent of a user's perception of "being there". Immersion satisfaction means the degree to how much the gamer is satisfied with the feeling of immersion. Parallel environments and activities between the virtual and reality world are conditions found to generate immersion or presence for game players (McMahan, 2003).

Drawn up from satisfaction and enjoyment literature, Teng (2010) defines that the needs of immersion satisfaction is different from the needs of overall satisfaction and enjoyment. Teng (2010) constructs a new reference for immersion satisfaction as the user's extent of satisfaction when the need for immersion is accomplished. Therefore, the need for immersion differs within individual users due to subjective standards. For some users a weak presence feeling could still be satisfying while a strong presence feeling is not sufficient enough to be satisfying. Festinger's (1957) cognitive dissonance theory explains the strong tendency of game users identifying oneself in the virtual game environment. Teng (2010) explained this tendency shows in behaviours such as avatar customization. In line with the notion that customizing contributes to immersion, this study examines the physical involvement of the game user in an AR based game set as the customization function.

2.3 Balance Theory

Heider (1958) introduces the balance theory to explain the human tendency to maintain balance between elements. The POX model (Heider, 1946) and ABX model

(Newcomb, 1953) extended to social groups, defines the structural arrangements of balance theory which is supported by the cognitive dissonance theory (Festinger, 1957). To elaborate the POX model, P is the main target to analyze, O is the one in comparison, and X is the third party. Hummon and Doreian (2003) visualized the balance theory model and categorized them into balanced groups and imbalanced groups. In the case of balanced arrangement, the relationships between each element satisfies the balance theory. On the contrary, the imbalanced arrangement scenario elements will encounter dissonance and therefore people will be stressed to alter the negative or positive attitude.

The field of tourism overlaps with many of the theories in consumer behavior studies and balance theory is one of the many. Interestingly, despite the strong likeness there are not many studies in the tourism field applying the theory of balance (Chung et al., 2017). Chung et al. (2017) gives an overview of four researches in relation to balance theory regarding tourism and all are looking into destination concepts (Niininen et al., 2004; Woodside et al., 2007; Hsu et al., 2009; Su et al., 2011). This study will utilize the balance theory to look into the destination concept as well.

Based on the premise of the balance theory, the POX model adequately describes the relationship between immersion and the cognitive and effective components of an AR game environment. Theoretically when the gamer is satisfied with the gaming experience, it will lead to satisfaction of the game site destination as well as immersion in the game environment. Resulting in high satisfaction with the destination that leads to positive immersion in order to avoid dissonance.

If game play satisfaction (P) has a positive relation with immersion (X) and game site destination satisfaction (O); naturally the game site destination satisfaction (O) has a positive relationship with immersion (X).

3 Research Model and Hypotheses Development

Base on the literature mentioned above the empirical model of the research is presented in Fig. 1 and three hypothesis are proposed. This paper pursues to find the composition of immersion in an AR environment as well as the relationship of AR mobile games and a destination from a tourism perspective.

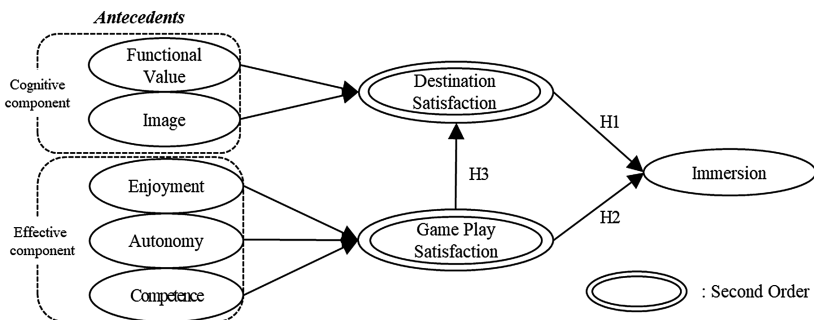


Fig. 1. Empirical model

In order to examine immersion in the concept of AR, attitude theory provides the basis for the model. The study structures immersion satisfaction as a merged concept of both cognitive and affective evaluation, to symbolize the concept of environment is comprised of reality and virtual environment. The meaning of affective is the assessment of environment's emotional quality while cognitive (perceptual) means assesses the environment's physical features (Hanyu, 1993). In other words, cognitive and affective is applied in order to classify the human interpretations that form immersion.

Destination satisfaction, the cognitive component, and game play satisfaction, the affective component, are examined to draw on immersion, the notion of place which integrates reality and virtuality.

Based on the finding that the cognitive component encompasses aspects of tourist destination resources (Stabler, 1995) and place satisfaction is accepted as a significant antecedent of perceiving place dependence and bond which in other words is place attachment (Prayag & Ryan, 2012; Ramkissoon & Mavondo, 2015), the research identifies destination satisfaction as the cognitive component. Image and functional value of a destination consists in order to examine the cognitive component of immersion in the virtual and reality merged environment.

When measuring the subjective satisfaction of game play experience, research in the game industry uses the measurement 'Game play questionnaire (GPQ)'. Online gaming's hedonic characteristic is universal and individuals would invest time and energy to gain enjoyment (Holbrook et al., 1984). Juul (2003) found game players are assigned to emotional attachment of the game and its outcomes. Furthermore, Rauschnabel et al., (2017) studied the motivation for experiencing AR mobile games including hedonic factors. Based on the findings, game play satisfaction is identified as the affective component of immersion which leads to the following two hypotheses:

H1: Destination satisfaction of the PokemonGo game environment will positively affect immersion satisfaction of the PokemonGo game play.

H2: Game play satisfaction of the PokemonGo game will positively affect immersion satisfaction of the PokemonGo game play.

A place can compass multiple meanings because of the diversity of individuals' experiences (Stedman, 2003). Accordingly, meaning is constructed through the actions that can be enabled by the characteristics of the place. In the case of PokemonGo, the virtual characteristic of the game divides the environment into two segments, offline/reality and online/AR. The game play satisfaction is derived from the online environment and destination satisfaction from the offline environment. Klopfer and Squire (2008) found that through playing games and experiencing immersion, tourists establish emotional attachment to the destination. In accordance with the balance theory the remaining hypothesis is the following:

H3: Game play satisfaction will positively affect destination satisfaction.

4 Method and Procedure

4.1 Questionnaire Design

The questionnaire was originally compiled in English and translated into Korean. Each variable is measured on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). The measurement items and operational definitions for each variable are adopted from existing literature (Table 1).

Table 1. Operational definitions of constructs

Variables	Operational definition	References
Enjoyment	The degree to how much players enjoy the game	Kim and Shute (2015)
Autonomy	The player’s perceived degree of freedom or number of choices in the game	
Competence	The degree of player’s feelings being capable of solving problems within the game	
Functional value	The visitor’s perceived value of visiting the destinations (in reality not in AR)	Lee, Yoon, and Lee (2007)
Image	The visitor’s interactive system of cognition toward a visiting destination (in reality not in AR)	Prayag and Ryan (2012)
Immersion	The player’s engagement satisfaction, in reality and virtual, derived from LBS and AR immersing functions of the game	Teng (2010)

4.2 Data Collection

The survey was conducted online via an online research company (EMBRAIN) with PokemonGo gamers in Korea, during the promotion of the PokemonGo’s game update (18–25 September 2017). To validate whether the respondents had PokemonGo game experience, only the surveys that went through the screening questions were used. Thus, out of 962 responses, 228 were used for analysis (Table 2).

Table 2. Demographic information

Demographic variables		N	%	Demographic variables		N	%
Gender	Male	117	51.3	Occupation	Student	64	28.1
	Female	111	48.7		Office worker	91	39.9
Age	10s	12	5.3		Sales and service	12	5.3
	20s	119	52.2		Technician	11	4.8
	30s	67	29.4		Labour worker	1	0.4
	40s	23	10.1		Professional	18	7.9
	50s	5	2.2		Business owner	10	4.4
	60s	2	0.9		Civil servant	3	1.3

(continued)

Table 2. (continued)

Demographic variables		N	%	Demographic variables		N	%
Period of PokemonGo game experience (months)	Less than 1	2	0.9	Frequency of PokemonGo game play (times a month)	Homemaker	11	4.8
	1-4	77	33.8		Other	7	3.1
	5-8	94	41.2		1-3	56	24.6
	9-12	41	18.0		4-8	66	28.9
	13-16	11	4.8		9-16	40	17.5
	17-24	3	1.3		17-25	27	11.8
Most memorable location for PokemonGo game play	Sokcho	46	20.2	Other activities at the destination to play PokemonGo	Only PokemonGo	67	29.4
	Park	46	20.2		Travel	67	29.4
	Region	34	14.9		Daytrip	40	17.5
	Attraction	34	14.9		Eat	20	8.8
	District	33	14.5		Exercise	15	6.6
	Station	12	5.3		Nothing special	6	2.6
	Abroad	12	5.3		Family/friends	5	2.2
	Other	11	4.8		Other	8	3.5
Total		228	100	Total		228	100

4.3 Data Analysis

To determine the relationship between the variables Structural Equation Modeling (SEM) using Smart PLS version 3.0 was conducted. Confirmatory factor analysis (Table 3) shows all factor loadings are higher than the value of 0.7 (Chin, 1998) with the composite reliability values, satisfying the requirements for each construct (Bagozzi, Yi, & Phillips, 1991). Moreover, all AVE values are higher than the recommended value of 0.5 (Hair, Ringle, & Sarstedt, 2011). Discriminant validity (Table 4) are all lower than the square root of the AVE for each construct, showing acceptance (Fornell & Larker, 1981).

Table 3. Analysis of reliability and convergent validity

Variables		Items	Factor loadings	Cronbach's alpha	Composite reliability	AVE
Destination satisfaction	Functional value	VAL1	0.918	0.917	0.947	0.857
		VAL2	0.932			
		VAL3	0.928			
	Image	IMG1	0.897	0.925	0.947	0.816
		IMG2	0.934			
		IMG3	0.881			
		IMG4	0.901			

(continued)

Table 3. (continued)

Variables		Items	Factor loadings	Cronbach's alpha	Composite reliability	AVE
Game play satisfaction	Enjoyment	EN1	0.962	0.923	0.963	0.928
		EN2	0.966			
	Autonomy	AU1	0.847	0.875	0.915	0.728
		AU2	0.851			
		AU3	0.880			
		AU4	0.835			
	Competence	CO1	0.827	0.904	0.933	0.777
		CO2	0.908			
		CO3	0.890			
		CO4	0.899			
Immersion		IMM2	0.859	0.928	0.945	0.776
		IMM3	0.859			
		IMM4	0.896			
		IMM5	0.879			
		IMM6	0.910			

Table 4. Analysis of discriminant validity

Constructs	VAL	IMG	EN	AU	CO	IMM
VAL	0.926					
IMG	0.762	0.903				
EN	0.603	0.568	0.964			
AU	0.598	0.603	0.647	0.853		
CO	0.587	0.577	0.577	0.631	0.882	
IMM	0.684	0.639	0.601	0.661	0.734	0.881

Note: The diagonal elements in **bold** are square roots of the average variance extracted (AVE)

5 Results

The results reveal all three hypotheses are positively supported (Fig. 2). Destination satisfaction (H1: $\beta = 0.288$, $t = 3.868$) and game play satisfaction (H2: $\beta = 0.573$, $t = 8.267$) are found to have high association with immersion, while game play satisfaction shows a stronger connection. Lastly, game play satisfaction shows the strongest positive impact on destination satisfaction (H3: $\beta = 0.722$, $t = 19.687$).

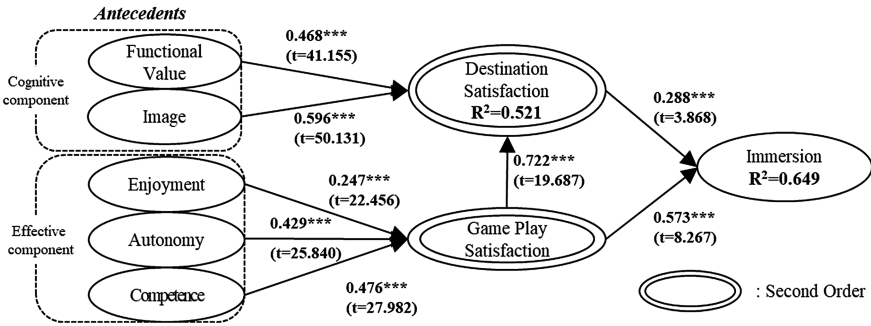


Fig. 2. Structural model results

6 Conclusion

6.1 Discussion

This study is conducted to empirically examine whether the relationship between LBS AR mobile games and destination satisfaction exist. Moreover, the unexpected, irrational, and spontaneous decision of choosing to go to a place, with motives apart from tourism, and eventually recognizing the place as a potential tour destination is the kind of transformation the study aims to bring into questioning. Predicting that the PokemonGo game will give players a new perspective of a place through the AR lenses is the underlying view of the research motives. The notion that consistent daily life weakens the recognition of a place and only through misplace of it does one come to acknowledge the value and meaning of the place (Relph, 1976; Fried, 1963), matches the concept of this study.

Through hypothesis verification, the study found that phenomenon of AR, within the tourism perspective, has the capability of influencing destination satisfaction and alter the sense of presence in a merged environment. This goes in line with the assertion of Ballagas et al. (2008) that serious omnipresent games have the capability to change our life and behaviour while concluding that a game is an effective informative tool for the needs of tourists.

To the author’s knowledge, this empirical study is participating in the pioneer efforts of identifying the dimensions of LBS AR mobile games and its relations with tourism. Due to these circumstances, the conceptualization and measurement of the place comprising the real and the AR world, immersion, was analysed based on the attitude theory. In the context of marketing people put more importance on the perception of reality than the actual reality when it comes to the image of a brand (Dobni & Zinkhan, 1990). Perception of a place or environment can be established in one’s mind even in the absence of the physical environment (Tuan 1977). This leads to speculations whether the existence of a non-physical, virtual environment leads to the perception of an AR inspired spatial presence. Hence, this study aims to contribute to the building of a more robust theory on how space or place is understood and utilized with AR software (Klopfer & Squire, 2008).

Looking into the model of immersion and the cognitive and affective components, the affective component seems to have higher association with immersion than the cognitive. Previous literature identified the emotional connection to a place is stronger than the cognitive knowledge in forming engagement with the environment. Provision in tourism is well known for being experientially-demanding (Bei et al., 2004; Dolnicar, 2005) and with regards to that King (2002) found that in a travel context, more emphasis is put on experiences and emotion than tangible materials and geographical elements such as the destination. Accordingly, the study shows that the spatial presence merged with reality and virtual is more influenced by affective, emotional, and intangible bonds compared to cognitive, objective and physical features.

6.2 Implications

Through this empirical study, using PokemonGo as an example, we expected to determine if an AR mobile game has influence in transforming a destination into a potential tourist destination and widen the perspectives of the use of technology and games in tourism. Xu et al. (2016) contends the game field supplies destination marketers and tourism organizations with a new creative channel for marketing. Middleton (1994) describes both formal and informal communication settings perform stimulus inputs in the decision-making of tourists which confirms that gaming is an effective communication tool. In conclusion, the multifaceted potential of AR mobile games should be taken into consideration for destination and tourism marketing.

Although this research is focusing on one example of AR mobile game, it addresses the need to clarify the understudied association between AR mobile games and destination in the tourism context. Hopefully it should offer an insight to how the development of AR can affect aspects of real life. Likewise, the findings in this study aim to provide researchers a utile empirical structure to stay in touch with the rapid evolution of the technology and game field.

6.3 Limitations

As much as the success of PokemonGo has channelled the attention towards AR and location-based game design, there should not be oblivion towards the strong cultural and brand power of 'Pokemon' franchise itself (Keogh, 2016). Niantic already had a location-based game before called 'Ingress', which is actually the origin on which the geographical database PokemonGo is built on. Why was it not the most downloaded app in history despite the same technical elements? Perhaps this phenomenon of an AR mobile game influencing myriads of people to travel domestically to certain destinations is only the case for PokemonGo. After all it is always the story that sells not the product. Therefore, there should be caution in generalization.

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Part II
**Sharing Economy, Crowdsourcing
and Coopetition**

Behaviour-Based Market Segmentation of Travellers and Their Different Activities at Peer-to-Peer Online Travel Marketplace

Sunghan Ryu¹(✉), Kyungmin Choi², and Daegon Cho²

¹ USC-SJTU Institute of Cultural and Creative Industry, Shanghai Jiao Tong University, Shanghai, China

shryu@sjtu.edu.cn

² College of Business, Korea Advanced Institute of Science and Technology, Daejeon, Korea

{kmc, dgcho}@business.kaist.ac.kr

Abstract. Regarding the growing importance of the peer-to-peer online travel marketplace and lack of understanding on it, this study aims to investigate how different types of travellers use peer-to-peer online travel marketplaces in distinctive ways. Different traveller behaviours are measured using six factors from twenty items. 2467 survey respondents were combined with real transaction data. We identify six idiosyncratic groups of travellers. They are named Shopaholic, Budget Explore, Long-Term Traveller, Trend Setter, Resort Addict, and Social Tripper. Those groups are different in several aspects, such as demographic characteristics. More importantly, the results show their usage of the online tourism marketplace is significantly different. Our study contributes to the literature on traveller segmentation through an exploration of their different usage of online travel services. It also provides practical insights, especially for marketplace operators and travel product providers.

Keywords: Traveller · Segmentation · E-traveller · E-tourism · Peer to peer online travel marketplace

1 Introduction

Advances in Information Technology (IT) have fundamentally reshaped the way of travelling in diverse aspects. As the travel industry is greatly information-driven, the Internet has become an indispensable channel for travellers to seek travel information and purchase tour products (Beldona, Morrison, & O’Leary, 2005). It offers great convenience for potential travellers who either desire to browse for something new to them or who want to retrieve travel related information for upcoming trips. It also provides an attractive marketplace for both travel agencies and travellers. So far, the advantages of online travel services have been revealed as lower cost, ease of comparison, customized service, and ubiquitous accessibility.

Typical online tourism services help travellers to search and arrange trips. Further, the services allow travellers to make reservations for accommodations, transportations, and guided tours. While online services tend to promote transactions of traditional

players in the travel industry, the peer-to-peer (P2P) online travel marketplace is a new type of online travel service connecting travellers and local suppliers such as accommodations (e.g., Airbnb) and tours (e.g., Triip). Although that practice has existed in the past, recent IT innovation (e.g., emerging online and mobile technologies) fosters the advent of online platforms allowing for interactions between travellers and local hosts. The P2P online travel marketplace has dramatically expanded and reshaped the landscape of the tourism industry. For example, Airbnb, the world-leading platform for P2P travel accommodation lending, is now valued \$30 billion. The firm is valued higher than the most valuable travel accommodation companies, such as publicly traded Hilton Worldwide.¹

While there is considerable knowledge established about overall online travel service usage in previous literature [e.g., decision-making procedures and factors affecting travellers satisfaction (Beldona, et al., 2005; Huang & Hsu, 2009)], very limited studies have focused on the P2P online travel marketplace. To discern the nature of the online travellers, different types of travellers need to be investigated in terms of typology. In doing so, the emerging marketplace may benefit from segmenting potential online travellers into groups revealing a unique set of recommended trips for each of them. In line with this aspect, the purpose of this study is to investigate how different types of travellers use the P2P travel marketplace in a distinctive way. For that purpose, we first segment travellers according to their travel behaviour by utilizing survey responses. Then, we combine the segmentation results with real transaction data obtained from an online marketplace. We compare the segments in terms of their usage of the P2P online travel marketplace. A better understanding of traveller segments and their difference will present valuable implications for diverse stakeholders in the travel industry. We collaborate with a South Korean-based tour product marketplace, providing local professionals with opportunities to take a role as a tour guide. Six factors from twenty items measure travellers' different behaviours. Based on 2467 survey respondents combined with real transaction data; we identify six groups of travellers. They are named Shopaholic, Budget Explore, Long-Term Traveller, Trend Setter, Resort Addict, and Social Tripper. Those groups are different in several aspects, such as demographic characteristics. More importantly, the results show their usage of the online marketplace is significantly different.

This study makes several significant contributions. Theoretically, it contributes to the literature on traveller segmentation through the exploration of their different usage of online travel services. Specifically, our study sheds light on the relationship between basic traveller behaviour and online service usage pattern by combining subjective (surveys) and objective (transaction) data. Our study also provides practical insights, especially for marketplace operators and travel product providers. Platform operators should not only chase travellers but also choose the products most suitable to their characteristics. Understanding online traveller characteristics is crucial to satisfy different segments. The proposed typology of travellers in this study can provide a practical aid in this regard.

¹ <https://skift.com/2016/09/23/airbnbs-latest-investment-values-it-as-much-as-hilton-and-hyatt-combined/>.

2 Literature Review

2.1 Traveller Segmentation

A strand of studies segment travellers using different variable sets, either psychographic or non-psychographic. The most frequently explored factor that serves as a determinant for traveller segments is travel motivation (Beh & Bruyere, 2007; Boksberger & Laesser, 2009; Cha, McCleary, & Uysal, 1995; Dey & Sarma, 2010; Kim & Prideaux, 2005). For example, Cha et al. (1995) identify six motivational factors (i.e., relax, knowledge, adventure, travel bragging, family, and sports) and discover three groups consisting of sports seeker, novelty seeker, and family/relax seeker. Using chi-square tests on demographic values, they attempt to describe differences between the traveller segments. Recent studies explore segments in more specific contexts. Boksberger and Laesser (2009) segment the tourists of a senior travel market by travel motivations using the k-means clustering method. Dey and Sarma (2010) classify tourists to emerging tourism destinations.

Other studies cluster travellers using different bases such as travel benefits, behaviours or activities (Eusébio, Carneiro, Kastenholz, & Alvelos, 2017; Mumuni & Mansour, 2014; Pesonen & Tuohino, 2017), and other multiple factors including sociodemographic characteristics (Fan, Zhang, Jenkins, & Tavitiyaman, 2017; Kang, Hsu, & Wolfe, 2003; Mehmetoglu, Hines, Graumann, & Greibrokk, 2010; Shani, Wang, Hutchinson, & Lai, 2010). It is worthy to note that Mehmetoglu et al. (2010) divide travellers into four groups in terms of their traveling behaviour. Interestingly, by investigating the survey participants' personal values, the authors show that the idealistic travellers tend to have stronger hedonistic travel motivations than others. Shani et al. (2010) analyse expenditure patterns of golf tourists in order to derive marketing strategies for attracting and retaining them. The authors also discover that there is no significant link between sociodemographic characteristics and the expenditure pattern, but measures that depict the features of a tour (i.e., golfographic and tripographic measures) are closely associated with it. The results of the study imply that travel-related or domain-specific measures can serve as strong predictive factors for segmenting travellers.

2.2 Online Travel Service and Online Traveller Segmentation

As the retailing context becomes more and more electronic nowadays, a number of e-tourism websites appear where tour information is shared and where tour market-places are established. For instance, it becomes more common that potential travellers acquire key tour-relevant information through major tourism websites like TripAdvisor and Trip.com, and they more and more frequently book their trips (and accommodations) with online market platforms such as Expedia and Airbnb. Researchers attempt to examine online travellers' tour patterns by exploring various tourism websites. Beldona et al. (2005) utilize a correspondence analysis to investigate purchase motives of travel components in an online tourism context. In particular, they reveal one-dimensional associations of transactional and informational features with the frequency of tour product types purchased. Brey et al. (2007) attempt to segment online

tourism website visitors into several groups according to contact-disclosing behaviour in the web environment, and identify three groups called the recurrent, typical, and occasional. In addition, the authors show that there are differences across the three groups in terms of online habits, travel types, and website design preferences: For instance, the recurrent group, who most frequently provide their names/e-mail addresses when visiting websites, spend more hours to search websites for a vacation trip.

3 Conceptual Framework

As reviewed in the previous literature section above, so far traveller segmentation studies have focused on travellers' motivation and behaviour in the offline context. However, to our best knowledge, there is no clear assessment of how different groups of online travellers prefer different traveling types in terms of traveller behaviours. This study fills this gap by proposing a conceptual framework linking traveller behaviours with their actual online service usage patterns using the following mechanism: First, different behaviours of travellers are formed based on their personal characteristics. Depending on personal characteristics individuals may choose to travel in particular ways. For instance, if someone appreciates new experiences, s/he would select a destination with some entertainment features (traveller behaviour). The travel behaviour, affected by her/his characteristics, will certainly determine the usage pattern of online travel services. The conceptual framework of this study is displayed in Fig. 1. Based on the framework, theoretical foundations for each component are developed.

First, we identify traveller behaviour of each traveller for segmentation. The constructs are formulated under the detailed review of a well-structured study (Özdemir & Yolal, 2017; Pizam & Sussmann, 1995). Second, we incorporate these constructs with travellers' actual data of online services used. It includes all transaction-related information such as purchase history. Finally, we also include basic demographic variables (e.g., gender, age) in order to further describe the relationship between traveller characteristics, traveller behaviour, and online service usage.

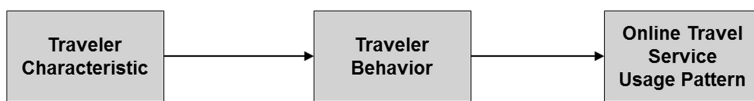


Fig. 1. Conceptual framework of the study

4 Research Method

The study is divided into two parts. In the first part, we segment travellers using a clustering method based on their self-reported traveller behaviour. In the second part of the study, crosstab analysis and analysis of variance (ANOVA) are conducted in order to pinpoint the differences between the segmented clusters with regard to traveling characteristics and usage patterns of online travel services. We conducted a survey to

collect and analyse data on traveller behaviour and motivation. Other empirical data such as transaction data and product-related information were also collected.

4.1 Sample

To collect survey samples for the study, we closely cooperate with a P2P online marketplace in South Korea, which helps local tour guides to connect with potential travellers. The platform is operated as follows. First, local guides design their own itineraries and curate a series of attractions, and then they upload their tour products to the platform. The privately designed tours comprise various forms of trips such as walking around a city, sightseeing, dining well-known food, visiting museums, and so on. The travellers may browse the tour products with detailed guide-written information and traveller-generated reviews, and they can book the tour packages via payment in advance. The revenues are shared between the platform provider and the guides; the same approach other online marketplaces such as Airbnb use.

The survey was conducted with three different channels, from January to February in 2017. First, the questionnaire was sent to about 10% of users who have already experienced one of the guided tours (11,339 users) via app notifications, and we received 342 responses from those. Second, we sent the survey to about 10% of all users (30,709 users), whether they have purchased a tour or not, and they gave us 565 responses. Finally, using e-mail, we sent the questionnaire to all users who signed up with their e-mail address (154,475 users), and we got 1560 additional questionnaires. In sum, we collected 2467 responses. The total response rate is about 1.26%. A mobile coupon is issued upon return of completing the survey. We checked with the platform operator that the gender, age, and funding experience ratios of the respondents resembled those of all registered members, thereby diminishing the potential for nonresponse bias. Table 1 presents the demographic profile of the sample.

4.2 Measurement

The survey questionnaire of the study consists of three main parts: basic demographics, traveller behaviour (i.e., our main interest), and traveller motivations. First and most importantly, we measure traveller behaviour in order to incorporate those items for segmenting online travellers. The questionnaire items are formulated under the detailed review of a well-structured study (Özdemir & Yolal, 2017) that employs the scale developed by Pizam and Sussmann (1995). The scale has twenty items describing behavioural characteristics of travellers doing guided tours. In the questionnaire, the survey participants were asked to rate the importance of each statement in relation to their preference. The behavioural characteristics were measured upon anchored semantic differential scale from 1 to 5. The list of items is presented in Table 2. In addition to the survey results, we collected transaction data from the platform and matched it to the survey respondents. This empirical data includes the type of products they purchased, tour product characteristic, and fellow traveller information. Operational definitions for each variable are provided in Table 3.

Table 1. Demographic profile of the sample

Demographic variables	Frequency	Percent (%)
<i>Gender</i>		
Male	808	32.75
Female	1659	67.25
<i>Age</i>		
Less than 20	20	0.81
20–29	889	36.04
30–39	903	36.60
40–49	501	20.31
50–59	131	5.31
60 and above	23	0.93
<i>Job</i>		
Student	462	18.73
Officer	1338	54.24
Executive	42	1.70
Self-employed	143	5.80
Others	482	19.54
Total	2467	100.00

Table 2. Traveller behaviour items (Özdemir & Yolal, 2017)

Item	5	4	3	2	1
1	Interaction	Interact with other tourists		Keep to themselves	
2	Social	Socialize with other tourists		Avoid socializing	
3	Foreign	Congregate with tourists from other nationalities		Congregate only with tourists from the same nationality	
4	Group	Travel in groups		Travel by themselves	
5	Long	Take long trips		Take short trips	
6	Souvenir	Buy souvenirs		Do not buy souvenirs	
7	Gift	Buy gifts for friends and relatives		Do not buy gifts for friends and relatives	
8	Suspicious	Suspicious of tourist-trade people		Trust tourist-trade people	
9	People	Interested in people		Interested in artifacts	
10	Local	Prefer local foods and drinks		Avoid local foods and drinks	
11	No plan	Visit places in loose and unplanned manner		Plan their tours rigidly	
12	Shop	Shop constantly		Do not shop at all	
13	Bargain	Bargain at shopping		Pay asking price	
14	Experience	Want to see the “real thing”		Satisfied with “staged” attractions/events	
15	Adventure	Adventuresome		Safe	
16	Active	Active		Passive	

(continued)

Table 2. (continued)

Item	5 ——— 4 ——— 3 ——— 2 ——— 1		
17	Novel	Interested in novelty	Interested in familiar things
18	Photo	Take photographs	Do not take photographs
19	Letter	Write letters/postcards	Do not write letters/postcards
20	Knowledge	Knowledgeable about the destination and well prepared	Not knowledgeable about the destination and well unprepared

Table 3. Operational definition of transaction-related variables

Variable	Operational definition
NumPurchase	Total count of products purchased by a traveller
NumPeople	Average number of fellow travellers across all travels
ProdTypeTour	Total count of tour products purchased by a traveller
ProdTypeTicket	Total count of ticket products purchased by a traveller
PurposeSingle	1 if a traveller prefers to travel alone, 0 otherwise
DurationFlex	1 if a traveller prefers flexible schedule, 0 otherwise
TranspWalk	1 if a product's transportation option is walking
TranspCar	1 if a product's transportation option is car
ProdTypeCorp	1 if a product is group tour, 0 otherwise
ProdTypePriv	1 if a product is private guide tour, 0 otherwise

4.3 Analytic Method

A nonhierarchical method (also referred to as K-means clustering) is adopted for clustering analysis. This partitions subjects into a pre-specified number of groups. After initial centre points of clusters are selected, each subject is assigned to the cluster with the closest centre point and the cluster centre points are reallocated. Multiple phases are processed by allowing subjects to change cluster membership based on their distance from new centre points. To reach an optimal solution, the phases continue until no subjects change clusters (Aldenderfer & Blashfield, 1984; Anderberg, 1973). By permitting subjects to switch cluster membership, the nonhierarchical method is less affected by outliers. Even though outliers can initially disfigure clusters, this is mostly corrected in subsequent phases. Consequently, the final solution minimizes within cluster distances and maximizes between cluster distances. In the study, k-means cluster analysis is run to segment travellers according to differences concerning the six factors of travel behaviour.

After that, the validity of the clusters are assessed by multivariate ANOVA with external variables (Milligan, 1980). Such variables should be related to the clusters, but not used for segmenting clusters. The tests can offer confidence in the obtained result because they are avoiding having the researchers propose the subject meaning of the results. In the study, we use cluster membership as the independent variable and characteristics of users and their usage of online services as dependent (i.e., external) variables for performing ANOVA.

5 Results

5.1 Factor Analysis

An exploratory factor analysis was performed on the 20 traveller behaviour items from Özdemir and Yolal (2017). Initial examinations of the inter-item correlation matrix show that there is no item for which all correlations were lower than the common threshold of 0.3. Parallel analysis recommended both five- and six-factor solutions, and the six-factor solution was chosen because the five-factor solution combined two seemingly conceptually distinct factors in a way that led to fairly low factor loadings for one of the factor's items. Moreover, because the goal of the factor analysis was to identify latent structures among the preferences in order to ease interpretation of the subsequent cluster analysis, the creation of more precise factors was preferable. The final six-factor solution was very clean and explained 53.53% of the total variance. All factor loadings easily exceeded the commonly used criterion of 0.4.

The factor analysis results are presented in Table 4. The first factor, Explore, explains a large share of the variance (16.31%), and consisted of six items associated with encountering new and exotic experience. The second factor, Buy, explained 11.77% of the variance and consisted of three items associated with shopping. The third factor, Meet, explained 8.19% of the variance and consists of three items related to socialization. The fourth factor, Long, explained 6.69% of the variance, and consists of two items. The fifth factor, Rest, explained 5.44% of the variance consists of four items reflecting intentions to be eased. Finally, the sixth factor, Deal, explained 5.13% of the variance, and consists of two items associated with bargaining deals.

Table 4. Results of the factor analysis

Factors	Items	Loadings	Eigen value	Variance explained (%)
1 Explore	17. Novel	0.749	3.263	16.31
	16. Active	0.681		
	10. Local	0.580		
	14. Experience	0.569		
	15. Adventure	0.567		
	3. Foreign	0.431		
2 Buy	6. Souvenir	0.810	2.355	11.77
	7. Gift	0.806		
	12. Shop	0.805		
3 Meet	1. Interaction	0.801	1.638	8.19
	4. Group	0.710		
	2. Social	0.610		
4 Long	19. Letter	0.742	1.338	6.69
	5. Long	0.656		

(continued)

Table 4. (continued)

Factors	Items	Loadings	Eigen value	Variance explained (%)
5 Rest	9. People	0.602	1.088	5.44
	11. No Plan	0.593		
	20. Knowledge	-0.553		
	18. Photo	-0.454		
6 Deal	8. Suspicious	0.756	1.025	5.13
	13. Bargain	0.645		
Total				53.53

5.2 Cluster Analysis

A factor-cluster approach has been utilized throughout tourism segmentation research, in which variables are first reduced via factor analysis and then the resulting factor scores are used for the clustering analysis (Beh & Bruyere, 2007; Boksberger & Laesser, 2009; Guttentag, et al., 2017). Cluster centroids were saved for four-, five-, six-, seven-, and eight-cluster solutions, and imported into a k-means analysis for further examination. Subsequently, based on the variance ratio criterion and an examination of factor means for various cluster solutions, a six-cluster solution was selected. Table 5 displays the group means for the selected six-cluster solution.

According to their traveller behaviour, the six clusters were named Shopaholic, Budget Explore, Long-Term Traveller, Trend Setter, Resort Addict, and Social Tripper. The summary information of the statistics reveals the importance of each factor for travellers of each cluster. The results of Duncan multiple range tests indicated that statistically significant differences in terms of all six traveller behaviour factors were found among the six clusters. Significant differences in mean scores (based on a factor coefficient of which the mean value is 0, and the standard deviation is 1) of the motivations were found among all six groups in the six factors. This indicates that all the clusters were different from each other. The highest ratings for the factors relative to each cluster are as follows: Shopaholic (Cluster 1, N = 400) placed the highest value on the Buy (0.570) and Deal (0.542) factors, but the lowest value on the Explore (-0.947) factor. Budget Explorer (Cluster 2, N = 374) recorded the highest on the Explore (0.542) and Deal (0.630) factors, but the lowest value on the Buy (-1.267) and Rest (-0.249) factors. Long-Term Traveller (Cluster 3, N = 441) placed the highest score on the Long (1.347) factor. Trend Setter (Cluster 4, N = 404) scored the highest on the Explore (0.684) and Buy (0.516) factors, but the lowest on the Meet (-0.864) factor. Resort Addict (Cluster 5, N = 355) placed the highest on the Rest (0.768) factor, but are lower than the other clusters in the Explore (-0.868), Buy (-0.803), and Deal (-0.666) factors. Finally, Social Tripper (Cluster 6, N = 493) scored the highest on the Meet (1.021) factor, but the lowest on the Long (-0.688) factor.

5.3 Cluster Profiles

We also conducted ANOVAs to validate the clusters and further examine the differences among the six clusters. With regards to demographics, the segments differed

Table 5. Results of the cluster analysis

Traveller behaviour factor	Traveller type (Total N = 2467)						F-value
	1 (N = 400) Shopaholic	2 (N = 374) Budget explorer	3 (N = 441) Long-term traveller	4 (N = 404) Trend setter	5 (N = 355) Resort addict	6 (N = 493) Social Tripper	
1 Explore	-0.947	0.542	0.102	0.684	-0.866	0.329	325.601*
2 Buy	0.570	-1.267	0.349	0.516	-0.803	0.342	450.545*
3 Meet	-0.516	-0.326	0.365	-0.864	0.036	1.021	347.691*
4 Long	-0.495	-0.204	1.347	-0.046	0.080	-0.668	420.593*
5 Rest	-0.198	-0.249	0.008	-0.042	0.768	-0.177	59.085*
6 Deal	0.542	0.630	0.280	-0.785	-0.666	-0.046	198.322*

* $p < 0.001$

significantly by age and gender. Budget Explorer is the oldest group of travellers and Resort Addict and Shopaholic follows. In terms of gender, Budget Explorer and Social Tripper show a higher portion of male travellers than the other clusters.

We further compared the online travel service usage pattern of each cluster with the matched dataset ($N = 802$). While we cannot find a difference in the number of purchase on the marketplace among the clusters, the results suggest they are considerably different in using the service. Shopaholic prefers tour-type products and tends to have more companions than the others. Social Tripper is most likely to purchase ticket-type of products and group tours provided by traditional travel agencies. Resort Addict tends to have more fellow travellers than the other groups and prefers tour-type products. Long-term traveller tends to travel alone, prefer tour-type products over ticket-type products, and avoid group tours. Trend Setter also prefers to travel alone or with fewer fellow travellers and looks for privately guided tours and walking tours. Budget Explorer likes a flexible tour program while avoiding car travels. Trend Setter wants to travel alone, and thus prefers private tour products. It is expected that the group is interested in walking tours. Those relationships between clusters and purchasing behaviour on the marketplace show that P2P online travel marketplaces should provide different types of values to different segments of travellers. The differences between clusters are summarized in Table 6.

6 Discussion and Conclusions

Based on the twenty items from the previous literature, we constructed six factors (Explore, Buy, Meet, Long, Rest, and Deal) of traveller behaviour. We further analysed these factors by conducting a cluster analysis, which identified six types of travellers. We also examined differences among these six types of travellers and labelled them according to their characteristics. They are Shopaholic, Budget Explore, Long-Term Traveller, Trend Setter, Resort Addict, and Social Tripper.

Theoretically, this study contributes to the traveller segmentation literature through its exploration of different usage of online travel services. Specifically, our study sheds light on the relationship between basic traveller behaviour and online service usage pattern by combining subjective (surveys) and objective (transaction) data. This study also constitutes an important first step in identifying specific traveller behaviours in the context of P2P online tourism marketplace, which has been less highlighted so far. Users of this new type of online services are similar in some ways to traditional travellers, but they differ among themselves in their utilization of the service.

Our study also provides practical insights, especially for marketplace operators and travel product providers. Platform operators should not only chase travellers but also choose the products most suitable to their characteristics. Understanding traveller characteristics is important for satisfying different traveller types. This study's proposed typology of travellers can provide a practical aid in this regard. Given the tremendous growth of online travel marketplaces, this typology can enable platform operators to identify distinct customer segments, thereby helping them to provide customized offerings for those target segments. Potential product providers (tour guides) should take into account that each target traveller type must be chosen based on the characteristics of the product.

Table 6. Results of ANOVA

Variable	Traveller type						Total (N = 802)	F-value
	1 (N = 139)	2 (N = 112)	3 (N = 147)	4 (N = 140)	5 (N = 99)	6 (N = 166)		
Gender ⁺	0.240	0.487	0.259	0.270	0.468	0.286	0.328	22.542 ^{***}
Age ⁺	30.075	33.316	27.982	28.094	30.901	28.174	29.607	20.845 ^{***}
NumPurchase	2.741	3.375	2.810	3.064	3.222	3.120	3.036	0.923
NumPeople	2.420	2.181	2.123	2.093	2.550	2.316	2.270	2.098 [*]
ProdTypeTour	1.108	1.652	1.721	1.586	1.747	0.795	1.394	4.710 ^{***}
ProdTypeTicket	1.288	0.982	0.850	1.279	1.091	1.705	1.225	3.571 ^{**}
PurposeSingle	0.281	0.643	0.571	0.757	0.717	0.151	0.494	2.874 ^{**}
DurationFlex	0.194	0.455	0.163	0.129	0.242	0.151	0.210	2.831 [*]
TranspWalk	0.489	0.955	1.041	1.164	1.121	0.380	0.828	6.339 ^{**}
TranspCar	1.741	1.357	1.429	1.436	1.424	1.910	1.573	2.017 [*]
ProdTypeCorp	2.295	2.607	1.966	2.171	2.586	2.795	2.396	2.034 [*]
ProdTypePriv	0.446	0.768	0.844	0.893	0.636	0.325	0.640	4.271 ^{***}

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$

Note: + collected by the survey

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Exploring the Booking Determinants of the Airbnb Properties: An Example of the Listings of London

Richard TR Qiu¹, Daisy Xuefeng Fan², and Anyu Liu³(✉)

¹ School of Hotel and Tourism Management, The Hong Kong Polytechnic University, Kowloon, Hong Kong

² Department of Tourism and Hospitality, Bournemouth University, Poole, UK

³ School of Hotel and Tourism Management, University of Surrey, Guildford, UK

Abstract. The aim of this paper is to investigate the factors which influence the probability of an Airbnb property being booked using the properties in London as an example. A binomial logistic model is estimated by sequential Bayesian updating due to the large volume of the data. The results show that, in spite of the market factors revealing great influence, the attributes of the properties play a more important role in influencing the booking probability of the properties. These research findings are potentially beneficial to both the Airbnb practitioners and the industrial organizers.

Keywords: Airbnb · Booking determinants · Binomial logistic model
Sequential bayesian updating · Big data · Sharing economy

1 Introduction

As a pioneer and symbol of the sharing economy in the hospitality industry, Airbnb has enjoyed impressive and sustained growth in the last decade. Airbnb is an online community marketplace for renting accommodations from private individuals. Now it lists more than three million properties covering 65 thousand cities in 191 countries (Airbnb, 2017). Benefitting from the sharing economy based business model, Airbnb enables small businesses and entrepreneurs to compete with traditional “brick and mortar” businesses (Morgan & Kuch, 2015; Orsi, 2013). However, due to the exponential expansion, it is more and more challenging for the hosts to stand out and be selected by customers among the numerous competitors on the same platform.

The aim of this paper is to investigate the factors which influence the probability of a property being booked using the Airbnb properties in London as an example. Due to the large sample size, the sequential Bayesian updating approach is introduced to the tourism and hospitality field for the first time. The findings of this study will be valuable and helpful for the current and potential hosts to improve the booking rates and revenue which will be beneficial to the development of the Airbnb industry.

2 Literature Review

2.1 Airbnb: An Emerging Platform of Sharing Economy Based Accommodation

As the rapidly and global expansion of Airbnb, plenty of research, especially since 2014, has been conducted to explore this phenomenon and the mechanism beyond. As a new accommodation rental platform in the market, some studies sought to provide an evaluation of Airbnb. By applying descriptive statistics, Zekanović-Korona and Grzunov (2014) explored the structure of Airbnb users and the advantages and disadvantages of the platform. Similarly, a SWOT analysis was conducted with Airbnb to assess different dimensions of this business model, including the investment and financial strategies, legal issues such as safety and tax, and its impacts on the other accommodation providers (Meleo, Romolini, & De Marco, 2016). Due to the rapid development of Airbnb, its impacts on traditional hotels and online travel agents were identified. In particular, some studies investigated the competitive and substitute roles of Airbnb compared to traditional hotels (Varma, Jukic, Pestek, Shultz, & Nestorov, 2016; Guttentag & Smith, 2017). Choi, Jung, Ryu, Do Kim, and Yoon (2015) found no impact of Airbnb on hotels' revenue performance with Korea as the context. However, Aznar, Sayeras, Rocafort, and Galiana (2017) argued that there was a positive relationship between the presence of Airbnb apartments and hotels' return on equity with Barcelona's hotel sector as the research target. In addition, the spatial patterns of hotels and Airbnb apartments were identified in a city destination (Gutiérrez, García-Palomares, Romanillos, & Salas-Olmedo, 2017). Not limited to the economic and geographical impacts, the social, cultural and environmental impacts brought by Airbnb were also discussed by both academics and the public (Haines, 2016; Gurrán & Phibbs, 2017).

Focusing on the Airbnb platform, some studies were conducted to explore the characteristics of the platform and consumers' behavioral patterns on the platform. It is stated that belongingness and uniqueness are the essences of the Airbnb concept (Liu & Mattila, 2017). On the Airbnb platform, it is argued that being a so called "Superhost" means more reviews, higher ratings, and higher willingness to spend more (Liang, Schuckert, Law, & Chen, 2017). It is also interesting to note that, images uploaded to the Airbnb by the hosts, including the interior decoration of the property (Rahimi, Liu, & Andris, 2016), hosts' personal photos (Ert, Fleischer, & Magen, 2016) and even facial expressions of the hosts (Fagerstrøm, Pawar, Sigurdsson, Foxall, & Yani-de Soriano, 2017) play an important role in determining consumers' booking behaviors on Airbnb. In addition, the determinants of prices on Airbnb are discussed to some extent. Factors such as host attributes, site and property attributes, amenities and services, rental rules, and online review ratings are stated to have a significant relationship with listings' prices on the Airbnb platform (Li, Pan, Yang, & Guo, 2016; Wang & Nicolau, 2017).

2.2 Determinants of Online Booking Intention and Behavior

Among the literature, sufficient studies explored the influencing factors which may affect customers' online booking intention or actual booking behavior. For example, research indicated that, online review comments and previous guests' recommendations

played important roles in customers' decision-making process when booking hotels online (Sparks & Browning, 2011; Tsao, Hsieh, Shih, & Lin, 2015; Ladhari & Michaud, 2015; Zhao, Wang, Guo, & Law, 2015; Yu, Guo, Zhang, & Zhao, 2016). Hotels' ratings (Ladhari & Michaud, 2015; Cezar & Ögüt, 2016) and terms and conditions (Law & Wong, 2010; Chen, Schwartz, & Vargas, 2011) also influence customers' online purchase intention. Wang, Law, Guillet, Hung, and Fong (2015) and Li et al. (2016) argued that the quality of hotel online booking websites can be a predictor of the booking intention. With that basic understanding as a starting point, comparisons were conducted to discover the different preferences or booking patterns of different segments. For example, international and domestic customers were compared regarding their perceptions of the room price, review volume, location, brand, rules and conditions, ranking etc. and their impacts on hotel booking intention (Cezar & Ögüt, 2012, 2016; Liu, Guillet, Xiao, & Law, 2014).

The above review shows that the literature focusing on the determinants of online booking is dominant by the conventional hotels. However, the factors influencing the booking probabilities in the sharing economy are still mystic, but they may be different from the traditional hotels (Gutt & Herrmann, 2015). As argued by Heo (2016), more attention should have been paid to the sharing economy when it has started to play a significant role in the industry. To fill in this gap, the booking determinants of the Airbnb properties in London are investigated by this study using a sequential Bayesian update approach. The methodology and data employed are introduced in the following section.

3 Data and Method

The data used in the current study is drawn from a third-party website, Insideairbnb.com (n.d.), which consists of information that is publicly accessible on Airbnb.com. 31 variables are considered relevant for the current study. The variables considered as influential factors on the booking probability include the number of reviews, the price per person per night, the location of the listing, the neighboring conditions, and some other listing characteristics. London, UK is used as the focus of the current study because it is not only the second largest city in terms of the number of the listings, but also the city with the most up-to-date data at the time of data retrieval (March 2017). The dataset provides 365-day-ahead booking information for all the listings starting from the date of the data retrieval (5 March 2017). The listings which are unavailable for all 365 days are considered unrealistic and removed from the investigation. The listings which have missing values in selected variables are omitted as well. 41,124 listings remain in the dataset after the data cleaning. Although 365-day-ahead booking information is available from the dataset, tourists would start to worry about the likelihood of a sell out or a price raise of the room from 30 days before check-in (Chen & Schwartz, 2008), thus, a 35-days-ahead booking information is selected as the sample of this study. A binomial logistic model is adopted to estimate the effects of various factors on booking behavior. Due to the large volume of data, Bayesian inference is adopted instead of frequentist (classical) inference.

4 Findings and Discussions

The mean value of posterior distribution of the time constant, c_t , captures the time effect on booking probability. Figure 1 shows the trend of the series $\{c_t, c_{t+1}, \dots\}$. As expected, the effect of time on the booking probability decreases over time, with the weekends being significantly higher than the weekdays.

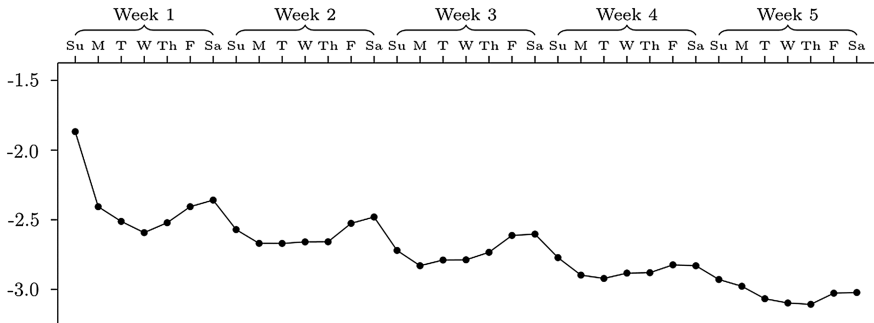


Fig. 1. The mean estimation of the time effect

Table 1 summarizes the posterior distributions of the parameters. The first column provides variable descriptions. The second and third columns are the mean of posterior distributions and the change in odds ratios holding other variables fixed, respectively.

One Pound increase in the price per person per night would decrease the odds of the listings being booked by 1.16%. The change in odds ratio are not very low on the number of neighboring listings and the number of available neighboring listings considering the magnitude of the two variables. The complicated rules may decrease the odds of the property being booked (−8.34%), whereas more detailed introductions about the property by text (in hundred words) and pictures may increase the odds by 5.45 and 20.08%, respectively. Particularly, if the host mentions the space of the property, it would significantly improve the odds by 11.93%. Holding all other factors fixed, being a “Superhost” in London will increase the odds of the listings being booked by 28.5%. Furthermore, the disclosure of a hosts’ profile will improve the odds by 45.58%, the verification of hosts’ identity will increase the odds by 19.64%.

In general, guests prefer large properties with more bedrooms and amenities. In particular, the offer of internet connection and kitchen would increase the odds of the property being booked by 35.29 and 26.76%, respectively. The guests are sensitive about private space while booking Airbnb properties. Shared bedroom is less preferred (−59.63%) while independent bathrooms are favored (21.40%). In the case that the entire property is available, the odds of the property being booked will increase dramatically by 290.84%. Extra charges, such as security deposit, cleaning fees, and the fees for an extra person, will keep guests from booking (−0.02, −0.03, and −0.93%, respectively). In contrast, discounts on weekly or monthly bases or flexible refund policy would be more than welcome (9.37, 8.82, and 5.34%, respectively). If a property

can be booked instantly without contacting the host, its odds of being booked is increased by 33.23%. In the case that guests' identity documents are requested by the host, the odds of the property being booked would decrease by 13.91%. Online reviews are also crucial for guests' decision. One additional piece of review would increase the odds of the property being booked by 0.69%.

Geographical convenience of the properties also plays an important role in attracting guests. The properties that are closer to underground stations or are in the city center are more popular in the market. In the current case of London, being away from an underground station and the city center by 1 km will decrease the odds of the listings being booked by 7.62 and 6.71%, respectively. The "theme" provided by the properties is also influential. In comparison with properties without a "theme", the most popular "theme" is romantic (12.89%) followed by family gathering (10.96%). In contrast, the properties that are set for business or social occasions are less popular (-6.37 and -3.55%, respectively). In terms of the property type, house or townhouse are preferred by guests (9.89%), whereas bed and breakfast are not (-17.35%). Regarding the bed type, in comparison with other types, having pull-out sofas or real beds are considered as a desirable attribute (28.55%) while having merely couches are not (-27.99%).

Table 1. Summary of selected parameters

Description	Mean	Δ Odds (%)
Price per capita	-0.0116	-1.16
Number of neighboring listings	0.0001	0.01
Available neighboring listings	-0.0002	-0.02
Number of characters in rules	-0.0871	-8.34
Property description	0.0530	5.45
Description of space (Dummy)	0.1127	11.93
Number of listing pictures	0.1830	20.08
Super host (Dummy)	0.2511	28.54
Host profile (Dummy)	0.3756	45.58
Host verified ID (Dummy)	0.1793	19.64
Number of bedrooms	0.0147	1.48
Number of amenities	0.0187	1.89
Number of bed per bedroom	-0.0984	-9.37
Bathroom per capita	0.1940	21.40
Internet (Dummy)	0.3023	35.29
Kitchen (Dummy)	0.2371	26.76
Security deposit	-0.0002	-0.02
Cleaning fee	-0.0003	-0.03
Fee for extra person	-0.0094	-0.93
Weekly discount (Dummy)	0.0896	9.37
Monthly discount (Dummy)	0.0846	8.82
Instant reservation (Dummy)	0.2869	33.23

(continued)

Table 1. (continued)

Description	Mean	Δ Odds (%)
Refund (Dummy)	0.0520	5.34
Guest verification required (Dummy)	-0.1497	-13.91
Number of reviews	0.0069	0.69
Distance to the nearest tube station	-0.0792	-7.62
Distance to city center	-0.0694	-6.71
<i>Property function (Group of dummies)</i>		
None	Benchmark	
Romantic	0.1214	12.89
Family	0.1040	10.96
Business	-0.0659	-6.37
Social	-0.0361	-3.55
<i>Property type (Group of dummies)</i>		
Others	Benchmark	
Apartment	0.0175	1.77
House and townhouse	0.0943	9.89
Bed and breakfast	-0.1905	-17.35
<i>Room type (Group of dummies)</i>		
Shared room	Benchmark	
Private room	0.4677	59.63
Entire property	1.3632	290.84
<i>Bed type (Group of dummies)</i>		
Others	Benchmark	
Couch	-0.3284	-27.99
Pull-out sofa/Real bed	0.2512	28.55

5 Conclusion

A binomial logistic model is estimated using the sequential Bayesian updating method in the current study to investigate the determinants of the booking probabilities of Airbnb properties in London. The results show that in addition to the market factors such as the price and the spillover effects of neighboring properties, the attributes of the property play a very important role in influencing the probability of the property being booked. These research findings will be beneficial for the existing and potential Airbnb hosts in their decision-making process. Based on the current situation of the markets and the properties, the hosts can reallocate limited resources from less important factors to more important factors in order to achieve a better booking status. The results of the current study can also be used by other organizations to predict the potential occupancy rate as well as the potential revenue for regulation purposes.

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Tourism, Development and Digital Technologies: Insights from Malaysian Homestays

Siew Wei Gan¹(✉), Alessandro Inversini², and Isabella Rega³

¹ The University of Nottingham Malaysia Campus, Semenyih, Selangor, Malaysia

wendy.gan@nottingham.edu.my

² The University of Reading, Reading, UK

a.inversini@henley.ac.uk

³ Bournemouth University, Poole, UK

irega@bournemouth.ac.uk

Abstract. Rooted in the Sustainable Livelihood Approach, this paper contributes to the current debate on e-tourism for development by analysing the use of ICTs in community-based tourism micro enterprises. Using a qualitative case study approach with semi structured interviews, observations and documentary evidence, this study sheds light on the importance of ICTs in homestays and analyses its impact on the five livelihood assets (i.e. human, natural, financial, physical, social) as perceived by Malaysian homestay managers. Results indicate that there are significant direct and indirect impacts of ICTs on the livelihood assets of the community and open the floor for further research in the field.

Keywords: ET4D · ICTs · Community-based tourism · Sustainable livelihoods

1 Introduction

From a third-world nation struggling to establish tourism as a development strategy after independence in the 1950s, to being one of the top 10 tourist destinations in the world today and the second largest (RM82 billion) (Tourism Malaysia, 2016) revenue generating industry (after manufacturing) (Lo, Songan, & Mohammad, 2013), the tourism landscape in Malaysia has undergone tremendous change in the last 60 years. While earlier developments had focused mainly on urban centres in West Malaysia (Din, 1982), tourism corridors spreading outside urban areas have provided great diversity in the products offered to visitors in recent times.

One of the earliest papers on tourism in Malaysia by Din (1982) over 35 years ago had already mooted the community approach as a strategy for developing rural communities and transforming fisher folks and farmers into part-time entrepreneurs engaged in rural tourism. There are divergent views of the effectiveness of this strategy for community development. Successful initiatives such as those in Bario, Sarawak (Harris, 2009) shows that meaningful engagement with the community and sustainable

endeavours which distributes the benefits among the community were key success factors. The term community-based tourism (CBT) can mean a type of tourist accommodation which allows guests to stay in local homes at a destination (such as ‘bed and breakfasts’ in Europe or ‘unofficial homestays’ in Malaysia) to full board accommodation with in-depth interaction with local culture, language and social structure (Agyeiwaah, Akyeampong, & Amenumey, 2014). Statistics from the Ministry of Tourism and Culture (MOTAC) indicate that in 2015, ‘official’ Homestay operators served over 391,000 tourists, more than 71,000 of them foreign, generating a total revenue exceeding RM28 million. There is no consensus as to the definitive meaning of CBT, but it is accepted that three key elements of community-based tourism (CBT) are: located within a community, owned by members of the community and managed by them (Hall & Richards, 2000).

Recent research highlighted the importance of a correct use of digital technologies by community-based tourism initiatives (Inversini, Rega, Pereira, & Bartholo, 2015). Digital technologies can be seen as a tool to foster promotional practices but also to promote a better organisation within the supply chain with all small firms interconnected in a network of micro businesses (Inversini & Rega, 2016). In this context, the term ICT is defined broadly to cover all available digital ICTs that the community have access to (Heeks & Duncombe, 2005). This is a critical issue for the communities at stake as internet penetration stands at 77.9% in 2016 with mobile broadband providing the necessary infrastructure for rural communities to have access to the internet (28 million mobile broadband subscriptions in 2016 for a population of 31 million—Malaysia Communications and Multimedia Commission, 2016).

2 Literature

Following the pro-poor tourism literature it is clear that in order to truly benefit the poorer communities (who make up the majority of those living in rural areas) growth needs to be located where the poor are mainly employed, in areas such as agriculture, rural businesses and informal sectors (Kakwani and Pernia 2000). Likewise, tourism literature has advocated the inclusion and involvement of local communities as they are seen as a key resource for sustainable tourism development (Din, 1982; Hardy, Beeton, & Pearson, 2002). In fact, tourism can facilitate community development and poverty eradication because it is labour intensive, inclusive of women and an informal sector, and often based on the natural and cultural heritage of the rural communities (Ashley & Roe, 2002). Apart from economic gains, other benefits include skills development, exposure to the world beyond their immediate locality, better access to education, healthcare, clean water and transportation, increased confidence and sense of ownership of the enterprise and the neighbourhood in which the tourism enterprise is situated (Scheyvens, 2007).

While pro-poor tourism may not contribute significantly to the economic development of developing countries on a macro level (Hall, 2007) or solve all the problems of the poor, this paper argues that the study of how tourism can have a significant impact on communities at a *micro* level is worthy of investigation.

In fact the study moves from Akama and Kieti (2007) who stated that the success of tourism should not merely be measured in terms of the increase in arrivals and revenues, but based on *how tourism is integrated with local and national economy and its contribution to the overall development* of the local communities. A bottom-up CBT initiative where local spontaneous participation (Zhao & Ritchie, 2007) comes with full involvement in production, management and marketing, product development in line with local assets and reliance on community networks can induce development for the community (Zapata, Hall, Lindo, & Vanderschaeghe, 2011). In fact, the key to enhancing the welfare of poor communities is not in expanding the size of the tourism sector but in *unlocking the opportunities for the poor* within the industry (Ashley & Roe, 2002). In this way, tourism can be understood as one of the many development strategies and could create synergies with other approaches to enhance community development and poverty alleviation (Zhao & Ritchie, 2007).

2.1 Measurements of Development

In his study on the capability approach Amartya Sen (2001) describes this in terms of human development by considering the capability to achieve valuable function(ing)s (Sen, 2001). Even if these alone do not provide a holistic picture of human development (Alkire, 2007; Blanchflower & Oswald, 2005) the Human Development Index is currently used by the United Nations Development Programme. In tourism literature, Kim, Uysal, and Sirgy (2013) used Quality of Life (QOL) as a measure to evaluate the impact of tourism on the community. QOL has an objective dimension which is external to the individual (income, standard of living, health, recreation etc.) and a subjective dimension which reflects the feelings and perceptions of the individual (life satisfaction, feelings of well-being).

One other key approach which utilises this perspective is the Sustainable Livelihoods (SL) approach which focuses on livelihoods, looking at development as an effort to improve the options of livelihoods of members of the community through a *micro-level* analysis (Duncombe, 2007). A number of sustainable livelihoods frameworks have been developed, all based on Chambers and Conway's (1991) definition of livelihoods which states that "a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes *net benefit* to other livelihoods at the local and global levels and in the short and long term".

The SL framework allows *multiple dimensions* to be dynamically linked, using a *bottom-up* approach (Parkinson & Ramirez, 2006), thus making it a suitable framework for analysing ICT related interventions because ICTs are introduced into an existing complex web of interrelated causality and does not operate in isolation. Tao and Wall (2009) advocate tourism as a livelihood diversification strategy, coming alongside agricultural and other sources of income as poor communities (which are often rural communities) tend to rely on a combination of sources of livelihood including

agriculture, hunting and gathering, fishing, odd jobs, benefits, remittances. For the purpose of analysing the case of e-tourism in Malaysian Homestays, Fig. 1 below depicts the adapted framework (from Carney et al., 1999; Tao & Wall, 2009; Duncombe, 2007) based on the sustainable livelihoods approach.

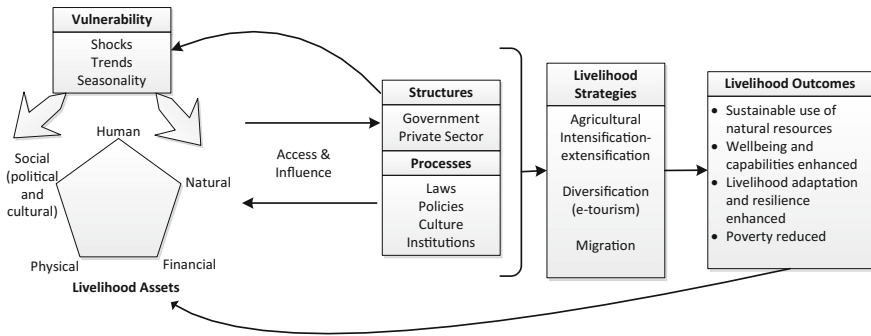


Fig. 1. Sustainable livelihoods approach for CBT

2.2 The Impact of Digital Technologies

Digital technologies, especially the internet, are seen as a democratic tool to change the current post-colonialist perception of tourism in the developing context (Nash, 1989). In fact, CBT firms can use the internet to create a sort of ‘virtual size’ (Spencer, Buhalis, & Moital, 2012) where even micro businesses can promote their offering, receive bookings and eventually manage the value chain of their business (Inversini et al., 2015). However, there is scant research in this field both from a tourism and a development studies (Rega & Inversini, 2016) point of view with academic claiming for a serious and deep understanding of the power of digital technology (if any) to support local socio-economic development (Rega & Inversini, 2016).

3 Research Design

Moving from the SL approach presented in Fig. 1, this research explores the livelihood assets: human, social, physical, natural and financial capital (see pentagon in Fig. 1), the access to which the community can expand to enhance their livelihoods. Livelihood outcomes are the achievements of livelihood strategies (the choices, goals, values and activities designed to secure the optimum quality of life) which may include income increase, improved well-being, reduction of vulnerability, improved security and future livelihood options, and preservation of natural resources.

As part of livelihood strategies, it is argued that digital technologies can have an impact on livelihood outcomes and therefore the following research objectives have been identified:

- to understand the general use and impact of ICTs in homestays;
- to assess the role of ICTs in expanding livelihood assets; and
- to estimate the relevance of digital technologies to support development in given CBT initiatives.

This research combines qualitative case study through (i) formal and informal interviews, (ii) observations, (iii) documentary evidence, and (iv) action research to provide a multi-angled view of the subject. Action research relies on knowledge creation which arises in the context of practice, and requires researchers to interact with practitioners (Bradbury-Huang, 2010).

The aim of the researcher's involvement is not only to collect data for a research project but also to work with practitioners to investigate the problem, understand the scenario and empower the stakeholders to solve these problems. With the aim of engaging with the community and to see scholarship impact real people in their livelihood, the researchers partnered with homestay managers and owners, and were involved in a variety of activities through a series of visits and meetings. Over a period of 18 months, these include discussions, formal and informal interviews, participation in the homestay experience as a guest, brainstorming sessions, preparation of proposals to tourism authorities and establishment of partnerships with the Malaysia Homestay and Kampungstay Association (MKHA).

For the purpose of this research paper, seven semi-structured formal interviews conducted in five homestays with managers and staff are presented. Interview questions were designed around livelihood assets and the impact of digital technologies on these assets. Observations by the researcher are used to reinforce and support the concepts arising, enabling these first-hand stories collected to emerge without the need for an extensive list of indicators which are difficult to catalogue, capture and manage (Stoll, Menou, Camacho, & Khellady, 2002).

3.1 Data Collection and Analysis

Data were analysed using the *directed* content analysis method (Kondracki & Wellman, 2002; Hsieh & Shannon, 2005) which allows for existing frameworks or models to be supported or extended (Richards, 2010). The contents of the interviews and observations were coded into content categories (Weber, 1990) of business functions and ICT use, importance and dimensions of analysis based on the livelihoods framework depicted in Fig. 1 above.

Table 1. Scale of operations and use of ICTs

Features	Homestay 1	Homestay 2	Homestay 3	Homestay 4	Homestay 5
Persons interviewed	1P1; 1P2	2P1; 2P2	3P1	4P1	5P1; 5P2
Number of homes	15 + chalets	15 + 10 chalets	35 (2 villages) + chalets	80 (3 villages)	18
Established	1996	2008	2006	1997	2008
Capacity	180	200	140	200	60
Visitors/year	7000	5000	3000	12000	250
Use of ICTs	Website Facebook Email Phone calls Chat Apps Agoda	Website Facebook Twitter Email Phone calls Chat Apps	Facebook Email Phone calls Chat Apps Agoda Booking Airbnb Tripadvisor	Facebook Email Phone calls Chat Apps	Facebook Email Phone calls Chat Apps

4 Findings

4.1 Use and Impact of ICTs in Homestays

ICTs in the homestays studied are mainly used as functional and operational enablers with a clear focus on sales and marketing, using various platforms as shown in Table 1. E-mail is used for external communication as a *definitive* means of communication and confirmation of reservations. 3P1 states that:

I'm using email in correspondence with all the agents. Also, we communicate with customers through emails and hand-phone. If they want to do any bookings, they must go through emails.

According to 2P2, the Head of IT at Homestay 2,

I have noticed many who came (to the Homestay)... through Facebook as they would say, 'I found out from Facebook'; some also asked through Facebook if they can come for a visit...

From Table 1, one key feature of ICTs is seen in the ubiquitous use of chat applications, the most common of which is WhatsApp. Observations indicate that this is the core communication platform for operations, logistics, planning, administration, and some aspects of communication with external parties, supported by mobile and fixed-line broadband, and smartphones. It is clear that ICTs are crucial to the management and operation of homestays, particularly for communication with external parties and internal co-ordination.

When asked what would be the impact if the internet was not available, all the managers stated that "it will slow down (the business)" [1P1], "*there would be... slow progress*" [2P2], and "*It will be a big problem. I can't imagine doing it without e-mail... cannot continue* (the business)...*we cannot do things professionally*" [3P1].

Therefore, in general terms it is possible to state that ICTs do play a critical role in the day-to-day management and operations of homestays.

4.2 ICTs in the Expansion of Livelihood Assets

The following section analyses how ICTs enabled CBT has impacted the development of the community by using the SL approach in Fig. 1.

4.2.1 Human Assets

Human assets include skills, knowledge, ability to work (including health), and adaptive strategies that enable people to pursue livelihood strategies. The use of ICTs in homestays has enabled the community to expand access to human capital in the form of increased opportunities for education, training in ICT and rejuvenation of skills training in cultural products towards a more conscious use of digital technologies and especially the internet (fixed-line and mobile). In fact, the community have had to learn to use the various technological platforms that are essential to the running of homestays (e.g. Booking, Agoda, AirBnB). As a small-enterprise, homestays sourced web design and web management skills from members of the community. 3P1 said *“for website, the teenagers in the village can do it...”* Describing the skills of his IT manager, 2P1 said that *“[he] learned through experience... not from going for formal courses”*. Further, almost all members of the community, including the elderly, have become proficient in the use of smartphones, in particular, chat applications such as WhatsApp which forms the core platform for internal communication. Describing the ubiquitous use of this application, 3P1 stated that, *“ICT is a must. Firstly,... a smartphone device...secondly... internet... Three years ago, I push them to use a smartphone, if it's possible, for all the houses to have it...because we have chat groups to organise things”*.

Indirectly, due to the success of the business enabled by ICTs, the communities were also able to enhance their access to higher education and skills in hospitality and cultural products. Furthermore, through the experience of running homestays, the communities have developed a visitor-friendly mind-set and experience taught them that *“we must serve the guests with gladness”* [1P1], *“we must serve them with the philosophy that ‘customers are always right, we cannot show our dissatisfaction in front of them”* [3P1]. The *“villagers’ awareness of the need to respect tourists has increased”* [1P1].

4.2.2 Social Assets

Social assets refer to the social arrangements which facilitate livelihood strategies, including norms, networks and governance structure. Through various ICT platforms, the communities have strengthened their social network through their engagement in homestays. During an informal interview session, one villager, 3P2 commented that *“we have chat groups for different functions, and have become like family because we are so close in our interaction, through WhatsApp a lot of the times...”*. The social wellbeing of the community has been enhanced as a result of the community's involvement in tourism and use of ICTs. In one homestay, the plight of an old man living in a dilapidated hut was highlighted on Facebook and within several days,

pledges started to pour in from private individuals, companies and government agencies to fund a project to build a house for this man on land belonging to a villager. This homestay officer was able to use ICTs and his social network to achieve a significant improvement in the wellbeing of the man, showing through his example how empowerment through ICTs can be facilitated as a result of the social networks established through his entrepreneurship. In terms of socio-political assets, the poor are often powerless (Duncombe, 2007) and detached from the mainstream political scenario due to their isolation in rural locations. It was observed that, through the use of ICT, one homestay community was able to access the socio-political networks established through the homestay business to champion causes that affect the community. In this instance, pictures of the beach littered with rubbish were posted on Facebook and tagged to the local council, councillors and local politicians, requesting them to take action to ensure that this issue is resolved so that tourism in the area is not adversely affected. It is noted that within 3 days the beach had been cleared of rubbish because of the direct access to the local government and politicians who took action, facilitated by Facebook and the internet. This is exemplified by 4P1 who, while discussing about the general impact of digital technologies in their business, stated that the homestay business empowered by ICTs impacted villagers in changing them *“mentally, ...and changes in perspectives... now they can view globally... so the mind opens”*.

4.2.3 Physical Assets

Physical assets refer to the infrastructure for the supply of basic needs of the community. The homestay business has brought tremendous improvements to the physical assets of the community. Observations made at all the homestay locations indicate that the villages are extremely well organised, clean and welcoming with good roads leading to these locations compared to other rural areas. The relationship between physical and digital infrastructure development is symbiotic. It is observed that as villages became more accessible, mobile broadband became more prevalent. This in turn drew more visitors as the homestays grew closer to their potential markets through ICTs and visitors chose to return to these locations as they can enjoy the rural environment while still connected to the rest of the world via the internet. As WhatsApp forms the platform of practically all internal communication, each member of the homestay community had to purchase a smartphone in order to participate in the business. As stated by 3P1, *“we created a WhatsApp group for ...homestay, and I encourage them to get a smartphone because we have chat groups to organise things”*. Other physical assets also increased as a result of the business. Evidence from the interviews and observations indicate a significant enhancement of the physical assets, including ICT assets, as a result of the community’s involvement in homestays.

4.2.4 Natural Assets

Natural assets are naturally occurring resources such as land, water, wildlife, and climatic conditions. The homestays are located in areas of large scale agricultural activities. This allows them to tap into the natural assets of suitable climatic conditions to grow crops, which in many cases become elements of attraction for tourists. Homestay 3, 4 and 5 are located in oil palm and rubber plantations, Homestay 3 has paddy fields and Homestay 1 is next to fishing villages. An example of how ICT were

used to enhance access to natural assets is seen where members of the community in Homestay 3 were able to harness the power of ICTs to put pressure on the local council to clean up the beach near their village. Greater access to the internet also allowed the homestay communities to educate themselves on environmental conservation, as these are pre-requisites for tourism to flourish. 5P1 stated that *“now they are much more organised and cleaner; lanes are well kept so the entrance passages to the village are not dirty...”*. According to 3P1, *“the villagers’ objective... to make our village cleaner, and a more organised community”*. This is reiterated in the “Beach Rescue” programme, documented on the Facebook page of one of the homestays, where tourists help to clean up the beach as part of their “voluntourism programme”. The community’s natural assets are harnessed for their livelihood, and enhanced because of their access to technology in tourism.

4.2.5 Financial Assets

For rural households, microenterprise is often a supplementary activity as the household income is derived from a spectrum of traditional sources (Duncombe 2007)—crops sale, employment, social benefits, odd jobs and remittances from relatives in urban areas. In this study, it is noted that ICT enabled tourism to become a livelihood diversification strategy (Tao & Wall, 2009) that exists alongside and enhances traditional livelihood strategies (such as farming, small business, cash crops plantations, employment and remittances) of the community. For instance, 2P2, a homestay accommodation provider, is a paddy farmer for parts of the year, and used to do ‘other work’ when it is not harvest season before turning to tourism as his second source of income (by allowing tourists to stay in houses beside the paddy fields). By switching to homestay business, he managed to double his yearly income. When explaining the financial and economic impact of the business, 1P1 stated that, *“for homestay operators, additional income of around RM1000/month...If it is the centre like this place, with catering, more than RM50000/year. The business (local factory which is a strategic partner of the homestay) the income is more than RM1 million a year. The increase from tourism would be quite a lot. This does improve the living standards of the villagers.”*

It is clear from the interviews that ICTs and digital technologies were one of the drivers of the evolution of the financial assets of the community. The operational aspects of the hospitality in the homestays are managed through the internet and social media; homestay owners learnt quickly how to engage in social media to gain visibility. As stated by 2P2: *“the financial aspect for this method (emails, Facebook) is also relatively cheaper”*. With the use of ICTs, homestays created their virtual size and developed an effective and reasonable way to talk to their target audience.

5 Conclusions

This study has found that Homestays in Malaysia are consciously using ICTs and the internet to develop their communities. At an operational level, it is possible to argue that this research confirms the findings of the study done in Rocinha (BR) by Inversini and colleagues (2015): Digital technologies are essential to manage and market

community-based tourism microbusinesses which, eventually can develop a strong digital presence.

Moreover, this research expands previous work on the sustainable livelihoods approach (Carney et al., 1999; Tao & Wall, 2009 and Duncombe, 2007) by investigating the impact of technologies on the five livelihood assets (Fig. 1), using e-tourism as a livelihood diversification strategy. This exploratory study found that the use of digital technologies has had a direct and indirect impact on each and every livelihood asset by (i) enhancing the training possibility of the human assets, (ii) expanding the community's internal and external network, (iii) enhancing the communities' physical assets (such as mobile phones to be involved in the homestay management), (iv) engaging public opinion on natural/environmental discourse and (v) supporting cost-effective promotion and management.

One other interesting—and to some extent unexpected—finding is related to the nature of the technology in use within the community. In fact, interviewees mentioned several times the use of a leisure digital message technology such as WhatsApp as a key tool to manage and effectively run the homestays.

Future research will therefore focus mainly on two crucial aspects: (i) the actual nature and contribution of ICT influence on the livelihood assets with a focus on the transformative power of ICTs in this context and (ii) the nature and the ever changing purposes of the digital tools used to effectively run microbusinesses in rural and developing economies.

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Crowdsourcing Social Innovation in Tourism: Insights on Platform Design

Thomas Kohler¹(✉) and Lea Rutzler²

¹ Hawaii Pacific University, Honolulu, USA
tkohler@hpu.edu

² University of Innsbruck, Innsbruck, Austria
hello@travel2change.org

Abstract. Crowdsourcing strategies that harness the collective energy and creativity of large numbers of contributors are useful to create social innovation. While the number of crowdsourcing social innovation platforms is increasing, many fail to engage a critical mass of users who are both willing and capable to participate in value co-creation. To address this shortcoming, a 6-year action research project was conducted to study the design of crowdsourcing platforms for social innovation in the tourism industry. In two action research cycles involving numerous data collection strategies and interventions, a crowdsourcing platform called travel2change was created, deployed, evaluated, and improved. The study reveals a set of design principles for crowdsourcing social innovation platforms and enriches research on crowdsourcing to fit the social innovation context. Practitioners receive helpful insights to leverage crowdsourcing for social innovation.

Keywords: Sustainable tourism · Crowdsourcing · Platforms · Co-creation
Open innovation · Social innovation

1 Introduction

Tourism destinations are frequently challenged with a range of messy, interdependent, complicated issues. Local communities in tourism destinations struggle with social, political, economic and environmental problems. For instance, tourism challenges the cultural authenticity of locals (Brunet et al. 2001), fails to generate income for local businesses (Akama and Kieti 2007) and puts pressure on natural resources (Butler 1991). To tackle these issues, we need social innovation. Social innovation are novel solutions to social problems for which the value created accrues primarily to society (Phills et al., 2008). As the internet is dissolving the boundaries of creators and beneficiaries of social innovation, new ways to create social innovation are emerging.

The shift towards open strategy (Chesbrough and Appleyard, 2007) has led to the emergence of crowdsourcing platforms that enable organizations to harness the collective energy and creativity of large numbers of contributors (Boudreau and Lakhani, 2009; Howe, 2006). While organizations increasingly employ crowdsourcing platforms for successful commercial innovations, recent examples indicate the potential of crowdsourcing to create social innovation (Chalmers, 2012; Chesbrough, 2012).

Like platforms for product or service innovation, several social innovation platforms are stillborn or fail to get a critical mass of users to participate. The crux for any successful platform is to attract a crowd that is both willing and capable to engage in value creation. Crowdsourcing organizers need to provide the appropriate structure and incentives to architecture active participation. One of the key questions for crowdsourcing strategies is hence how to design platforms that leverage the crowd's creativity and knowledge. Research by Lakhani and Boudreau (2009, 2013) suggests that there are two main ways to tap into external innovators: Collaborative communities and open markets. Collaborative communities are useful when an innovation problem involves cumulative knowledge and continually building on past advances. Communities are more oriented toward intrinsic motivation whereas markets tend to reward extrinsic motivation such as through financial compensation. Open markets are effective when an innovation problem is best solved by broad experimentation. The design choice of whether to build a collaborative community or a competitive market is not obvious and context specific (Boudreau and Lakhani, 2009). Many business leaders are still struggling to design effective platforms (Parker et al., 2016). While research has mainly been concerned with the application of open innovation to the commercial domain of creating new products and solutions for customers, this research is aimed to enhance our knowledge about how to design platforms that generate social innovation for the tourism context. To tackle this task, we embarked on an action research study that develops design principles for crowdsourcing social innovation platforms. We developed the crowdsourcing platform travel2change, during 6 years and consisted of two main action research cycles involving numerous data collection strategies and interventions with the following phases: diagnosing, action planning, action taking, evaluating, and specifying learning (Susman and Evered, 1978b). While the first iteration of travel2change was set up as a collaborative community, the second version represents a competitive market. We first offer a conceptual overview on how crowdsourcing plays a role in envisioning and empowering solutions to social problems. Next, we discuss the effective design of crowdsourcing platforms. The empiric section sheds light on the process of building the crowdsourcing system and reveals guidelines for the design of crowdsourcing social innovation platforms that benefit local communities in travel destinations.

2 Crowdsourcing Social Innovation

According to Phills et al. (2008, p. 36) social innovation is “a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals.” Contrasting social innovation with business innovation highlights a number of *challenges of creating social innovation*. First, social innovations tend to emerge from environments with constrained resources (Datta, 2011). Lack of financial means hinders growth and long-term engagement of the organization (Hubert, 2011). Unlike product innovations, which depend mainly on money, social innovations also need other resources including political recognition and support, or philanthropic commitment (Mulgan et al., 2007). This leads to the second problem of governance and

coordination when dealing with social innovations (Hubert, 2011). As social innovation occurs at the boundaries between organizations and sectors, complexity is one of the main barriers to social innovation. In order for social innovation to work, nations and actors in all sectors must collaborate. While policymakers realized the need to act (Murray et al., 2010; Hubert, 2011), a lack of coordination and networks for social innovators is a main barrier (Pulford, 2010). Another problem is measuring the success of social innovation. Business innovations aimed to raise profits can be expressed numerically while the impact of social innovation is difficult to evaluate (Pol and Ville, 2009). As a consequence, investors avoid risky projects with the potential to create disruptive innovations, and tend to invest in lower-risk, incremental innovations (Chalmers, 2012). Business innovations on the contrary constitute interesting opportunities for investors independent from their risk: Venturesome lenders prefer high-risk investments because of the potential high earnings, whereas traditional investors favor low-risk but secure assets. The challenges call for new approaches for generating social innovation.

Information and communication technologies (ICTs) provide the opportunity for individuals and organizations to engage in innovation activities (Di Gangi and Wasko, 2009). In this open innovation process (Chesbrough, 2003), users are empowered to co-create value (Prahalad and Ramaswamy, 2004). Crowdsourcing is one approach where a great number of users collaborate to innovate and co-create value (Surowiecki, 2004; Howe, 2006). The innovative power of networks ranges from the development of open source software (Lakhani and von Hippel, 2003; Pitt et al., 2006) to digital products like Wikipedia and even physical products such as t-shirts from the Threadless community (Lakhani and Panetta, 2007). Inspired by its success, organizations have started to explore the *promises of crowdsourcing to create social innovation*. Chalmers (2012, p. 29) links open innovation to social innovation and characterizes open social innovation by (1) a porous organizational structure (2) committed investment in developing absorptive capacity (3) the involvement of multiple stakeholders—including the user, and (4) a systematic focus on reducing the risk involved with innovation through broad knowledge sourcing activities. We understand crowdsourcing social innovation as the process that involves outsourcing social innovation tasks to a distributed group of people. Crowdsourcing social innovation promises to tap user innovation (von Hippel, 2001), to facilitate external search for innovation outside the organization (Jeppesen and Lakhani, 2010) and to allow organizations to collaborate with a distributed network. These potential benefits could be transformational for tourism. While the importance of collaboration has been widely emphasized (Jamal & Getz, 1995; Selin & Chavez, 1995; Bramwell & Sharman, 1999), there is a lack of understanding about alternative partnership and collaboration models (Ring & Van de Ven, 1994; Selin & Chavez, 1995).

The crux for a successful social innovation platform is to attract a crowd that is willing and capable to engage in the innovation task. Many are stillborn or fail to get a critical mass of users to participate. How can organizations design platforms to effectively leverage the crowd's creativity and knowledge? Research by Lakhani and Boudreau (2009, 2013) contributes to knowledge base upon with this research builds. They suggest collaborative communities and competitive markets as the two main ways

to tap into external innovators: The choice depends on the following three critical issues:

Type of innovation: *Collaborative communities* have inherent advantages if the innovation problem involves cumulative knowledge and continually building on past advances. They are geared toward solutions that depend on integrating skills, knowledge and technologies that transcend an individual contributor's purview. They have knowledge-sharing and dissemination mechanisms designed into them and converge on common norms with a culture of sharing and cooperation. *Competitive markets* have advantages if the innovation problem is best solved by broad experimentation across a set of technical approaches or customer groups. They encourage experimentation, foster diversity and spur regular "creative destruction". Innovators take actions to maintain their proprietary interests, engage in their own work and benefit as individuals.

Motivation: Understanding why people join and contribute to crowdsourcing is key to drive the participation of a crowd. Crowdsourcing organizers need to provide the appropriate mechanisms and incentives to cater to the motives that activate users to participate in crowdsourcing. Motivations are heterogeneous and can be categorized as *intrinsic* or *extrinsic*. Markets tend to favour extrinsic motivations and communities are more oriented toward intrinsic motivation. The choice between a competitive market and a collaborative community will affect the types of external innovators and their level of effort and investment they devote to the innovation process.

Platform business model: Categorizing by who-sells-to- whom, there are three types of business models: In the *integrator platform* model, the platform takes contributions from the crowd of external innovators and sells them to consumers. With the *product platform* model, external innovators build on top of a technology or a basic product and then sell the resulting products to customers. On *two-sided platforms*, external innovators and customers interact directly.

The design choice of whether to build a collaborative community or a competitive market is not obvious and context specific (Boudreau and Lakhani, 2009). Many business leaders are still struggling to design effective platforms (Parker et al., 2016). While the bulk of research has focused on the corporate perspective of how to involve users in crowdsourcing, little is known about how to design crowdsourcing platforms for social innovation.

3 Method

To develop and test design principles for crowdsourcing social innovation we selected *action research* as our mode of inquiry. Action research is especially adequate for the development of system design principles (Lindgren et al., 2004). It is a collaborative, rigorous, iterative process that goes through several phases in several cycles (Davison et al., 2004; Baskerville and Wood-Harper, 1998; Iversen, 2004). We conducted a 6-year action research study consisting of two main cycles with the following phases: diagnosing, action planning, action taking, evaluating, and specifying learning

(Susman and Evered, 1978a; Baskerville and Wood-Harper, 1996). The online platform travel2change provides our *research context*. The idea for travel2change (t2c) emerged from one of the author's personal travel experiences. After realizing that his travel activities did not benefit the places and people visited as well as the rapid development of mass tourism in this destination, t2c was launched in 2011. Leveraging crowdsourcing the online platform connects travelers with local communities to create a positive impact. The social innovations emerging from t2c are travel experiences that benefit local communities in tourism destinations. Over the past six years the platform evolved from a collaborative community to a competitive market.

4 First Action Research Cycle—Collaborative Community

4.1 Diagnosing

To identify design principles for crowdsourcing social innovation, the first action research cycle started with an investigation of existing crowdsourcing social innovation platforms. Eight projects were closely monitored and discussed with platform leaders ($n = 10$). Most platforms struggled to attract sustained engagement. They attracted limited interest from contributors and therefore failed to build vibrant sources of social innovation. This raised the pivotal question of how to design an effective social innovation platform. To gain an initial understanding of this question, we conducted workshops with potential t2c participants, the first contest sponsor and the platform development partner. We received valuable insight into the requirements of crowdsourcing social innovation platforms. The results enriched our understanding of the requirements of a crowdsourcing platform for social innovation and we came to realize that Boudreau and Lakhani's work provided the most instructive theoretical foundation. We formulated the following working hypothesis:

- *Innovation type*: Cumulative knowledge required to create social travel innovations; Cold start problem of limited users and content can be resolved by running a crowdsourcing contest
- *Motivation*: Participants are attracted through altruism, the creative challenge and support to realize idea
- *Business model*: Integrator platform allows travel2change to convert crowd ideas into trips sold to consumers.

4.2 Action Planning

Informed by the theoretical foundation and the initial qualitative studies, we teamed up with a developer (Hyve, an innovation agency) and a travel partner (Kuoni, a travel company active in sustainable tourism) to build the first iteration. The contest issued an open call for ideas for trips that create a positive impact for local communities around the theme of water. Contests awarded the best ideas with travel support to realize wining projects. The design of the collaborative community platform considered the design principles from literature:

- Facilitate and encourage knowledge exchange and interactions among members
- Nurture culture of sharing and cooperation for productive collaboration
- Engender a sense of affiliation and communicate larger cause.

4.3 Action Taking

The platform was launched with an initial contest in 2011. In the first year, the t2c crowdsourcing platform collected 60 ideas about water from which four projects in Kenya, Sri Lanka, Brazil, and Peru were realized. Between 2012 and 2014, the t2c community participated in four more challenges, submitting more than 400 ideas and realizing projects in 10 different countries.

4.4 Evaluation

The evaluation of the first cycle focused on the individuals participating in the crowdsourcing system. The group of researchers observed online participation behaviour and joined the prize winner on the first trip. We interviewed participants who were actively involved in the crowdsourcing process. Data were analysed using the open coding techniques typical of a grounded theory approach (Strauss and Corbin, 1990). To directly compare a collaborative and a competitive approach we set up one contest as an experiment (n = 110). Workshops with the platform sponsor, the t2c team and community members complemented the data.

The results are organized as they apply to the three critical issues managers should take into account when deciding between communities versus markets: (1) the type of innovation (2) motivations of participants and (3) the platform business model suggested by Boudreau and Lakhani. Our intent is to capture the richness and complexity inherent in designing crowdsourcing platforms. Despite this contextual presentation, we hold that the generated principles are applicable to the social crowdsourcing platform design in general.

With regards to the *innovation type*, the intent to build a collaborative community that accumulates knowledge, builds on past advances and cooperation, was not accomplished. The ideas for trips were too vague and required substantial integration efforts from the platform leader. Based on our experience with the first research cycle, we propose two design principles.

Simplify value unit: In essence, crowdsourcing platforms connect creators and consumers around the value unit. The value unit represents the outcome created on the platform. Crowdsourcing platforms need to prove that they can produce the value unit in a more efficient, effective, reliable, personal, or faster way. The value unit for the first version of t2c was volunteer trips. The goal was to leverage crowdsourcing to create more and better trips. However, we quickly realized that the submitted trip ideas were too vague, not ready for realization, not grounded on the local problems, together with the travel partner, t2c had to invest substantial effort to curate the ideas. As the platform incrementally has changed during the first action research cycle, so has the vocabulary around it. Every iteration simplified the travel experience, starting with trips, to projects and experiences. The current value unit is activities.

Focus on core interaction: The value unit results from the core interaction (Parker et al., 2016). The core interaction is the key activity the platform actors perform repeatedly to create value. The core interaction consists of three actions: creation, curation, and consumption. They are divided among the platform actors of the company, creators, and consumers. In t2c's case, the creators are hosts of travel experiences and consumers are travelers who join the experiences. T2c relied on a travel partner to curate the trip ideas into actual trips. The interaction between t2c and the travel partner created too much friction and diverted resources. We lacked clarity on what our core interaction was that will produce the value unit.

Considering the *motivation*, the contests were effective in attracting interest from travelers and local communities who created ideas. However, we learned that the platform suffered from limited engagement beyond the idea challenges. Contests were effective to attract initial interest and to create ideas, but the platform suffered from limited engagement beyond the contests. The following design principles informed the second iteration.

Segment crowd: The contests were built around an open call and everyone was invited to participate. This turned out to be challenging. While travelers had good ideas, social innovations need to be grounded in local expertise to be effective and sustainable. We recognized that local organizations have the necessary expertise, local knowledge, and infrastructure to develop superior trips that properly address local sustainability issues, not travelers who are considered consumers on the platform. The other lesson with regards to the different roles is that crowdsourcing platforms only function if there is consumption. Consumption takes many forms: from paying attention to content, to buying products or services created by the crowd. Thriving platforms have enough consumers to make it worthwhile for creators to create. A lack of consumers discourages creators, and the platform will collapse. In order for crowdsourcing platforms to thrive, both sides of the platform need to grow proportionally. This turned out to be particularly challenging for t2c because two types of consumers were required: Users who pay attention to the trip ideas and users who book the actual trips. Neither one reached critical mass to inspire more creation.

Purpose trumps incentives: A major reason for the lack of sustained user engagement, was that idea challenge winners may have participated only once because of the prize incentive. Those who did not win left the platform and t2c failed to build a thriving community. After the first contest, we concluded that we might not have been able to build our community, because of a lack of social features. The second version of the t2c platform was much more interactive and enhanced with community features such as activity feeds and user profiles. However, it turned out that crowd members were not interested to merely interact for the sake of interacting, but they wanted to come together around a shared purpose. T2c failed to rally the community around a clear purpose. The crowdsourcing process was too complicated and the community growth was hampered by a lack of clear purpose.

The *business model* of the first iteration of t2c was built as an integrator platform model that leveraged crowdsourcing to source ideas for trips creating positive impacts for local communities. The community and the contest sponsor selected the winning submission and the best ideas were realized as prototypes. The goal was to make

successful trips available for booking to more travelers who are consumers on the platform.

Ensure value capture: The core interaction shapes the type of business model (Boudreau and Lakhani, 2009). T2c failed to generate the potential for a revenue stream because the building blocks for an effective platform, such as the creation of the value unit, proven platform actors and an effective core interaction were not in place. Regardless of the non-profit nature of t2c, the platform needs to generate revenue to facilitate more and better interactions that create a positive impact through traveling.

4.5 Specifying Learning

The first research cycle improved our knowledge about requirements of crowdsourcing social innovation platforms and we propose a number of design principles. The theoretical framework proved useful in guiding our design and provided us with a valuable initial understanding of general issues of crowdsourcing. However, our evaluation of the first two interventions revealed a number of barriers that hampered the effectiveness of crowdsourcing. We thus concluded that we needed a more effective platform to generate social innovation, improve the participation experience and promote more active participation. Therefore, we embarked on a second action research cycle.

5 Second Action Research Cycle—Competitive Market

In our second action research cycle, we sought to empirically test the lessons learned by considering them in a second iteration of t2c which we launched in April 2015. T2c pivoted from the initial integrator platform to a two-sided platform in 2015 to connect travelers and local communities directly. The value unit changed from volunteering trips to short-term activities with positive impacts. Each activity listing provides information to travelers on times, venues, level of effort, cost, and accessibility. Furthermore, t2c enables partners to decide whether their activities are free, donation-based, or fee-based, considering the variety of activity combinations. Instead of trying to launch this effort worldwide simultaneously, t2c decided to focus on Hawaii as one destination to achieve critical mass before scaling to other tourism destinations.

5.1 Diagnosing

We participated in travel activities offered by potential hosts (600 h), conducted interviews with hosts (n = 15) and three workshops. We formulated the following working hypothesis:

- Innovation type: Activities are easier to create than trips; Diverse activities attract travelers to join; Chicken-Egg problem can be resolved by seeding initial content
- Motivation: Travelers seek to personally benefit from fun activity; Hosts seek to acquire resources to create more impact
- Business model: Two-sided platform allows travel2change to charge a commission on paid activities.

5.2 Action Planning

The collaborative community platform was turned into a competitive market considering the design principles identified in literature:

- Foster diversity and broad experimentation
- Implement formal and competitive mechanisms
- Ensure direct flow of income to external innovators.

5.3 Action Taking

Guided by our diagnosis, we set out to develop further design principles that would improve the effectiveness of the crowdsourcing platform. The mission of the platform remained the same, but we adapted the design to the lessons learned in the first cycle. The learnings from cycle 1 were implemented in the second prototype. In 2015 the two-sided marketplace was launched. Hosts list travel activities and travelers can book these activities. A range of travel activities are listed. Host can choose to offer the activity for free, ask for donations or charge for them. Payment flows directly to hosts.

5.4 Evaluation

We spent hundreds of hours observing and interacting with hosts and travelers. Since the relaunch in 2015 the platform connected 1700 travelers to hosts around activities that create a positive impact. In the summer of 2016, we interviewed 13 current hosts. Based on the results, we suggest additional design principles. The first two design principles address the *innovation type*, the next the *motivation* and the final one refers to the *business model*.

Curate value unit by enabling creators: Early in the second cycle we learned that both non-profit organizations as well as tour operators can be hosts of t2c activities. While tour operators excelled at providing a compelling experience through welcoming travelers, telling stories, providing for or refreshments or leaving travelers with a memorable gift. non-profits were experts in the social or environmental cause. We wanted t2c activities to be the sweet spot where fun meets impact. This required supporting tour operators to add an impact component to their fun activity and guiding non-profits to add fun to their impactful endeavour. The most popular activities include: yoga sessions combined with beach clean-ups, canoeing while learning about Hawaiian culture and hikes with tree planting. To enhance the quality of the value unit, we conducted workshop that helped hosts to improve their activity and offered additional services such as professional photography and editing of the listing descriptions.

Remove friction from core interaction: Crowds need to be challenged by the co-creation task, not by technical or organizational hurdles. They need transparent procedures for participating in value creation, including guidelines for creating products or designs, clear evaluation criteria, and a reasonable selection process of the value unit. T2c struggled with technical problems that emerged from directly connecting

travelers and hosts. For instance, the booking notifications that hosts receive did not include the contact information of those who signed up, which was particularly problematic when changes to the activity had to occur. During the activity missing information resulted in interaction failures, where travelers did not find the hosts, got lost or did not have a rewarding experience. T2c evolve the value creation process for hosts to minimize the barriers to creation and enhanced the usability of the steps involved in creating the value unit with the second version of the marketplace model.

Initiate supply to stimulate desired interactions: T2c struggled with the chicken-egg problem most marketplaces are confronted with (Hagiu, 2014): Hosts are not willing to invest time to manage listing if they don't receive bookings from travelers; travelers are not interested if there are limited offers from hosts. To solve the chicken-and-egg problem, marketplaces can seed supply (Choudary, 2015). The in-house t2c team rather than the hosts worked on the creation of listing content, curation of user-generated content and moderation of other actions by users. For one activity, t2c initially became to host. As the activity evolved, the t2c phased out of their host role and turned it over to the actual host. With increased platform activity the focus for t2c shifted to curation of the quality of activities rather than creation of new activities.

Provide value to creators regardless of interactions: One strategy to initiate activity on a two-sided platform is to launch the platform in 'standalone mode' (Choudary, 2015). Given the challenge of limited travelers booking t2c activities and lack of positive network effects, t2c looked for ways to provide value to hosts regardless of the presence of travelers as consumers on the platform. The value for hosts was complemented through service offerings such as professional photography, editing support and free consulting on how to create a t2c activity.

Involve additional platform sides for value capture: Like most other two-sided platforms, t2c planned to charge a commission for bringing creators and consumers together. However, paid activities compete with traditional travel experiences, which have stronger economic incentives for distribution partners. In addition, t2c hosts were not ready to cannibalize their higher value touristy activities with lower priced or free t2c activities. To increase the impact created through travel, t2c encouraged activity providers to discount the price for volunteering participants. On the other side, t2c was not in a position to charge hosts because not enough value was created for them. Hence, t2c is now attracting corporations who involve their employees or customers in t2c activities as an additional site to its multi-sided platform in order to generate revenue. More platform sides could also lead to potentially larger cross-sided network effects and the diversification of revenue sources for the platform.

5.5 Specifying Learning

While the first t2c version struggled with attracting enough users who are willing and capable to contribute high quality value unites, the marketplace oriented platforms faced similar issues: creators want more consumers and vice versa. Hosts were not willing to invest time to manage listing because they did not receive bookings from

travelers; travelers are not interested if there are limited offers from hosts. Through a range of strategies and tactics t2c attempted to build both sides of the platform simultaneously.

6 Conclusion

We set out to explore the applicability, the peculiarities, and challenges of using crowdsourcing for social innovation in tourism. We learned that the fact that circumstances make it possible for a crowdsourcing platform to exist, does not mean that it will. Yet the twists and turns of building t2c were instructive. Our journey has led to useful and often encouraging lessons about how to create, grow and sustain crowdsourcing platforms in the travel context. By connecting travelers and locals around impactful activities, tourism can be more sustainable. Travelers have more authentic and meaningful experiences and hosts benefit from tourism.

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Supporting Tourism Through Digital Ecosystems: The E015 Experience

Maurilio Zuccalà^(✉) and Emiliano Sergio Verga

Cefriel—Politecnico di Milano, via Fucini 2, 20133 Milan, Italy
{maurilio.zuccala,emiliano.verga}@cefriel.com

Abstract. Tourism is one of today’s most relevant industries. It is a data intensive, complex sector that can involve various stakeholders, services and technologies in varying proportions and on different scales. ICT plays a key role in supporting tourism. In this paper we focus on ICT as a key enabler for effective information exchange and provision of value-added services to end-users, and we discuss how tourism can benefit from digital ecosystems as a means for creating relationship environments of stakeholders from both the public and the private sector. In particular, we present a selection of tourism-oriented end-user applications enabled by the E015 Digital Ecosystem operating in Italy since 2013.

Keywords: Digital ecosystems · E015 · API economy · Coopetition

1 Introduction

Tourism is acknowledged as one of the world’s most relevant, rapidly growing and information intensive industries, providing revenues that significantly support the economies of many countries (Farkhondehzadeh, Robot Karim, Roshanfekar, Azizi and Legha Hatami, 2013). Recent reports confirm this view, e.g., in 2016 travel and tourism direct global Gross Domestic Product (GDP) contribution was greater than the GDP contribution of the automotive and chemicals manufacturing sectors; travel and tourism generated \$7.6 trillion in GDP globally, exceeding that of other sectors except for construction, financial services, and retail sectors; travel and tourism GDP is expected to grow 4.0% per annum—compound annual growth—over the next decade, whereas the total global economy is expected to expand only 2.7% per annum (WTTC Benchmarking Research, 2017a).

These figures indicate that the economic contribution of tourism is not only a matter of direct transactions between tourists and tourism service/product providers, but it also takes into account the indirect impact on the overall tourism supply chain, as well as the induced impact on local economies (WTTC Global Economic Impact and Issues, 2017b).

Such impacts become more evident if the touristic experience is considered from the point of view of potential and actual tourists: their user experience, in fact, is linked to a broad process that can include different phases—from “dreaming” to planning, booking, travelling, rescheduling, sharing and reviewing (Cantoni, 2015)—and each of these phases can entail a wide number of other stakeholders belonging to various

sectors and different countries (travel agencies, airlines, hotels, restaurants, vehicle sharing services, stores, travel fare aggregators, specialised search engines etc.) that provide or govern different services made available through different means, most of which can nowadays leverage innovative technologies.

In the light of the above, technology-wise the tourism sector poses several specific challenges that are strictly related to providing users with modern services meeting their evolving needs and expectations: usage of mobile devices, ubiquitous connectivity, multimedia data exchange, data elaboration and machine learning etc., and eventually an overall shift towards more mature business models and user engagement approaches (WTTC Global Economic Impact and Issues, 2017b).

2 Key Facets of Modern Tourism

Tourism is therefore a multifaceted and rapidly evolving phenomenon that can entail various stakeholders, services, technologies and processes in varying proportions and on different scales. On that ground, supporting tourism necessarily requires addressing multiple, complementary dimensions. For the purpose of this paper, we would like to emphasise in particular the following key aspects of tourism-related solutions and initiatives:

- **Engagement.** End-users need to be properly involved in the tourism experience in order to nurture their motivation and participation. Proper means must be available to reach and then accompany visitors and tourists with flexible offers and services addressing their specific needs and expectations.
- **Sponsorship.** Tourism is not necessarily a totally self-sustaining sector, e.g., public authorities and organisations often play a primary role in defining goals and fostering initiatives for the valorisation of territorial resources and economies.
- **Governance.** Once started, such initiatives must be continuously monitored and governed in order to remain operational and effective over time, and to be able to address context changes such as emerging user requirements, new market trends and economic conditions etc.
- **Scale.** Tourism offers can operate on local or worldwide scale, with several possible degrees in between. Modularity and interoperability of services and solutions are key factors for promptly creating flexible and customised offers.
- **Technology.** Information and Communication Technology (ICT) plays a fundamental role in supporting and improving all the above mentioned aspects of tourism offers. The importance of this role is increasing due to the overall technological development of our society and the spread of ICT tools for the end-users. Moreover, ICT is capable of enabling or improving accessibility to tourism services by lowering several barriers (language, distance, costs etc.).

Put in other words, ICT plays a key role in unlocking the potential of modern tourism. In this paper, we focus on ICT and API Economy as the enabler of effective information exchange for the provision of value-added services to end-users. We also discuss how tourism can benefit from digital ecosystems as a means for creating and

managing innovative relationship environments of different stakeholders cooperating according to a holistic approach without losing their competitive advantage.

3 The E015 Digital Ecosystem

The E015 Digital Ecosystem (www.e015.regione.lombardia.it) is a multi-stakeholder digital service environment enabling and fostering IT interoperability between different organisations and companies, from both the private and the public sector. It was initially created to exploit the Expo Milano 2015 (www.expo2015.org) as a major opportunity to introduce disruptive innovation in providing visitors and citizens with a novel and immersive experience, as well as in all aspects of urban daily life: infrastructures, tourism, cultural and social life, services and facilities etc. (Zuccalà and Celino, 2015).

E015 aims to enable a new, cooperative—i.e., allowing for both cooperation and competition at the same time—approach to the design and implementation of advanced digital services. It provides members—which can be companies, public authorities etc.—with participation guidelines and a set of shared and consolidated standards, processes, policies and technologies to develop their digital products—i.e., service accessible via Application Programming Interfaces (APIs) and end-user applications—and enable information systems interoperability (Bonardi, Brioschi, Fuggetta, Verga and Zuccalà, 2016).

E015 fully exploits the notion of API Economy, being in fact an open API ecosystem. Ecosystem participants can describe and publish their APIs, in terms of both functionalities and usage policies, in order to share their data assets through standard Web service interfaces. Other participants can then discover such APIs and leverage them, in agreement with the respective usage policies, for building new value-added APIs or new integrated applications for the end-users, thus contributing to the overall growth of the ecosystem. The interoperability model is based on open, consolidated standards, thus enabling open innovation (Bonardi et al., 2016).

Such an overarching ICT-based initiative represents a modular, open, scalable and replicable backbone sustaining Milan's (and Italy's) evolution process towards building a network of federated smart cities. In May 2017 the E015 Digital Ecosystem became part of a regional law in Lombardy as a strategic reference initiative promoting a “digital first” approach for asset sharing (Regional Government of Lombardy, 2017).

4 A Digital Ecosystem for Tourism

Due to its systemic and institutional role, E015 is neutral, i.e., it can support any sector's players willing to share their information assets or develop applications for their end-users. Thanks to its model, the ecosystem is capable of addressing the key facets of tourism mentioned above:

- **Engagement.** E015 enables and eases the sharing of value-added data and the creation of value-added end-user applications fulfilling the needs and requirements of tourists. Moreover, the governance processes of the ecosystem include periodic on-boarding and dissemination activities in order to promote participation of new public and private players. These initiatives are both technology- and business-oriented. On-boarding actions are also very important to create consensus and promote a “cultural shift” towards the adoption of innovative approaches in different sectors, including tourism.
- **Sponsorship.** E015 has a strategic role in promoting digital relationships among different stakeholders operating at different levels. E.g., many national and regional authorities already recognized this potential and are committed to encourage further participation of local authorities and organisations willing to promote actions at different levels. As noted before, in 2017 the Regional Government of Lombardy introduced E015 as a structural element of its strategic initiatives for the territory.
- **Governance.** E015 is governed both from a technical and a strategic point of view, with well-defined roles and processes, in order to support overall coherence, strategic evolution and day-by-day management. The Technical Management Board is the team in charge of managing the technical and procedural aspects of the ecosystem, such as: maintain and update the technical and process guidelines; manage the ecosystem registries, the Web portal and the other core components; provide technical and procedural support to ecosystem participants; validate services and applications in order to assess their compliance with the E015 technical standards and guidelines; monitor the availability of services and, in general, the health of the ecosystem. The Governance Board is the team in charge of long-term governance and strategic evolution of the ecosystem. They take care of different tasks, such as: management of membership requests; management of communication and relationships; strategic planning and management of long-term evolution of the ecosystem.
- **Scale.** E015 is inclusive towards all kinds of players operating, e.g., at district, city, regional or national level. Engagement initiatives are in place to link the ecosystem with other existing initiatives, thus encouraging convergence and scale-up towards federated initiatives.
- **Technology.** In E015 ICT serves as a foundation for building a “common language” enabling effective digital relationships. The ecosystem provides members with shared technical guidelines for developing their software products, and for inter-operating with the other members via the realisation of APIs, data schemes etc.

5 Tourism-Related Solutions in E015

Several innovative solutions for tourists and travellers have been created since 2013 thanks to the E015 Digital Ecosystem. Some examples are presented in the remainder of this section. These end-user applications not only provide tourists with useful information and features, but above all they show the potential of the digital ecosystem approach in building innovative solutions for end-user.

5.1 Turning a Mobility App into a Complete Experience for Travellers

Infoblu (www.infoblu.it/?q=en/company) is the Italian leader in the business-to-business and business-to-business-to-customer traffic information market, providing solutions to the major Italian players of different sectors, e.g., automotive, navigation systems, video and radio broadcast, phone companies, call centres and mobile apps (Fig. 1). Since 2010 Infoblu provides the *Infoblu Traffic* app (e015.infoblutraffic.com). Initially this solution was a vertical app providing information about traffic owned by Infoblu. Then it was enriched by adding information incrementally shared via APIs in the E015 Digital Ecosystem by different providers. Thanks to E015, now this end-user application is capable of providing real-time information about many public transportation services—i.e., buses, trains, underground, parking, bike-sharing—cultural heritage and main events taking place in Lombardy. In this way, a vertical info-mobility app has become an effective entry point of accessing a rich set of information useful to tourists and travellers visiting Italy.



Fig. 1. Example of E015 real-time data available through the Infoblu Traffic app

5.2 Promoting Public Transportation for a Sustainable Cultural Tourism

Every year, at the end of summer, the Province of Monza (the public body governing the metropolitan area around the town of Monza) organises a cultural festival named “Ville Aperte”. During this festival, more than 130 ancient villas host concerts and exhibitions. Information about these events, listed on the Ville Aperte official web portal (www.villeaperte.info, Fig. 2), are updated thanks to the APIs made available by several cultural foundations via the E015 Digital Ecosystem. Furthermore, for every

villa it is possible to know how to reach it via the intermodal public transportation system, thanks to a functionality published by the Regional Government of Lombardy as an E015 API.

Ville Aperte
IN BRIANZA

Ville e altri siti | Visite guidate | Eventi | Itinerari | Approfondimenti

Raggiungi CESANO MADERNO con i mezzi pubblici

PARTENZA DA: Crema, P.le Rimembranze
 ARRIVO A: CESANO MADERNO
 DATA DI PARTENZA: 28/07/2017
 ORA DI PARTENZA: 11:44

MEZZI DI TRASPORTO: Altro
 NUMERO MASSIMO DI CAMBI: qualsiasi
 DURATA DEL CAMBIO: qualsiasi

Cerca soluzioni di viaggio

PARTENZA	ARRIVO	ORA PARTENZA	ORA ARRIVO	DURATA	CAMBI	MEZZI	DETTAGLIO
Crema, P.le Rimembranze	Cesano Maderno, Stazione	11:46	14:00	02:14	2		
Crema, P.le Rimembranze	Cesano Maderno, Stazione	12:41	14:30	01:49	2		
Crema, P.le Rimembranze	Cesano Maderno, Stazione	13:06	14:53	01:47	2		

Questa sezione del sito è stata realizzata grazie all'uso del servizio "Muoversi in Lombardia" pubblicato da parte di Regione Lombardia all'interno dell'ecosistema digitale E015

Fig. 2. The “Ville Aperte” web page integrated via E015 with information from the regional intermodal public transportation system

5.3 Creating a Common Event Schedule in a Collaborative Way

The Regional Government of Lombardy recently created a web application named *L15* (www.l15.regione.lombardia.it), which besides providing useful information represents an innovative way for building solutions at regional level in a collaborative way (Fig. 3). In order to build the section about the main events of the territory (www.l15.regione.lombardia.it/#/eventi), the Regional Government of Lombardy asked municipalities and cultural foundations to share the information about their own local events—e.g., the ones they already published on their institutional web sites—via APIs made available through the E015 Digital Ecosystem. Moreover, such APIs have to adopt the same common data schema defined in E015 for representing structured data about events. In this way the Regional Government of Lombardy could build a comprehensive event schedule, continuously updated directly by the same municipalities and cultural foundations thus acting as a sort of editorial staff distributed on the territory. Thanks to the digital ecosystem approach, this initiative pooled information previously heterogeneous and available only locally, thus unlocking its value and making it reach a wider target audience.

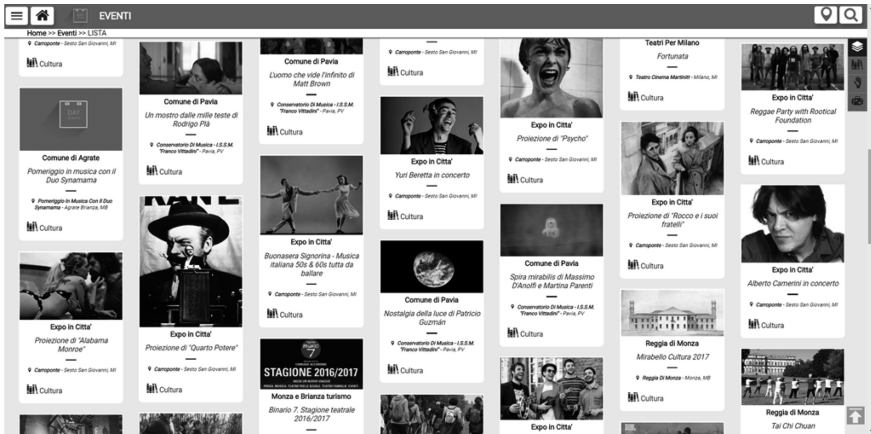


Fig. 3. The integrated schedule of events available via the L15 app

5.4 Governing a Promotion Strategy Based on Information Sharing

Ascom Bergamo, the local association of retailers in the Bergamo city area, implemented a comprehensive promotion strategy for the territory via the initiative named “GoInBergamo” (www.goinbergamo.it, Fig. 4). In order to advertise and support local resources and peculiarities—e.g., events, places, itineraries and shops—Ascom Bergamo asked municipalities and local associations to share in the E015 Digital Ecosystem via APIs their own information available via their local tourism portals. Also in this case, this information became available for common and integrated promotion initiatives of local players, such as local tourism associations, and even for regional institutions or private tourism companies.



Fig. 4. Promotion enabled by sharing data for the “GoInBergamo” initiative

5.5 Helping Start-Ups in Fostering Innovation

Sharing information via APIs in the E015 Digital Ecosystem is an effective way to also foster the development of innovative start-ups for creating value-added solutions targeted to tourists and citizens. E.g., the social travelling start-up YAMGU—You Are My Guide (www.yamgu.com/en) provides an app that helps tourists in the discovery of local events, entertainment initiatives, leisure activities etc. (Fig. 5). Thanks to E015, YAMGU could find a source of trustful and certified information about events that are shared as APIs by different municipalities. YAMGU could leverage such information and enrich it with dynamic user-generated information collected via social media.



Fig. 5. Enriched information provided by the YAMGU app

5.6 Innovating the Solutions for Retailers

EPSON, one of the leading manufacturer in printing solutions, enhanced their printing solution for cashpoints named “ExPOSITION” (www.epson.it/exposition) thanks to the E015 Digital Ecosystem. In particular, EPSON enriched printers with the capability of printing on receipts information about events happening on the same day nearby the store or the restaurant where the device is installed (Fig. 6). Such events are selected on-the-fly from the updated information available via the APIs shared by different municipalities. In this way, retailers can provide customers—including tourists—with information about upcoming events in a very straightforward and original way.

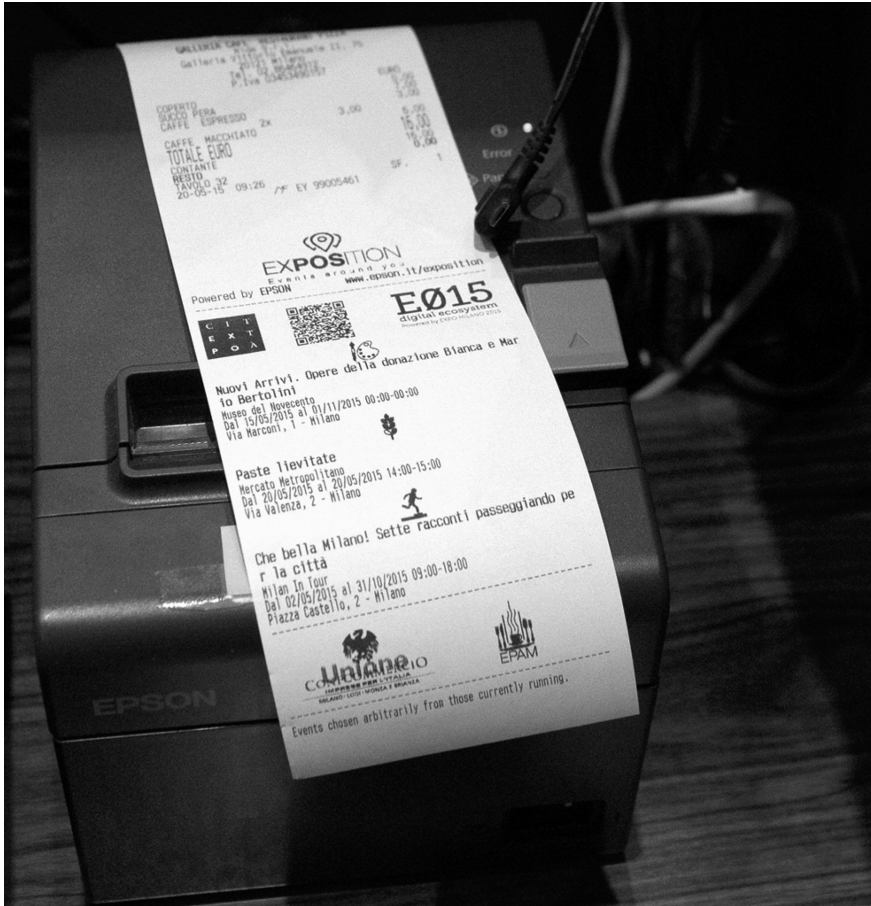


Fig. 6. ExPOSITION can print updated event information on receipts

5.7 Building “Games with a Purpose”

Sharing digital assets as APIs in the E015 Digital Ecosystem is an effective way for exploiting and re-using existing digital assets by adding functional value to them. E.g., information about architectures in Milan having a historical and cultural interest, shared by the Regional Government of Lombardy, have been re-used in order to build a “game with a purpose” (GWAP) named Indomilando (bit.ly/indomilando, Fig. 7). This game is a sort of guessing game where players are challenged to find the right picture (out of four) of the building whose name is shown at the top of the page. Besides the educative and engaging mechanism of the game, this solution has also another purpose: by analysing the answers of the players, it is possible to identify and rate the most recognizable buildings of the city, as well as the most descriptive pictures among the ones included in the repository of the Regional Government of Lombardy.


indomilando

E015
digital ecosystem
Powered by OPEN PLAINS 2015


Leaderboard	Best last players	Badge list	How to play	Hello ziomau. Not you?	it	en
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Next


Level: 2 of 6
Time: 95
Score: 250
Your badges




Duomo di Milano




Campanile di S. Gottardo in Corte



Chiesa di S. Luca Evangelista



Duomo di Milano



Chiesa di S. Maria presso S. Satiro

Fig. 7. Playing with the Indomilando GWAP

5.8 Sharing Information About Accessibility

Information about accessibility of city places and venues can be a precious resource in order to help tourists having specific needs. For this reason, the Regional Government of Lombardy, working together with many associations, defined a E015 glossary—a common data schema for exchanging information via APIs—to standardise and promote via the ecosystem the sharing of the information about the actual accessibility of points of interest, museums, bus/metro stops, venues on touristic itineraries etc.

5.9 Taking Care of Safety and Security

Effort to put into effect safety and security measures is often hardly perceived by tourists, but it can affect the attractiveness of touristic venues and attractions. The Regional Government of Lombardy created an integrated dashboard for institutional control rooms based on the E015 approach, seamlessly integrating information from the different control rooms operating in various settings such as railway stations, ambulance services, firefighters etc.

6 Conclusion

Tourism is one of the world's most relevant, rapidly growing and information intensive industries. It is a complex and challenging sector that involves various stakeholders, services and technologies on different scales. In this paper we discussed how tourism can take advantage of ICT-based digital ecosystems as a structural foundation for fostering and regulating effective information exchange between different players, thus

enabling the creation of value-added services for tourists. We presented a compendium of tourism-oriented solutions for end-users, developed by different players from both the private and the public sector by relying on the E015 Digital Ecosystem operating since 2013. These solutions not only demonstrate the potential of the ecosystem for the tourism industry as well, but also represent best practices that are being replicated and extended. E.g., the “ExPOSITION” solution has recently been launched in other Italian cities such as Rimini and Florence. One of the main challenges to tackle in the coming years is the scalability model: if, on the one hand, the E015 “common language” and approach could spread through the growth of a unique instance of the ecosystem, on the other hand a more viable scenarios sees the federation of different ecosystems. This requires concrete engagement and governance measures put in place at different levels, like the ones currently being developed by the “Sharing Cities” H2020 lighthouse project (www.sharingcities.eu) whose urban IT platform is empowered by E015. Moreover, adoption contexts different from the tourism sector are being investigated, like environment and healthcare. E.g., E015 is being adopted to mitigate urban pollution using real-time data about air quality, so to implement traffic restrictions; real-time data about first aid stations, e.g., number of people waiting or undergoing treatment, will be shared through E015. Players of the tourism sector already showed interested in taking advantage of these innovative services. In other words, the E015 Digital Ecosystem is enabling the creation of a more holistic smart city concept, supported by many pillars among which tourism is one of the most solid, relevant and positive.

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Part III
Information Search and Travel
Behaviour

Content Analysis of Travel Reviews: Exploring the Needs of Tourists from Different Countries

Shuang Song¹, Hajime Saito²(✉), and Hidenori Kawamura¹

¹ Graduate School of Information Science and Technology, Hokkaido University, Sapporo, Japan

{sousou, kawamura}@complex.ist.hokudai.ac.jp

² Faculty of Information Media, Hokkaido Information University, Ebetsu, Japan

hajime@do-johodai.ac.jp

Abstract. The inbound tourism industry keeps growing in recent years. Affected by the factors such as education, culture and geographic conditions, people from different countries may have different preferences and attitudes towards tourism products. Thus, it is important to understand the need of people from different countries to develop an effective and targeted promotion and marketing strategy. This research aims to develop a method to extract the needs of tourists from different countries from travel reviews. In this paper, both manual analysis and basic text-mining techniques are used to explore the content of reviews posted by tourists from six different countries, written in English, Japanese and Chinese from TripAdvisor.

Keywords: Need analysis · Review contents · Manual analysis
Text-mining · Cross language

1 Introduction

Tourism is an industry that has a large impact on the economy (Sinclair, 1998; Kvist, 2005). To attract more tourists, effective promotion strategies are needed. Meanwhile, it is noticed that people from different countries have different preferences in destination selecting (Saeki et al., 2015) and different focuses during travelling (Hatoh et al., 2013). Therefore, it is important to understand the needs of tourists from different countries to develop an effective and targeted promotion and marketing strategy.

In this research, tourists' motivation and expectation, travel experience (viewpoint, action), complaints and satisfaction (attitude and opinion) and factual information (visiting times, companion, travel date/time etc.) are considered as the most common needs-related information (Japan National Tourism Organization (JNTO), 2017; Website of Tourism Research Australia, 2017; Tourism Bureau, M.O.T.C. Republic of China (Taiwan), 2016; Ontario Ministry of Tourism, Culture and Sport, 2006). The most direct approach to find out the needs of tourists is by conducting a survey. However, to carry out a large-scale survey can be money and time consuming (Saeki et al., 2015). The result of a survey may also be affected by the design of the survey

(Hearne and Santos 2005), and by participant's attitudes and mental status (Kvist, 2005; Li et al., 2011).

Alternatively, exploring the needs of tourists using user generated contents (UGC) is considered. Along with the rapid development of web2.0, millions of users are posting data to SNS, blogs and forums nowadays. It is possible to find out tourists' demographic profiles (Wenger, 2008; Fujii et al., 2017), viewpoints (Hatoh et al., 2013), preferences (Marrese-Taylor et al., 2013), complaints (Maurer & Schaich, 2011; Del Chiappa and Dall'Aglio, 2012; Levy et al., 2013; Liu et al., 2016) and destination images (Murakami and Kawamura, 2011; Serna et al., 2013; Suzuki & Kurata, 2017) from a large amount of data using text-mining techniques or manual analysis.

Massive and up-to-date travel-related UGC provide an opportunity for developing a lower-cost method for real-time investigation of the needs of tourists from different countries. However, existing cross-countries tourist studies are largely limited to English-speaking countries (Li, 2012), and only a few studies include cross-language analysis using UGC. Thus, for hints and insights of developing a method to extract the needs of tourists with different geographical and linguistic backgrounds from travel-related UGC, this research will analyse the contents of travel reviews posted by tourists from six different countries, written in English, Japanese and Chinese.

The rest of the paper is organised as follows. Section 2 reviews related studies. Section 3 introduces the methodology of this research. Section 4 discusses the results. And conclusions are presented in Sect. 5.

2 Related Works

Studies on the similarities and/or differences in the needs of tourists across countries started in late 1980s by Sheldon and Fox (1988) and Richardson and Crompton (1988). According to a meta-review by Li (2012), questionnaire surveys were the most widely used means of data collection, followed by secondary data, experiment and interview. And recently, the use of UGC is increasing (Hatoh et al., 2013; Serna et al., 2013; Stepchenkova et al., 2014; Saeki et al., 2015; Kim & Stepchenkova, 2016).

It is possible to avoid cross-language analysis when studying the needs of tourists from different countries by selecting data that are written in one commonly used language (Kim & Stepchenkova, 2016) or by using non-textual data (Stepchenkova et al., 2014; Saeki et al., 2015). Meanwhile, Hatoh et al. (2013) studied the difference between the viewpoints of Japanese and Chinese tourists using travel reviews from TripAdvisor. Text mining techniques are used to compare the coherence of keywords with the highest occurrence frequency from Japanese and Chinese travel reviews, and manual comparison is used in sentimental analysis.

Murakami and Kawamura (2011) studied 120 travel blogs which were written by foreign tourists who have been in Tokyo, Hokkaido or Ishikawa in Japan. Both text mining techniques and manual analysis were used to show which attraction spots those bloggers had been to, what activities they had participated in and how they felt about these three destinations. Their research showed that text mining is a useful tool to extract a general destination image from a large amount of text data. Yet manual analysis is still needed to get detailed and specific results.

Textual UGC is unstructured data that need to be grouped into categories to enable knowledge to be extracted (Marine-Roig & Clavé, 2015). Categories can be pre-established or discerned from the text itself (Stepchenkova, 2012). Nakajima and Ohta (2013) identified the content of travel blogs as tourist spots information (name, location and introduction of attractions), their related information (tourists' actions, tourists' emotions, tourists' description of the attraction, and origin or background knowledge of the attraction) and unrelated information (a third-person's experience, tourists' past experience, and information of unrelated attractions). Kurashima et al. (2009) classify tourists' experience into location, time, activity and emotion. Nakajima et al. (2013) categorized Twitter content into food, view and action. Their categories are later expanded to be applied to tourists' actions (shopping, eating, experiencing, staying and seeing) (cited in Iinuma et al., 2017).

There are various channels of travel-related UGC. Serna et al. (2013), studied the cognitive destination image and found that Facebook and Twitter are more relevant when it comes to image projected by the DMO, while reviews from TripAdvisor are more about tourists' thoughts and feelings.

3 Methodology

This section explains the method used to analyse reviews, which includes two main steps: collection and categorization of reviews, and categorization of review contents. The first step explains the data that is needed for the cross-countries tourists' needs comparison. In the second step, two approaches (manual analysis and text-mining techniques) are used. The manual analysis session explains a content categorization model, developed from a pre-analysis of contents of 100 randomly selected reviews. The text-mining section explains a semantic categorization model for nouns.

3.1 Data Collection and Categorization

Target Data is travel-related texts that are: (1) posted by people from different countries for a single attraction allowing cross-country comparison, (2) posted in various types of attraction spots, considering tourists' different preferences in selecting destinations, (3) posted in attraction spots located in different countries, considering tourists' behaviour may differ between domestic and overseas travel. To collect the target data, data source, countries and attractions to be studied needed to be determined.

Source. TripAdvisor, the largest travel site in the world is chosen as the source for the following two reasons: Firstly, it has travel-related reviews about over 155,000 attractions from 232 countries posted by tourists all over the world and secondly, its reviews are more about tourists' thoughts and feelings rather than the image projected by the DMO (Serna et al. 2013).

Data. Countries and attractions are selected as follows: Countries to be studied are chosen by the following two standards: (1) countries that vary with regards to social culture and geographic conditions, (2) countries whose native language include English, Chinese or Japanese. As a result, United States, Australia, Great Britain, China, Japan and Singapore are selected.

There are over 23.1 million reviews posted in the six selected countries on TripAdvisor. It will take about two years to collect at an estimated collection speed of 2500 reviews per hour using one computer. Ideally, all reviews should be collected and analysed, but due to the experimental constraint, to study attractions we narrowed them down to those that (1) are located in the top 20 cities with the highest amount of attractions in each country except for Singapore, (2) belong to the 7 attraction types that are frequently investigated in national travel surveys and that also exist in TripAdvisor, namely Sights & Landmarks, Nature & Parks, Shopping, Museums, Zoos & Aquariums, Water & Amusement Parks, and Food & Drink, (3) are among the top 30 with regards the amount of reviews for each attraction type in every city, and (4) have more than a hundred reviews.

Finally, the latest 1000 reviews, a sampling size with a confidence level of 95% and an error of approximately 3%, are collected in each language (English, Chinese and Japanese) from each attraction.

Data Categorization. The reviews also need to be categorized according to the country of a tourist. Ideally, the country of a tourist should be the country where he/she was raised, received an education, or has been living for a very long time to have resulted in an influence on his/her preference and attitudes from a social, culture or geographic perspective. However, TripAdvisor only provides a user's location information along with the review when the user has filled in this information. Thus, to rule out those who move abroad for a middle or long term stay for the purpose of a job, education, or others; a tourist's country will be the country of the location the tourist claims to be only if the native language of the country of the location is consistent with the language used in the review. For example, if a tourist filled the location information as Beijing, China, he/she will be categorized as a Chinese if he/she writes reviews in Chinese.

Result. Data was collected from 1/2/2017 to 4/8/2017 using a tool named Octopus Data Collector. Approximately 290,000 English reviews posted by American tourists, 210,000 English reviews by British, 110,000 English reviews by Australian, 16,000 English reviews by Singaporean, 170,000 Japanese reviews by Japanese and 90,000 Chinese reviews by Chinese were collected.

Three Data Sets are created from the collected data for the following purpose: Dataset 1 for manual content analysis: 1300 reviews randomly selected from 6000 reviews (1000 reviews per country) randomly selected from 69 attractions with the most reviews in the six selected countries (Table 1), covering various attraction types namely parks, religious locations, historic locations, museums, observations, zoos, botanic gardens, shopping areas, bridges, water areas, mountains and amusement parks.

Dataset 2 for pre-analysis of the content of reviews: 100 randomly selected reviews from Dataset 1.

Dataset 3 for text-mining: 30,000 reviews (5000 reviews per country), randomly selected from the collected data.

Table 1. Reviews in dataset 1

Destination location	American	Australian	British	Chinese	Japanese	Singaporean	Total
United states	69	7	30	3	32	0	141
Australia	8	53	10	6	18	5	100
Great Britain	37	18	88	13	28	3	187
China	28	32	17	50	26	27	180
Japan	55	39	33	93	87	53	360
Singapore	27	63	50	34	46	112	332
Total	224	212	228	199	237	200	1300

3.2 Pre-analysis and Manual Content Analysis

A pre-analysis including the following two steps is conducted to get a general idea of the content of reviews using Dataset 2.

Step 1 content extraction. Content is identified phrase by phrase and is named using expressions adopted from existing studies and surveys. Taking the review shown in Fig. 1 as an example, three kinds of content (visit date/time, see, and comment) can be extracted. Results of the content of 100 reviews are shown in Table 2.

We visited at night (*visit date/time*), what a great atmosphere (*comment: good atmosphere*) and prices were pretty reasonable (*comment: good price*). Lots to see and a big range of different restaurants to choose from (*see: restaurant*). Not a 'touristy' as we'd expected, which was good (*comment: good not touristy*).

Fig. 1. Example of the content analysis of a review

Step 2 content categorisation. Content is categorized into 10 sub-categories and further into 3 main categories using KJ method, an affinity diagram helps to categorize and organize a large number of fragmented uncertain information into logical cohesive groups (Kawakita, 1986). During the process, categories from existing studies are also taken into consideration (Nakajima & Ohta, 2013; Iinuma et al., 2017). Explanations of the 3 main categories are as follows:

Information about the attractions: Descriptive content about an attraction or otherwise related attractions. This category also includes recommendations and information about people in/around the attraction.

Information about the tourist: Personal experience before and during the travel. To distinguish personal experience from descriptive content, reviews with information about visiting date or weather, or reviews involving expressions such as "we saw ...", "we went there with our friends ..." are counted.

Comment: Tourists’ positive or negative feelings and opinions towards content involved in the information of an attraction or the tourist.

Altogether 1300 reviews (Dataset1) are manually analysed. The content of these reviews is transformed into categories accordingly. Results are shown in Sect. 4.1.

Table 2. Content of 100 reviews

Category	Sub category	Content	Review amount
Information of the attractions	Introduction of the attraction	Resource description	43
		Background	16
		Location	13
		Ticket	9
		Access method	8
		Shop	5
		Price	9
		Atmosphere	4
		Activity	2
		Open/close time	2
	Introduction of surrounding attractions	Surrounding attractions	2
		Surrounding events	2
		Surrounding facilities	1
	Recommendation	Recommend point	44
		Watch out issues	10
		Other attractions	8
Photo point		2	
Information about the people	People	16	
	Waiting duration/queue	5	
	Staff/guide	3	
Information of the tourist	Past experience	Times of visits	4
		Experience from past visits	2
		Personal history	1
	Travel background	Visit date/time	15
		Purpose/motivation	7
		Weather	6
		Companion	5
		Stay duration	4
Visit form	3		

(continued)

Table 2. (continued)

Category	Sub category	Content	Review amount
	See	–	10
	Do	Take photo	10
		Eat/drink	9
		Attend activity	8
		Walk around	4
		Accidental event	1
		Shopping	1
Comment	On this travel	–	72
	On next travel	–	3

3.3 Semantic Categorization and Text Mining

Text-mining techniques are used as a second approach of content analysis. The general idea here is to firstly break a text into separated words using a morphological parsing technique. Next one finds the most written words, then these words are categorized based on their semantics, and finally the amount of reviews included in each semantic category is calculated.

It is worthwhile to point out that the result of morphological parsing depends on the dictionary embedded in different tools (Murakami and Kawamura, 2011). Thus, to process reviews written in different language fairly, it is important to use the same tool (esp. the same dictionary). Besides, among the various kinds of parts of speech, nouns are considered as the most informative ones in search for content in reviews (Liu et al. 2016). Therefore, the process of semantic categorization can be listed as the following 3 steps. The amount of reviews included in each semantic category will be calculated and the results are shown in Sect. 4.2.

Table 3. Categorization of nouns

Semantics	Variety of nouns
View (nature/artificial)	269
Culture	92
Food	73
Access/transportation	62
Activity	58
Shopping	47
Atmosphere	40
Infrastructure	38
Price	22
Service/staff	15
Safety	6
Sanitary	2
Not travel related	691
Total	1420

- Step 1 review translation: Chinese and Japanese reviews are translated into English using Google Translation (<https://translate.google.co.jp>) to be processed by the same dictionary.
- Step 2 morphological parsing. We use a tool called TreeTagger to annotate a text and each word with part-of-speech and lemma information (Schmid, 1994, 1995).
- Step 3 semantic categorisation of nouns. A variety of 1420 nouns which occurred more than 50 times in Dataset 3 is manually categorized according to their semantics (Table 3).

4 Results

4.1 Results of the Manual Analysis

This session shows the results of the manual analysis of 1300 reviews. Table 4 shows the amount of reviews with content included in each main category. Information about the tourist and comments are considered as useful information for extracting tourists' needs. When the numbers are divided by the total review amount in each column, we can see that over 34% of reviews contain useful information. Meanwhile, the percentage differs between countries. Thus, the smaller the percentage, the bigger the sample size should be in a sampling study.

Table 4. Amount of reviews with content included in each main category (US: American, AU: Australian, GB: British, CN: Chinese, JP: Japanese, SG: Singaporean)

Category	US	AU	GB	CN	JP	SG
1. Information about the attractions	186 (83%)	176 (83%)	204 (86%)	165 (83%)	178 (78%)	182 (91%)
2. Information about the tourist	87 (39%)	87 (41%)	92 (39%)	80 (40%)	137 (60%)	68 (34%)
3. Comment	177 (79%)	180 (85%)	204 (86%)	98 (49%)	119 (52%)	120 (60%)
Total reviews	224	212	228	199	237	200

Table 5. Percentage of reviews with content included in the 10 sub categories

Sub category	US	AU	GB	CN	JP	SG
1. Introduction of the attraction	0.72	0.67	0.72	0.69	0.58	0.80
2. Introduction of Surrounding attractions	0.07	0.09	0.07	0.11	0.08	0.09
3. Recommendation	0.26	0.32	0.31	0.37	0.20	0.39
4. Information about the people	0.21	0.20	0.21	0.19	0.22	0.12
5. Past experience	0.02	0.03	0.03	0.01	0.05	0.07
6. Travel background	0.23	0.21	0.20	0.19	0.25	0.20
7. See	0.25	0.31	0.26	0.31	0.44	0.18
8. Do	0.13	0.11	0.11	0.11	0.18	0.11
9. Comment on this travel	0.78	0.84	0.86	0.47	0.51	0.58
10. Comment on next travel	0.02	0.04	0.03	0.04	0.02	0.04

Table 5 shows the percentage (amount of reviews divided by the total review amount in each column in Table 4) of reviews with content included in each sub category. Less than 7% of the reviews contain information about tourists' past experience and comments on the next travel. Detailed statistics of sub categories 6, 7, 8 and 9 are shown.

Table 6. Amount of reviews with travel background

Travel background	US	AU	GB	CN	JP	SG
Visit date/time	23	21	20	15	27	18
Companion (family/couple/friends)	10	12	17	8	14	10
Weather	16	10	9	8	24	9
Stay duration	5	8	7	4	0	10
Travel formality	4	5	2	2	0	1

Table 6 shows the amount of reviews with travel background that can be useful for fact-finding investigation. Also, among the 1300 reviews, only 33 reviews (2.5%) have clearly identified their travel purposes or motivations, such as "nearby the hotel" (6 reviews), "because it is famous" (3 reviews), "was recommended by a friend" (2 reviews), celebration of a birthday, or desire to see a certain view or show.

Table 7 shows the amount of reviews about things the tourist saw, which can be useful for investigating tourists' viewpoints. Of 489 reviews about things the tourists saw, only 72 reviews (14.7%) use specific words instead of general words, such as azaleas instead of flower, cherry blossom instead of tree.

Table 7. Amount of reviews with things the tourist saw

See	US	AU	GB	CN	JP	SG
Tree/flower/garden/plant/lawn	15	20	17	15	25	13
Animal/fish/birds	3	8	3	7	8	3
Night view/lights	3	3	2	6	10	2
Building/architecture/design	5	4	3	3	6	3
Exhibits	6	1	2	2	6	3
Lake	1	6	3	0	4	3
Sea/beach	2	0	2	7	3	1
Waterfall	1	4	1	1	4	1

Table 8. Amount of reviews with activities the tourist attended

Do	US	AU	GB	CN	JP	SG
Walking/jogging/cycling/hiking/climbing	10	6	4	2	14	8
Take photo	5	2	3	10	10	2
Boat trip	2	4	9	4	5	7
Food	5	8	10	7	9	5
Shopping	2	3	1	1	0	0
Guide tour	3	0	1	0	1	0

Table 8 shows the amount of reviews with things the tourist did, which can be useful for investigating tourists' actions. American and Japanese tended to write about doing more exercises. Also, Chinese and Japanese wrote about taking photos.

Table 9. Amount of reviews with the most written comments on this travel

Comments	US	AU	GB	CN	JP	SG
Good view	94	92	76	35	55	62
Worth a visit	14	22	37	17	7	13
Must visit	19	31	17	8	6	15
Enjoyable	17	18	17	6	26	8
Good activity	14	13	16	5	8	6
Good staff	10	7	10	1	2	0
Good culture	10	4	9	0	1	4
Good food	3	7	5	3	1	8
Good access	7	4	1	3	2	2
Good infra	6	3	6	1	0	2
Nothing special	2	4	2	3	1	3
Bad crowds	3	2	2	3	2	3
Bad price	0	2	7	1	1	1
Good price	1	4	4	1	1	1
Bad infra	4	2	3	1	1	0
Good shop	2	5	1	1	0	1
Good guide	4	1	4	0	0	0
Good building	2	0	3	0	2	1
Worthy (money)	2	0	5	0	0	0

Table 9 shows the most written comments, which can be useful for analysing tourists' complaints and compliments. Comments on views are the most, followed by general comments about the whole travel experience (worth a visit or enjoyable). American, Australian and British tourists gave comments on the staff and guide. American and British cared if the culture is interesting or not. Australian and Singaporean commented more on food. British tourists commented more on price.

4.2 Results of Text-Mining

Table 10 shows the results of text-mining. There are results that are consistent with the manual analysis. The most written words are about the views. Americans wrote more about cultures; Australian and Singaporean wrote more about food; British wrote more about price and services, and little about access; Chinese wrote more about views and less about activities. However, it is difficult to exclude non-needs descriptive information from the needs-related information (information of the tourist and comments) without further analysis.

Table 10. Amount of reviews with different semantics divided by 5000

Semantics	US	AU	GB	CN	JP	SG
View	0.84	0.83	0.81	0.93	0.88	0.83
Activity	0.54	0.57	0.58	0.38	0.37	0.52
Culture	0.46	0.38	0.41	0.47	0.32	0.42
Access	0.29	0.32	0.27	0.31	0.36	0.36
Food	0.31	0.40	0.35	0.21	0.28	0.37
Shopping	0.24	0.27	0.25	0.21	0.33	0.34
Atmosphere	0.23	0.19	0.20	0.31	0.23	0.20
Infrastructure	0.20	0.20	0.23	0.10	0.16	0.19
Price	0.15	0.16	0.19	0.17	0.15	0.19
Service	0.09	0.12	0.15	0.03	0.05	0.09
Safety	0.02	0.01	0.02	0.03	0.02	0.02
Sanitary	0.00	0.00	0.00	0.00	0.00	0.01

5 Conclusions and Future Research

In this paper, contents of travel reviews collected from TripAdvisor posted by tourists from six countries written in English, Japanese, or Chinese, are analysed both manually and automatically. During the manual analysis, a content categorisation model with three main categories and ten sub categories (Table 2) is developed based on the KJ method. By transforming review content into these categories, information that is useful for finding travel facts, tourists' viewpoints, actions, complaints and compliments can be identified from non-needs-related information. Over 34% of reviews contain needs-related information (information of the tourist and comments), which can be useful for extracting tourists' needs. This result suggests that travel reviews from TripAdvisor can serve as a possible data source in order to develop a lower-cost method for real-time investigation of the needs of tourists across countries. Since the percentage of useful information differs between countries, sample size should be selected accordingly. Meanwhile, in the automatic analysis based on basic text-mining techniques, some results are consistent with manual analysis, which suggests that it is possible to use automatic analysis instead of manual analysis.

Limitations. Reviews used in this research are limited to six countries and three languages. Also, reviews are collected from a single UGC data source. Therefore, the results may not be able to be generalized to other data sources. Besides, reviews are clustered by the country of a tourist in this research, while other factors such as tourists' age, gender or occupation, travel season or destination, activities taken part in and experience can also be used for clustering. Moreover, the amount of reviews analysed using the manual analysis is limited. As a result, the overall amount of reviews is rather small when looking at detailed content and each country which prohibits from providing a representative conclusion concerning tourists' needs. Automatic content analysis is needed to process massive data. But basic text-mining techniques used in this research are unable to distinguish needs-related information from descriptive information.

Future research. To enable the analysis of a huge amount of reviews, a method that automatically transforms the content of reviews into the three main categories and the ten sub categories is needed. Also, results extracted from reviews need to be compared with survey results to prove that text mining may be able to serve as a substitute for field surveys. Meanwhile, information about the attraction is considered as unrelated information in the search for tourists' needs, but it may be helpful for the analysis of the characteristics of the destinations.

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The Search for Kenya: How Chinese-Speaking Generation Z Does Its Online Travel Planning

Shanshan Qi¹ and Rosanna Leung²(✉)

¹ Tourism College, Institute for Tourism Studies, Macau, China
shanshan@ift.edu.mo

² Department of International Tourism and Hospitality, I-Shou University,
Kaohsiung, Taiwan
rosannaleung@isu.edu.tw

Abstract. Travel planning is highly reliant on the websites of tourist bureaus, professional travel writers and experienced (non-professional) travelers. This study examines the search preferences of Chinese speaking Generation Z (alternatively known as Post-Millennials, the iGeneration, Founders, Plurals, or the Homeland Generation) as they plan a trip to a destination unfamiliar to them. The findings indicated more than 70% of the websites they frequented were well-known international sites, including user generated content (UGC) and the sites of business entities. The sites most preferred by Generation Z were UGC websites, with 100% of the participants saying they frequently use them while travel planning. The Destination Management Office (DMO) website was not a popular source, being frequently used by only 13% of participants. Of the nine dimensions of destination information, the two rated most important were *natural resources* and *natural environment*, which suggests that travel planners strongly associate Kenya with these qualities. *Leisure and recreation information* ranked least important. The results indicate, firstly, the perceived destination image affects the perceived importance of the destination information, and secondly, with the exception of popular world-wide travel websites, travelers prefer using local sites which share the same language and cultural background.

Keywords: DMO website · Destination information · Generation Z
Post-millennials · Search behavior · Preferred websites

1 Introduction

Information technologies have revolutionized the tourism industry in regard to the promotion of travel products and the ways that tourists search for and purchase travel related products (Buhalis & Law, 2008). Official websites and online social media networks are the main sources of destination information for potential tourists (Xiang, & Gretzel, 2010). The sites are managed by Destination Marketing Organizations (DMOs), which are non-profit entities aimed at generating tourism demand for a given area. “DMOs are generally involved with developing a unique image of an area, coordinating most private and public tourism industry constituencies, providing information to visitors, and leading the overall tourism industry at a destination” (Gretzel, Fesenmaier, Formica & O’Leary, 2006, p. 116). Hence destination official

websites offer local information and news to tourists, particularly information relating to such things as accommodations, dining, attractions and events (Gretzel, Yuan & Fesenmaier, 2000). Online social travel networks are proficient with helping tourists gather and share travel related information before and after their trips (Xiang & Gretzel, 2010). User Generated Content (UGC) in the form of travel reviews has become a major source for trip preparation (Leung, Law, Van Hoof & Buhalis, 2013).

This study investigates the information differences between online social travel networks and the websites of DMOs, comparing tourists' perceived information according to various dimensions of a destination. Beerli and Martín's (2004) nine-dimensional destination image framework is used to analyze the perceived destination images of potential tourists. The nine dimensions are: natural resources; general infrastructure; tourist infrastructure; tourist leisure and recreation; culture, history and art; political and economic factors; natural environment; social environment; and atmosphere of the place. Each dimension is a slice of the tourists' perceived destination image, and the frequency of the terms in each dimension defines its weight relative to the image. One can then compare and contrast the dimensions by means of their respective weights, to show, in multiple layers, how tourists perceive the image of a destination. This study aims to examine the search preferences of Generation Z as they plan a trip to a destination unfamiliar to them.

2 Literature Review

A destination image can be described as a compilation of beliefs and impressions based on the information processed from a variety of sources over time (Choi, Lehto & Morrison, 2007). The image can be categorized into two types: primary and secondary destination images (Phelps, 1986). Primary images are formed by internal sources, images of what one sees and hears, such as from past experience, whereas secondary images are formed by external sources—information obtained from others, for instance from their comments (Phelps, 1986). Baloglu and McCleary (1999, p. 874) distinguish between “symbolic stimuli” and “social stimuli”. The former refers to “the promotional efforts of a destination through media”; the latter concern “friends’ and relatives’ recommendations or word-of-mouth”. Destination’s official websites and online social travel networks are two excellent examples of online official channels and online UGC platforms.

2.1 Destination’s Official Websites

A potential destination should be in outstanding condition to attract tourists’ attention. Buhalis (2000) states that the meaning of a destination now comprises tourism products, and this transformed meaning is gaining recognition as a perceptual concept that may explain consumers’ inner and personal experience rather than facts such as their travel plans, cultural backgrounds, purpose of travel, as well as educational degree. To manage and develop destinations well, DMOs must, in their marketing strategies, endeavor to establish linkages between potential tourists’ experiences and destination tourism products. Official destination websites are one of the promotional channels

managed by DMOs to present destinations to potential tourists online. These websites should have a user-friendly interface (Qi, Law & Buhalis, 2008). Stienmetz et al. (2013) found that destination websites should notify, instruct, publicize, persuade and entertain. Homepage multimedia such as images and video are what users first notice, and the information should be presented in ways that encourage further exploration of the site (Luna-Nevarez & Hyman, 2012). Tourists need a variety of information to decide on their travel destination. Thus, it is a key how DMOs present information on their website to influence potential tourists' pre-trip image of a never visited destination.

2.2 Social Media Impact on Destinations

Destination positioning and tourists' selection of a destination are mainly influenced by the perceived destination images (Liang, Scherer & Morrison, 2011). Online social media networks provide an effective platform for most of the success factors associated with the marketing of destinations on the Internet, factors that include: attracting users, engaging users' interest and participation, retaining users, learning about user preferences, and relating back to users through customized interactions (Park & Gretzel, 2007). Virtual communities have transformed communication models and interactions with online users. Travel agencies and publishers aggressively exploit diverse marketing channels to promote destinations to their online customers. Tourists also explore, arrange, share and expand accounts of their travel experiences via multiple online channels including blogs and microblogs (e.g., Twitter), online communities (e.g., Facebook and TripAdvisor), media sharing sites (e.g., YouTube), social bookmarking sites (e.g., Delicious), social knowledge sharing sites (e.g., Wikitravel) and other channels (Leung, et al., 2013). There is growing interest in the effects of these online channels on destination images (Leung et al., 2013).

This study will investigate how prospective tourists obtain destination information of Kenya from different online channels. Since gaining independence from the United Kingdom in 1963, Kenya has become a popular tourist destination, receiving over 6% of total international tourist arrivals (Akama & Kieti 2003). The visitors are mainly from Europe, North America and other developed countries, and are attracted by wildlife parks and the coast (Akama, 1997; Akama & Kieti 2003). Tourist arrivals increased by 4% between 2015 and 2016, and the 2016 market share distributes as: Europe 35%, Africa 29%, Asia 17%, America 14%, Middle East 3%, and Oceania 2% (Kenya Tourism Board, 2017). The objectives of this study are: (1) to identify popular online channels selected by Generation Z; (2) to examine the role of DMO websites for travel planning; (3) to evaluate the perceived importance of nine dimensions of destination-related information, relative to each other and the two groups studied.

3 Methodology

This study aims to investigate how Generation Z searches for travel information for an unfamiliar travel destination. Due to financial restriction, Generation Z in both Taiwan and Macau mainly have short-haul trips in Asia during their vacation. Therefore the

researchers picked an African country—Kenya as this is not a popular travel destination among Generation Z in Taiwan and Macau. A quantitative research method is used in gathering tourists' perceptions as to the destination image of Kenya via websites. A total of 153 students were chosen using a convenience sample. The questionnaire was distributed to two English speaking colleges in Macau and Taiwan from mid-May to early June 2017. Only those who had never visited Kenya were qualified to participate in the study. The questionnaire was divided into two main parts: part A requested demographic information from the participants. Part B sought to capture, in accordance with Beerli and Martín's (2004) nine-dimensional framework, the attributes determining the importance and usefulness of the travel information that Kenya's travel websites provided. Each dimension contains four to 12 items. Students were asked to spend at least 30 min browsing all the information that Kenya's travel website presents. A pilot test was conducted with two university students before the formal data collection. The students were not confused by the questionnaire, nor did they have any suggestions other than to remark that they needed at least 40 min to review and collect information, and then five to 10 min to complete the questionnaire. Therefore, during the data collection process each respondent was given 40–50 min to search for information, then 10 min to complete the questionnaire. All students were required to perform the entire process in the campus computer lab. The collected questionnaires were transferred into SPSS for further data analysis. Descriptive statistics, Chi-square test and T-test were used to examine the behavioral differences among two groups of students.

4 Findings and Discussions

4.1 Participants' Background

A total of 153 students studying hospitality and tourism in two higher education institutes were selected. Ninety-one of them were studying in Macau and 62 of them in Taiwan. None of the students had ever visited Kenya, and their demographic distributions are listed in Table 1. Of these 153 students, about 25% were male and the rest were female. Regarding their travel experience, around one-third of the students had travelled three to five times and one-fourth of them had travelled more than eight times. The frequency distribution among the two study groups did not show any significant differences. However, more than half of the students in Macau had organized their latest tour by themselves, compared with one-third of the students in Taiwan. Tours for students in Taiwan were mainly arranged by family members and friends (54%) or consisted of group tours (15%). One participant had never travelled overseas.

Table 1. Participants' demographic frequency distribution

		Region		Total (n = 153)	χ^2	Sig
		Macau (n = 91)	Taiwan (n = 62)			
Gender	Male	20	19	39 (25%)	1.459	0.227
	Female	71	43	114 (75%)		
No. of trips travelled	0–2	17	15	32 (21%)	1.459	0.692
	3–5	36	19	55 (36%)		
	6–8	14	10	24 (16%)		
	Over 8	24	18	42 (27%)		
Who organized the tour	Never travelled	0	1	1 (1%)	12.639	0.005*
	Self	51	19	70 (46%)		
	Family and friends	36	33	69 (45%)		
	Group tour	4	9	13 (8%)		

*Significant at $p < 0.01$

4.2 Types of Travel Websites Used

Students were asked to list the travel websites they frequently use for planning trips. Around 36% of the students listed three websites, and around 33% listed two websites, the maximum number listed being six. A total of 416 items were collected, 365 of them are specific domain names and the remainder consisting of web categories (e.g. travel blogs and review sites). The top 10 travel websites amounted to 73% ($n = 266$; total = 365) of the listed websites. Table 2 lists the statistics of these 10 websites. The most popular site was TripAdvisor, which 56 participants reported using most often. The second most popular was Google. Participants said they just used keywords on Google and browsed for the travel information they needed. The third most popular website was Ctrip. This is the leading China-based travel hub and online travel agent, offering lots of Chinese travel information (Forbes, 2017). Of the 27 participants who used Ctrip, 24 were from Macau. As most of the participants' native language is Chinese, they can obtain travel information easily from Chinese websites. OTA's websites were also popular among participants. Of the top 10 websites, six were related to online purchasing. Interestingly, YouTube also played a role as destination information provider. Around 4% of the participants chose it as an information source. The key reason could be that a growing number of participants prefer to watch multimedia travel information rather than read texts (Almeida-Santana & Moreno-Gil, 2017).

Table 2. Top ten websites used for travel planning

Rank	Websites	Macau	Taiwan	Total (%)	Cumulative %
1	TripAdvisor	31	25	56 (15.3)	15.3
2	Google	40	13	53 (14.5)	29.9
3	Ctrip	24	3	27 (7.4)	37.3
4	Agoda	20	6	26 (7.1)	44.4
5	Airbnb	19	2	21 (5.8)	50.1
6	Trivago	7	14	21 (5.7)	55.9
7	Facebook	15	3	18 (4.9)	60.8
8	booking.com	11	5	16 (4.4)	65.2
9	YouTube	14	1	15 (4.1)	69.3
10	Expedia	13	0	13 (3.6)	72.9

The 416 websites are divided into four categories based on their content source: *user generated content* from tourists, *business websites* from tourism business entities, *information hubs* from official travel organizations and *search engines* from portals. User generated content (UGC) is further divided into three sub-categories: *travel blog*, *social media*, and *user review sites*. *Business website* is sub-divided into online travel agencies (OTA), *company website* (i.e., travel organization websites), and travel-related *metasearch engine*. *Information hub* includes *DMO* websites and online travel *guidebook*, and the last category is *search engine*. The most popular category is business websites, with a total of 160 items (38%) listed by the participants. UGC websites ranked second with a total of 153 listed, which indicates that 37% of the preferred websites were UGC websites. Search engine ranked third, with Google named 55 times. Baidu (China-based search engine) was named four times and Yahoo three times.

Table 3. Travel planning website category per region

Category	Sub-category	Region		Total	χ^2	Sig
		Macau	Taiwan			
Business Website	OTA	101	21	122	33.495	0.000**
	Company website	3	7	10		
	Metasearch engine	10	18	28		
	Total	114	46	160		
UGC	Travel blog	34	16	50	7.319	0.026*
	Social media	32	7	39		
	User review sites	36	28	64		
	Total	102	51	153		
Information Hub	DMO	8	12	20	0.196	0.658
	Guidebook	7	14	21		
	Total	15	26	41		

(continued)

Table 3. (continued)

Category	Sub-category	Region		Total	χ^2	Sig
		Macau	Taiwan			
Search Engine	Google	40	15	55	9.052	0.011*
	Baidu	4	0	4		
	Yahoo	0	3	3		
	Total	44	18	62		

*Significant at $p < 0.05$

**Significant at $p < 0.001$

4.3 Travel Website Preference

In the third question of the questionnaire, students were asked if they would use a DMO website when travel planning. The preferences of the Macanese students differed statistically from their Taiwanese counterparts. Table 4 illustrates the T-test results for these two groups. Half of the Macanese students reported that they would use a DMO website, compared with 70% of the Taiwanese students. The main reason for using DMO websites was the belief that it provides trustworthy information, whereas the main reason students gave for using non-DMO sites was that they valued the opinions of other travelers more than “manipulated” official information. Table 3 shows that only 20 students (13%) frequently used a DMO website. This shows that DMO websites are not a popular information source for Generation Z.

Table 4. Usage of DMO websites for travel planning

Use official website	Region		Total	χ^2	Sig
	Macau	Taiwan			
Yes	46 (50%)	43 (70%)	89 (59%)	5.359	0.021*
No	45 (50%)	19 (30%)	64 (41%)		
Total	91	62	153		

*Significant at $p < 0.05$

4.4 Ranking of Travel Information Importance

Berli and Martín’s (2004) framework helps tourists to perceive a potential tourist stop in all its major dimensions. This study asked the participants about the importance of each of the nine dimensions when planning trips. The dimension rated most important is *natural resources*, with an average score of 4.10; *natural environment* ranked second with an average of 4.08. The least important dimension was *tourist leisure and recreation*, averaging 3.35, and the second least important was *atmosphere of Kenya*, at 3.48.

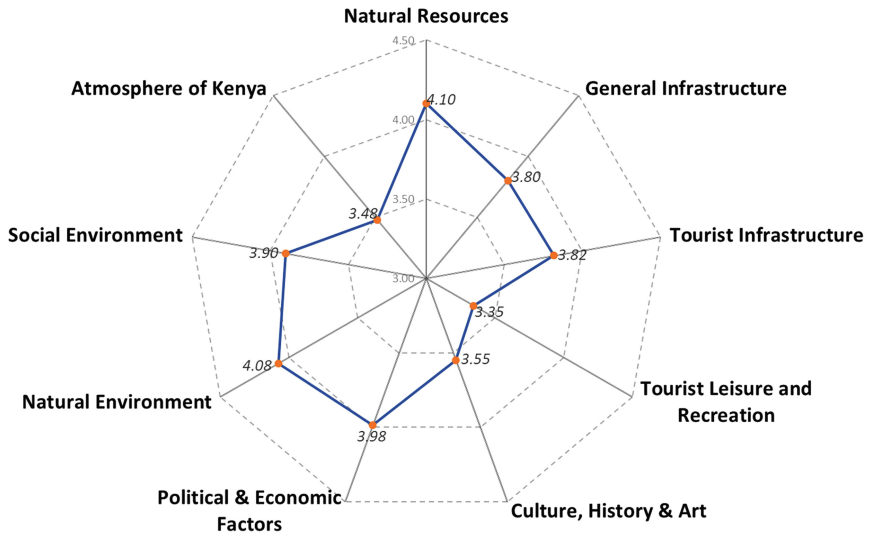


Fig. 1. Perceived importance among nine Web travel dimensions in terms of average scores

Figure 1 shows that *natural resources* ranked first and *natural environment* second in importance as destination image dimensions. However, when comparing the participants' rankings by region, we find several differences. First, average scores of students in Macau in eight out of nine dimensions were higher than those in Taiwan, and the remaining dimension, *tourist leisure and recreation*, was only 0.009 lower than Taiwan. From the T-test results, four dimensions show a significant difference between the two groups. *Political and economic* factors got the highest difference ($t = 4.375$; $p = 0.00$), with students in Macau 0.5 points higher than students in Taiwan. This indicates that students from Macau are more concerned with the political and economic situation of the places they consider visiting. The second dimension is *natural resources*, which include the local weather, natural attractions and the uniqueness of these attractions. The difference between the two groups is 0.3 ($t = 2.568$; $p < 0.05$). Evidently students in Macau are more concerned than their counterparts with what can be seen at a destination. The third dimension was *tourist infrastructure*, the differences being 0.2 ($t = 2.145$; $p < 0.05$). The infrastructure includes transport networks, airports, health services, wireless services and commercial infrastructure (Beerli & Martin, 2004). All these facilities could directly and indirectly affect tourists' travel and stay experience. The Macau group indicated a higher perceived importance than the Taiwan group. The last dimension that shows statistical differences is *natural environment*, which includes such factors as the attractiveness of the cities, cleanliness, overcrowding, pollution level and traffic congestion. All these factors affect tourists' overall impression of the destination, and the Macau group was 0.2 points higher than the Taiwan group ($t = 2.038$; $p < 0.05$) (Table 5).

Table 5. Perceived relative importance of nine web travel dimensions

Dimensions	Region	Mean	Std.	T	Sig.
Natural resources	Macau	4.206	0.529	2.568	0.012*
	Taiwan	3.952	0.646		
General infrastructure	Macau	3.890	0.660	2.145	0.034*
	Taiwan	3.677	0.558		
Tourist infrastructure	Macau	3.820	0.549	0.087	0.931
	Taiwan	3.811	0.655		
Tourist leisure and recreation	Macau	3.342	0.660	-0.074	0.941
	Taiwan	3.351	0.711		
Culture, history and art	Macau	3.567	0.715	0.392	0.696
	Taiwan	3.523	0.650		
Political and economic factors	Macau	4.190	0.698	4.375	0.000**
	Taiwan	3.681	0.713		
Natural environment	Macau	4.169	0.597	2.038	0.044*
	Taiwan	3.946	0.704		
Social environment	Macau	3.918	0.709	0.324	0.746
	Taiwan	3.880	0.688		
Atmosphere of Kenya	Macau	3.495	0.464	0.503	0.616
	Taiwan	3.458	0.425		

*Significant at $p < 0.05$ **Significant at $p < 0.01$

5 Conclusion and Limitations

This study has examined the importance of travel information from the perspective of Generation Z. The findings bring insights on tourists' travel activities, information channels and their information search behavior. The results indicate that out of the nine dimensions proposed by Beerli and Martín (2004), Generation Z perceived *natural resources* and *natural environment* as the two most important travel dimensions they consider for their travel planning, and *tourist leisure and recreation* the least important dimension for Kenya. This may indicate that when Generation Z travels to African countries, they expect to see the natural environment but are not looking for leisure and recreational activities. Business websites were the most popular source of travel information. One reason could be concern over price, since all participants are university students, and thus have limited travel budgets. The results also show that more than one-fourth of the websites used for travel planning are related to UGC sites. This reflects the importance of word-of-mouth and the influence power of peers (Erkan & Evans, 2016). In addition, 40% of the participants said they prefer to use a search engine as their entry point when searching for travel information. Even though DMO websites provide comprehensive and trustworthy information, around 40% of the participants said they prefer not to use these sites because they believe the information has been face-lifted to attract tourists. Prior research indicates there are differences in

social media usage depending on nationality, gender and age (Almeida-Santana & Moreno-Gil, 2017). Interestingly, when we compare the statistical results from the two study regions, we find several significant differences in travel behavior and information search behavior, even though the demographic backgrounds are quite similar. Students in Macau prefer to use Mainland Chinese websites, whereas students in Taiwan use Taiwanese websites.

This study has several limitations. First, the sample size is relatively small, and all the participants were university students, so the results might not fully generalize to Generation Z's behavior. Second, this study was conducted in Taiwan and Macau, so the results reflect only the behavior of Chinese-speaking regions. Finally, given that three-quarters of the participants were female, male travel behavior and information search behavior may be under-represented.

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Ethnic Restaurant Selection Patterns of U.S. Tourists in Hong Kong: An Application of Association Rule Mining

Muhyang (Moon) Oh, Irene Cheng Chu Chan^(✉),
and Fuad Mehraliyev

School of Hotel and Tourism Management, The Hong Kong Polytechnic
University, Hung Hom, Hong Kong

{moon.oh, irene.cc.chan, fuad.mehraliyev}@connect.
polyu.hk

Abstract. Food is widely recognized as an important attribute that attracts tourists to a particular destination. Drawing on data related to the online reviews of U.S. tourists on ethnic restaurants in Hong Kong, this study presents the first attempt to identify tourists' restaurant selection patterns at destinations by applying the association rule mining technique. Results of this study show that most U.S. tourists have tried Cantonese food while in Hong Kong. Japanese, Asian Fusion, Shanghainese and Taiwanese cuisines are found to be substituting alternatives to Cantonese cuisines, as tourist review patterns reveal negative relationships between them and ethnic Cantonese restaurants. A portion of U.S. tourists exhibit food neophobic behaviours as they appear to be reluctant to try Cantonese cuisines and stick to their own food instead. Given these findings, practical implications are provided for destination marketing organisations.

Keywords: Association rule mining · Market basket analysis · Online reviews · Restaurant selection · Ethnic food

1 Introduction

Food consumption plays a significant role in enhancing tourists' experiences at a destination and influencing their revisit intention (Kivela & Crofts, 2006). Food is also a manifestation of national identity and culture, which differentiates a destination, and enhances its attractiveness (Guan & Jones, 2015; Kim & Kim, 2017). Cuisines offered by a destination have gradually become a primary motivation for people to travel, especially to metropolitan destinations such as Hong Kong (Enright & Newton, 2005). Hong Kong, a multi-cultural destination featuring a mixture of Asian and Western cuisines, is renowned as a "culinary capital". The vibrant mix of cuisines embellishes Hong Kong's destination image, and sustains the city on the competitive edge (Okumus, Okumus, & McKercher, 2007). According to the statistics from Hong Kong Tourism Board (2016), food consumption outside hotel occupies 14.3% of tourists' total expenditure, representing the third largest portion of tourist expenditure in the city, after accommodation and shopping.

The purchase decisions of tourism products at a destination are, however, not independent (Solnet, Boztug, & Dolnicar, 2016). For example, if a tourist chooses to stay at a hotel downtown, he/she has to take a taxi or book a transfer from the hotel. Conversely, if he/she chooses to stay next to the airport, a taxi is not needed. There are various possible relationships and combinations among tourist products consumption. Similarly, the selection of restaurants, in particular ethnic restaurants, during a trip is not independent. A tourist's choice of restaurants serving Cantonese cuisine is likely to reduce the probability of selecting the same cuisine again in the next meal. This proposition is supported by the variety seeking behaviour (Ratner & Kahn, 2002; Van Trijp, Hoyer, & Inman, 1996), and may even be more prominent at destinations featuring rich diversity of international tastes because tourists are provided by many choices. There is, however, a lack of understanding of the restaurant selection behaviour of tourists at a destination. Understanding tourists' pattern of restaurant selection will provide important implications for destination marketing organisations in terms of promotional efforts on food tourism. This research seeks to fill this void by answering the following research question:

RQ: Are choices of ethnic restaurants associated with each other? If so, how?

It is evident that long-haul and short-haul tourists are motivated by different factors, which lead them to perform rather different activities at a tourist destination (Ahn & McKercher, 2015; Bao & McKercher, 2008). This study focuses on the restaurant selection patterns among U.S. tourists, who represent 26% of all long-haul markets and is the largest source market visiting Hong Kong (Hong Kong Tourism Board, 2016). In particular, this paper has two main objectives. First, it seeks to identify the pattern of ethnic restaurant selection using empirical data from U.S. tourists. Second, it demonstrates the usefulness of association rules mining in providing useful suggestions to industry practitioners.

2 Literature Review

2.1 Ethnic Food Consumption

Ethnic food refers to the food pertaining to a specific region, which represents the cultural characteristics and traditions of a particular ethnic group (Kim & Kim, 2017). The term "ethnic food" is often used to indicate unfamiliar cuisines outside ones' domestic region (Ting, Run, Cheah, & Chuah, 2016). Thus, ethnic restaurant experience is not only for dining-out, but also for learning foreign cultures (Chhabra, Lee, Zhao, & Scott, 2013). The ethnic food market has been growing rapidly due to globalization and tourism development in recent years (Bu, Kim, & Son, 2013). People who enjoy ethnic food try to have an authentic cuisine experience from a variety of sources. These efforts make providers expend the sources of entertainment, such as ethnic food in restaurants, festivals, and other tour products (Kim & Kim, 2017). There is, thus, a need to find specific ethnic food consumer segments (Kim, Choe, & Lee, 2016; Kim & Kim, 2017).

2.2 Restaurant Selection of Tourists

Food is an imperative pull factor that leaves impressive memory through tourists' sensory experiences (Kivela & Crofts, 2006; Ryu & Han, 2010b; Updhyay & Sharma, 2014). Unlike restaurant choice in daily lives, restaurant selection at tourist destinations exhibits a different pattern due to its temporal characteristics (Mak, Lumbers, Eves, & Chang, 2013). Dominantly, food quality, atmosphere, and service quality are important attributes that customers consider when choosing restaurants (Clemes, Gan, & Sriwongrat, 2013; Ha & Jang, 2010; Ryu & Han, 2010a). Meanwhile, the type of restaurant establishment also influences selection criteria. For instance, food quality and presentation, ambience, and friendly employees are essential for upscale restaurant choices (Clemes et al., 2013), while a cozy environment and service speed are critical for fast-food restaurants (Baek, Ham, & Yang, 2006). The differences in restaurant choice attributes primarily grounds on the different values that customers seek (Ha & Jang, 2013), and their demographic characteristics (Harrington, Ottenbacher, & Kendall, 2011). Female customers stress more on price, predicted quality, and dietary traits compared to male customers. On the other hand, mature customers prefer restaurants with promotions and private ambience, while their younger counterparts pursue value for money (Harrington et al., 2011).

Tourists frequently rely on advertisements in magazine or internet to select restaurants (Pedraja & Yagüe, 2001). They also make spontaneous and random decisions at a destination based on the attractive ambience of restaurants manifested from the interior design, music, and menu at the door (Cohen & Avieli, 2004; Pedraja & Yagüe, 2001). Although studies related to ethnic restaurant selection is scant, similar features are expected. Batra (2008) found that cultural signals such as unique atmosphere, taste of food, cues of authentic cooking are the most important factors attracting foreign tourists to ethnic restaurants.

2.3 Food Consumption: Food Neophobia

Research reveals five motivational factors of food selection in tourism including cultural experience, excitement, interpersonal relationship, sensory appeal, and health concern (Mak, Lumbers, Eves, & Chang, 2017). Different attempts have been made to segment tourists based on their restaurant selection factors. Yüksel and Yüksel (2002) put tourists into four segments, including value seekers, service seekers, adventurous-food seekers, atmosphere seekers, and healthy food seekers. Updhyay and Sharma (2014) segmented three clusters of tourists namely taste seekers, localization seekers, and experience seekers. These studies on motivational factors and segmentation of food tourists commonly assumed that food is perceived as one of the attractions for tourists.

However, food does not always represent positive experiences. Cohen and Avieli (2004) asserted that food can also be a physical and psychological barrier for tourists. Westerners experience food neophobia when they visit developing countries because of the fear coming from poor hygienic standards and health risk in local food (Cohen & Avieli, 2004). Food neophobia refers to a person's unease towards unfamiliar food, and consequently the tendency of avoiding it (Barrena & Sánchez, 2013; Pliner & Salvy,

2006). Food neophobia is mainly caused by sensory quality, information about the food, and consumers' personality (Tuorila, Meiselman, Bell, Cardello, & Johnson, 1994). Moreover, the differences in local habits from that of tourists hinder their intention to try local cuisines as well. A typical example is the display of swimming fish in water tanks in front of the restaurants commonly found in China, Hong Kong, and Korea. Some tourists feel uncomfortable and disgusted (Cohen & Avieli, 2004) to see the fish being killed and prepared for them according to their requests. This "strange food" is one of the seven risks for international tourists in addition to risk such as health, political issues, terrorism, and cultural barriers (Lepp & Gibson, 2003). Food-neophobic consumers seek to improve their feeling of security (Siegrist, Hartmann, & Keller, 2013). Existing studies show that, food neophobia does not have a significant impact on intention to try ethnic food consumption (Ting, et al., 2016). There is, however, limited research on the role of neophobic attitude on ethnic food consumption patterns.

2.4 Food Consumption: Variety-Seeking Behaviour

Variety seeking behaviour (VSB) is an alternative explanation of food consumption. VSB refers to the tendency of selecting a variety of products when consumers are given a chance to select more than one product and a chance to repeat their preferred items (Ratner & Kahn, 2002). This phenomenon explains customers' brand switching behaviours in marketing literature (Van Trijp et al., 1996), and is attributed to different mechanisms. According to McAlister and Pessemier (1982) one of the important reasons for VSB are changes. McAlister and Pessemier (1982) summarized the motivations of variety seeking into three categories of changes, including change in accessible alternatives, change in preferences, and change in restrictions. People travel with a "touristhood state of mind" (Jafari, 1987), in which they ignore all cultural norms and psychological barriers to allow themselves to act as they wish (Zhao & Lin, 2014). From these perspectives, travelling to a new destination could be thought as a change in the surrounding environment and consequential changes in preferred food availability, and changes in psychological barriers. Therefore, tourists are more likely to try a variety of food which they would not have tasted in their own country.

2.5 Association Rules Mining

Association rules mining is a method to identify correlations among items, with the purpose of extracting patterns in data (Li, Law, Rong, & Vu, 2010). Market basket analysis (MBA) is one of the association rules mining techniques to identify frequent patterns of product purchase in a dataset. In other words, it uncovers hidden association rules in data that may not be observable on the surface. In MBA, it is assumed that products offered in a store is the whole world, and the basket of each customer is the main target of analysis for identifying the pattern of their choices. A finding of positive correlation indicates that people who bought item X also purchased item Y (Taniar, 2008). Conversely, negative correlation between two items means that those who purchased X did not purchase Y. Consumption patterns derived from MBA can be applied to plan merchandizing, goods display, and so on. For instance, knowing that

customers who purchased nuts also purchase beers suggests that supermarket managers should arrange displays of the two products close to each other, thereby enhancing the shopping experiences and conveniences for customers, and trigger impulsive purchases.

There are three essential indicators including support, confidence, and lift. *Support* indicates the frequency of occurrence of a particular rule in a given dataset. A value of 1 indicates that 1% of the data support this particular relationship. The threshold for this indicator is usually defined by researchers themselves based on the distribution of the data (Li, et al., 2010). The formula is denoted as:

$$S(X \rightarrow Y) = \frac{P(X \cup Y)}{N} \quad (1)$$

The second indicator, *confidence* refers to the probability of Y's existence given X's existence in the same basket, or in other words, the probability of a customer buying both items X and Y together given that he/she has purchased X, and the formula is:

$$C(X \rightarrow Y) = P(Y|X) = \frac{P(X \cup Y)}{P(X)} \quad (2)$$

Lastly, *lift* is the probability of co-existence of X and Y in the same basket, given that X and Y are independent incidents. A value larger than 1 indicates a positive correlation between X and Y, which means that customers purchasing item X are likely to purchase item Y at the same time, and vice versa. Conversely, a value less than 1 denotes a negative correlation between X and Y. A value of 1 specifies that X and Y are independent of one another, and their occurrences are not related at all.

$$L(X \rightarrow Y) = \frac{\text{Confidence}(X \rightarrow Y)}{P(Y)} = \frac{P(X \cup Y)}{P(X)P(Y)} \quad (3)$$

2.6 Association Rules Mining in Tourism Literature

In tourism literature, limited research has been conducted to apply the association rules mining technique. Li, et al. (2010) used this method to study the outbound tourism market of Hong Kong. They found that without visiting Guangdong Province, a tourist is unlikely to visit other parts of Mainland China. Similarly, without experience with browsing a website and visiting Macau, a tourist is not likely to visit Mainland China. Thus, the travel experience at Guangdong Province or Macau is a key signal for anticipating outbound trips to other parts of Mainland China. On the other hand, Emel, Taskin, and Akat (2007) tried to find the association rules among hotel preference attributes. Their findings showed that, married customers who consider activities for children as important in their selection of a hotel, will also consider room size, room view and cleanliness as important attributes. Versichele et al. (2014) studied the association rules among tourist attractions based on Bluetooth tracking data, and revealed interesting patterns. The study showed that tourists tend to rarely combine visits in the city center with visits in suburban areas.

There is a gap in the literature related to the association among restaurant selection decisions. Specifically, there is a lack of studies investigating the associations among the choices of different ethnic restaurants. For the purpose of this study, an ethnic restaurant is defined as any full-service restaurant that serves food of a specific country or region (Ting et al., 2016). This study uses restaurant online reviews to represent tourists' food preferences.

3 Methodology

3.1 Data Collection

Similar to the approach of Ye, Law, and Gu (2009), online reviews on ethnic restaurants were used as a proxy for restaurant selection. The study treated reviewers as tourists who are willing to participate in social sharing due to the high intensity of emotions they experienced (Luminet IV, Bouts, Delie, Manstead, & Rimé, 2000) regardless of whether they are positive or negative. Data were collected from Yelp.com in July 2017 using an automated Web crawler (Parsehub.com). Yelp.com is selected for its popularity among U.S. residents. Preliminary filtering on the type of restaurants was performed on the review platform, so that categories such as "Coffee & Tea Shops", "Wine Bars", and "Cafés" etc., were excluded. Only categories representing a specific type of food from a nation (i.e., "Sushi", "Dim Sum", and "Italian", etc.) were included in the data crawling process. For each restaurant in Hong Kong listed on the review platform, the Web crawler extracted five pieces of information, including (1) name of the restaurant, (2) type of restaurant, (3) names of all reviewers, (4) places of origin of the reviewers, and (5) date of reviews posted. The whole data collection process was completed on the same day to avoid potential discrepancies as online review platforms contain dynamic information. From the collected data, only the information from U.S. tourists were extracted, which resulted in a total of 4411 set of entries corresponding to 596 restaurants in Hong Kong.

3.2 Data Coding—Classification of Ethnic Restaurants

The present study is interested in the type of ethnic food (or menu) that tourists consume while traveling, as well as their associations. As such, restaurant classification is performed on the ethnic origins of food served by the restaurants. To ensure consistency, the restaurant type is manually recoded based on the work of Okumus, Okumus, and McKercher (2007). As shown in Table 1, restaurants in Hong Kong range from three main categories including Chinese, other Asian, and Western cuisines. They can be further categorized into 27 different unique cuisines (e.g., Cantonese, Pekingese, etc.). Further verification by checking the website of the restaurant was done to resolve any doubts on the categorization. For subsequent data analysis, cuisines representing less than 1% of all U.S. tourist reviews were grouped into sub-categories, including Other Chinese, Other Asian, American, and Other Western cuisines, resulting in a total of 14 sub-categories of ethnic restaurants.

Table 1. Categorization of restaurants in Hong Kong

Category	Sub-category	Grouped cuisines
Chinese	Cantonese	
	Pekingese	
	Shanghaiense	
	Other Chinese	Northeastern Chinese, Shandon, Shanxi, Chiu Chow, Szechuan
Other Asian	Japanese	Japanese traditional, Japanese fusion
	Taiwanese	
	Korean	
	Asian fusion	
	Other Asian	Indian, Indonesian, Singaporean, Malaysian, Thai, Vietnamese
Western	French	
	Italian	
	American	U.S., Mexican
	Spanish	
	Others Western	British, German, International

Note Adapted from Okumus, Okumus, and McKercher, (2007)

The date on which each review was posted was used to determine whether the restaurant choices fall into the same basket (i.e., during the same trip) or not. According to the National Travel and Tourism Office (2016), the average length of stay of U.S. travelers is 17.2 nights in 2015. Thus, a value of 18 was used as a cut-off point to distinguish restaurant choices belonging to the same basket of a tourist. The data was then ranked according to reviewers and transformed into 3152 online review baskets. On average, each reviewer's market basket contains 2–3 restaurant choices in a trip. Reviewers may share the same user name, and thus their places of origin were used to confirm the unique identity of each reviewer.

3.3 Data Analysis

A total of 3152 online review baskets were used in the analysis. Since the number of unique types of ethnic restaurants is 14, multiplying it by 3152 baskets resulted in a total of 44,128 cells. RStudio was used for the data analysis. RStudio software is an open source statistical analysis software offering multiple user-friendly interfaces which is not available from the R programming software. It also has strong advantages of visualization of statistical results. The package "arules" was applied for the market basket analysis. This study set the threshold of support and confidence as 1 and 10% respectively for reporting based on the distribution of the dataset (Li, et al., 2010).

4 Results

4.1 Frequency Analysis

Figure 1 shows the proportion of U.S. tourists’ online reviews on restaurants in Hong Kong. In their online review baskets of Hong Kong restaurants, Cantonese restaurants occupied a dominant proportion (62.13%), followed by Japanese restaurants (11.39%) and Asian Fusion restaurants (8.02%). American restaurants and Taiwanese restaurants occupy the same proportion in the baskets (5.93%), while Spanish (1.62%) and Korean (1.55%) occupy the smallest.

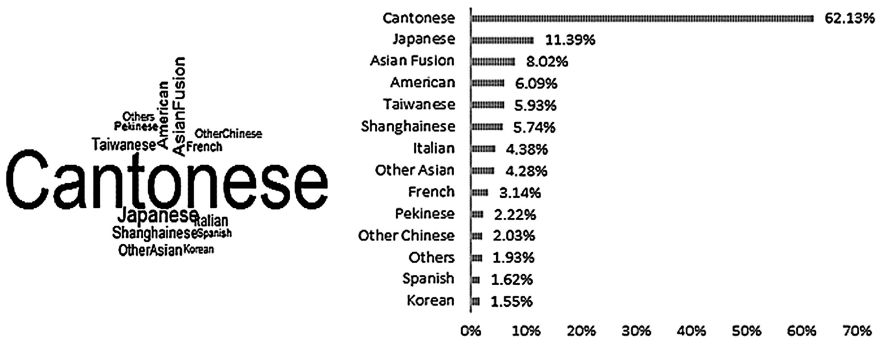


Fig. 1. Proportion of U.S. tourists’ online reviews on restaurants in Hong Kong

4.2 Association Rules Mining

The results of the market basket analysis is presented in Table 2. A total of 18 rules were found with support values larger than 1% and confidence values larger than 10%. The rules were arranged based on the value of support from descending order. The first two rules contain only one restaurant in the basket, indicating that if there is only one comment about a Hong Kong restaurant generated by U.S. tourists, it is likely to be either about Cantonese restaurants (supp = 62.13%) or Japanese restaurants (supp = 11.39%).

Interestingly, most of the rules are having a lift value less than 1, which indicates negative correlations between the two types of ethnic restaurants. Rule 3 (Japanese → Cantonese: supp = 2.92%, lift = 0.44) indicates that if U.S. tourists made comments about Japanese restaurants, they are unlikely to make comments about Cantonese restaurants. Rules 4–7 can be interpreted in a similar way. When U.S. tourists post comments on Asian Fusion restaurants (Asian Fusion → Cantonese: supp = 2.19%, lift = 0.42), Shanghainese restaurants (Shanghainese → Cantonese: supp = 2.06%, lift = 0.58), Taiwanese restaurants (Taiwanese → Cantonese: supp = 1.55%, lift = 0.41), and American restaurants (American → Cantonese: supp = 1.14%, lift = 0.30), they are unlikely to post reviews on Cantonese restaurants. In other words, the selection of these ethnic restaurants are all negatively associated with the selection of Cantonese restaurants.

Table 2. Association rules of online review baskets

No.	Rules		Support (%)	Confidence (%)	Lift
	Antecedent	Consequent			
1	{ }	→ Cantonese	62.13	62.13	1.00
2	{ }	→ Japanese	11.39	11.39	1.00
3	Japanese	→ Cantonese	2.92	25.63	0.44
4	Asian Fusion	→ Cantonese	2.19	27.27	0.42
5	Shanghainese	→ Cantonese	2.06	35.91	0.58
6	Taiwanese	→ Cantonese	1.55	26.20	0.41
7	American	→ Cantonese	1.14	18.75	0.30

Note Minimum support threshold = 1%, minimum confidence threshold = 10%

5 Discussion and Implications

The study reveals several interesting findings from U.S. tourists' online reviews on restaurants in Hong Kong. First, American tourists show substantial preference to local food (Cantonese) followed by Japanese and Asian Fusion cuisines. This is not surprising as food plays a significant role in attracting tourists and enhancing tourists' destination experience (Bessière, 1998; Enright & Newton, 2005). The results align with the notion of variety seeking behavior associated with changes in feasible alternatives (McAlister & Pessemier, 1982). Apparently, Hong Kong features more Cantonese restaurants than American ones, and so tourists sought food different from their own ethnic background given the changes in available choices.

From the market basket analysis, tourists commenting on any ethnic restaurant of Japanese, Asian Fusion, Shanghainese, and Taiwanese cuisines are less likely to comment on Cantonese restaurants. This negative correlation implies that U.S. tourists may consider these four ethnic restaurants as competitive substitutes for Cantonese ones. Tourists face limited resources, such as time, money, and even quota for food, albeit offered with thousands of appealing alternatives. Trying Japanese or Shanghainese, or any one of the four restaurants seems to be representative of Asian flavours, and thus reduce the probability of selecting Cantonese restaurants.

It is worthwhile to note that, although the majority of U.S. tourists tried, and therefore, commented on Asian cuisines, a portion of tourists did not. Findings show negative correlation between U.S. and Cantonese restaurants implying that, a portion of tourists who go to U.S. restaurants are less likely to go to Cantonese restaurants. This may be due to various reasons, and one possible reason is that these tourists are likely to be neophobic people, who prefer their own cuisines rather than trying local ones (Barrena & Sánchez, 2013; Pliner & Salvy, 2006). For them, local food represent a barrier rather than an attraction (Cohen & Avieli, 2004).

Above all things, this study represents a pioneering attempt to study restaurant selection patterns of tourists at a destination. It also demonstrates the usefulness of association rule mining which offers valuable methodological insights. It contributes to the existing literature related to tourists' food consumption by identifying their variety

seeking and neophobic behaviours in ethnic restaurant selection. Further research is needed to collect comprehensive restaurant selection data, which will shed more light on this important topic.

This study also offers practical implications. First, this study suggests that Cantonese cuisines are perceived as highly similar to other Asian cuisines, including Japanese, Asian Fusion, Shanghaiese, and Taiwanese. It is posited that tourists face difficulty in differentiating local Cantonese cuisines with other Asian cuisines. The non-distinguishable features among different types of Asian cuisines reduce tourists' intention to actively try local food as they believe that one Asian restaurant may be a representative of all the others. Cantonese cuisines represent the rich local culture and identity of Hong Kong (Guan & Jones, 2015; Kim & Kim, 2017). Destination marketing operators should put more effort in highlighting the unique features of Cantonese cuisine to stimulate tourists' interests in consumption. Moreover, it seems that some American tourists are resistant to try any local food. This represents a great potential segment which should be addressed. Future research may study the demographic characteristics of the group of tourists with food neophobia and address specific research questions, such as "what are the antecedents and consequences of their neophobic behaviors?" and "how can they overcome food neophobia?"

To answer the research question proposed earlier in this paper, choices of ethnic restaurants are associated. The findings of this investigation contribute to our understanding of restaurant selection of tourists. The main limitation of this study lies in the application of online review data as a representative of restaurant selection and preference, owing to the paucity of possibility to get a complete list of tourists' restaurant selection. Thus, generalizing the findings and implications of this study have to be made with caution. The authors call for more research effort on this important research topic, which will generate useful insights for the industry.

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Automatic Summarization of Multiple Travel Blog Entries Focusing on Travelers' Behavior

Shumpei Iinuma, Hidetsugu Nanba^(✉), and Toshiyuki Takezawa

Graduate School of Information Sciences, Hiroshima City University, Hiroshima,
Japan

{iinuma, nanba, takezawa}@ls.hiroshima-cu.ac.jp

Abstract. The evolution of information and communication technology now makes it possible to collect travel information in a variety of ways. Social media content that includes blogs is one such useful information source when planning a trip. In this study, we propose a method for generating a summary of multiple travel blog entries that contain images. Our method identifies significant sentences in addition to the images by using a graph-based approach that takes account of travelers' types of behavior. To investigate the effectiveness of our method, we conducted experiments, which demonstrated that our method can outperform some baseline methods. We also implemented a system for generating summaries based on our method.

Keywords: Travel blog · Multimedia summarization · Travel information processing

1 Introduction

Travel guidebooks are a useful information source about travel. Guidebooks give basic information about tourist spots, souvenirs, restaurants, and hotels. However, social media content, particularly travel blogs, are another, more recent, information source that provides many bloggers' experiences of travel destinations, tourist spots, and hotels.

Various researchers have investigated travel blogs as an information source for travel. For example, Nanba et al. (2009) proposed a method that can identify travel blog entries automatically from blogs using machine learning technology. Fujii et al. (2016) proposed a method of classifying travel blog entries into the five categories (or content types) shown in Table 1. However, these methods are not useful for travel planning if there are many travel blogs related to the intended destination, because it would take too long to read all of them.

In this paper, we propose a method that summarizes a set of travel blog entries about a destination. Although there are many studies about text summarization, which we will describe in Sect. 2.2, a notable difference between previous studies and our approach is that our method focuses not only on texts but also on images. Our summarization method is based on LexRank (Erkan & Radev, 2004), which were proposed for summarizing texts. Main contribution of our work is to expand the LexRank to summarize not only texts but also images. Potential travelers using our system can

quickly get essential information about a destination from our system’s output summary, which contains both text and image information.

The remainder of this paper is organized as follows. Section 2 discusses related work. Section 3 describes our method. To investigate the effectiveness of our method, we conducted experiments whose results are reported in Sect. 4. Section 5 shows the system behavior in terms of snapshots. We present some conclusions in Sect. 6.

Table 1. Content types and their descriptions

Content type	Description
Watch	Blog entry about sightseeing at tourist spots
Experience	Blog entry about an experience such as scuba diving or dancing
Buy	Blog entry about shopping or souvenir stores
Dine	Blog entry about drinking and dining
Stay	Blog entry about accommodation

2 Related Work

2.1 Travel Information Recommendation

Wu et al. (2008) proposed a system that searched and summarized tourism-related information. When a user (traveler) entered a query, such as “What is the historical background of Tian Tan?” the system searched for and obtained information from Wikipedia, Flickr, YouTube, and official tourism Web sites using the tourist spot name as a query. Their system also classified the query as belonging to one of five categories, namely “general,” “history,” “landscape,” “indoor scenery,” and “outdoor scenery,” to provide users with more relevant information. For example, if a query is classified as belonging to the “history” category, the information is obtained from texts, whereas a query regarding “outdoor scenery” obtains its information from photos and videos. However, even if a query is classified to “history” category, showing a text with images as an answer might be easier to understand than just showing a text. Therefore, we construct a system that generates summaries comprising multiple sentences and images from a set of travel blog entries.

Hao et al. (2010) proposed a method for mining location-representative knowledge from travel blogs based on a probabilistic topic model (the Location-Topic model). Using this model, they developed three modules, namely a destination-recommendation module for flexible queries, a characteristics-summarization module for a given destination (with representative tags and snippets), and an identification module for informative parts of a travel blog that enriched the recommendations with related images. However, the output summaries do not always match with images, because this system extracts them from different sources. We propose a summarization method that takes account of association between texts and images.

2.2 Text Summarization

Text summarization is a method that identifies important information in a text (or multiple texts), and shows the results as a summary text. Text summarization has been studied since Luhn (1958) and has become a hot topic in the field of natural language processing. Typically, the traditional approach to text summarization is to identify important sentences from a text (or multiple texts) and output them as the result of the summarization. Several methods have been proposed to identify important sentences in texts. We now describe one such well-known method, called LexRank (Erkan & Radev, 2004), whose effectiveness has been confirmed in other text-summarization research, including the Text Analysis Conference (TAC) (<https://tac.nist.gov/>), an evaluation workshop for text summarization. In our work, we also adopt LexRank.

LexRank calculates the importance of each sentence based on the idea of centrality in eigenvectors and creates a similarity graph. Figure 1 is an example of such a graph.

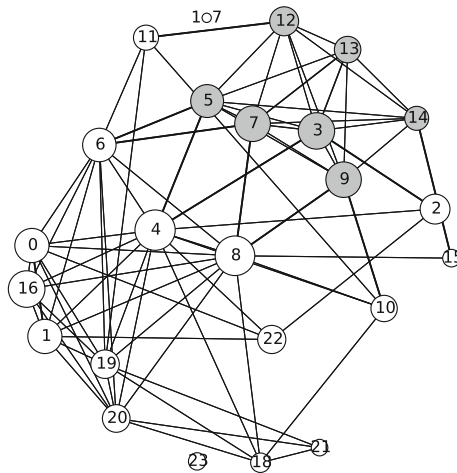


Fig. 1. An example of a similarity graph

In the graph, each node indicates a sentence, with the number in each node identifying the node. If the similarity between two sentences exceeds a threshold value, the two nodes are linked, as shown by the edges in the figure. From this graph, the importance of each node u (a sentence) is calculated using the following Eq. (1). This equation is similar to the PageRank equation (Brin and Page, 1998).

$$p(u) = \frac{1-d}{N} + d \sum_{v \in \text{adj}[u]} \frac{p(v)}{\text{deg}(v)}, \quad (1)$$

where N indicates the number of nodes (sentences), d is a “dumping factor” (Brin and Page, 1998), $\text{adj}[u]$ is the set of nodes linked to node u , and $\text{deg}(v)$ is the order of node v . As for PageRank, sentences that have many links to others tend to obtain higher

page-rank scores. Erkan and Radev (2004) proposed Continuous LexRank, which is an extension of LexRank. LexRank treats all links between sentences equally, whereas Continuous LexRank employs a similarity value between sentences as a weight for each link. Continuous LexRank is defined by Eq. (2).

$$p(u) = \frac{1-d}{N} + d \sum_{v \in \text{adj}[u]} \frac{\text{weight}(u, v)}{\sum_{z \in \text{adj}[v]} \text{weight}(z, v)} p(v) \quad (2)$$

In our work, we expand LexRank to generate a summary that comprises text and images. If we can associate texts with images, we can calculate the importance of each sentence and image at the same time. We consider that the two sentences appearing before and after an image are related to that image, and create one graph from both sentences and images. We then apply LexRank (or Continuous LexRank) to this graph to calculate the importance of each sentence and text. In applying the equation, we also employ a “biased factor” (Otterbacher et al., 2009), which we will describe in Sect. 3.

3 Summarization of Multiple Travel Blog Entries

Our system assumes that the travel blog entries to be summarized have been geotagged and classified into five categories using Fujii’s method (Fujii et al., 2016) in advance. When a user specifies a content type and geographical region, our system generates a summary from all blog entries having the relevant content type within the region. A summary is generated by the following procedure.

- Cluster the travel blog entries to be summarized,
- Calculate the importance of each sentence and image for each cluster,
- Select three to five important sentences and images for each cluster.

Because the blog entries to be summarized might contain multiple topics, we conduct hierarchical clustering when grouping blog entries having a similar topic. We employ the furthest-neighbor method for the clustering. In the clustering process, we merge two clusters if the distance between these clusters is smaller than a threshold value. Here, we express each document as a vector of words, whose weights are calculated by tf*idf (term frequency-inverse document frequency). To calculate the distance between clusters c_i and c_j , we use the function $f(c_i, c_j) = 1 - \cos(c_i, c_j)$, where $\cos(c_i, c_j)$ indicates cosine similarity.

3.1 Calculation of the Importance of Each Sentence and Image Using LexRank

As discussed in Sect. 3.2, both LexRank and Continuous LexRank obtain the importance of each sentence by calculating the PageRank score for each node of a sentence-similarity graph. We expand these algorithms by calculating the importance of each

sentence-and-image together, using a graph created from sentences and images. We consider that the two sentences appearing before and after an image are related to that image, and create one graph from sentences and images. In creating this concatenation graph, we consider the similarity score between an image and its adjacent sentences as 1. We then use the weights $a_{i,j}$ in Eq. (3) to calculate the weight between nodes i and j (sentence/image).

$$a_{i,j} = \begin{cases} \text{sim}(s_i, s_j) & (\text{type}(s_i) = \text{type}(s_j)) \\ 1 & (\text{type}(s_i) \neq \text{type}(s_j) \text{ and } |i - j| = 1) \\ 0 & (\text{otherwise}) \end{cases}, \quad (3)$$

where s indicates an element (a sentence or an image) in a blog-entry sentence and s_i indicates the i th element in a blog entry. $\text{type}(s_i)$ indicates whether each element is a sentence or an image, and sim is a function that calculates the similarity between two elements. Here, we use different similarity functions for each element type. We will explain the calculation between elements in Sect. 4.2. In our example of a graph (see Fig. 1), white and gray nodes indicate sentences and images, respectively. The size of each node indicates its importance, as calculated using Eq. (4) in Sect. 3.3.

3.2 Similarity Between Sentences and Images

Each sentence is expressed as a vector, where each element of the vector is the tf*idf score for a word. We use cosine similarity for the calculation between vectors. Each image is expressed by two kinds of vector, namely a color histogram and a bag of visual words (BoVW). We calculate the similarity between two images for both types of vector, and take the average of the two similarity values as the similarity between the two images. The color histogram is created by projecting all elements in an image to an HSV color space divided into 160 areas (H, S, and V are divided into 10, 4, and 4, respectively) and then counting the number of elements in each area. The BoVW represents images by vectors of the frequency of appearance of local features. These features were obtained by extracting from images using an algorithm, such as SIFT (Lowe, 1999), and by clustering them. BoVW was originally applied in natural language processing as a “bag of words” (BoW) that represented documents by vectors of appearance frequency for its constituent words.

3.3 Expansion of LexRank Using Content Types

In each travel blog entry, there are sentences that have a strong relationship with a given content type, and we expect these sentences to be in the summary. To achieve this, we employ biased LexRank, which consists of the following two steps (Otterbacher et al., 2009). First, we calculate the degree of association of each sentence with a given content type. Second, we use these degrees to calculate the importance of each node using the following equation, which is an extension of Eq. (2).

$$\begin{aligned}
p(u) = & (1 - d) \frac{\text{typeScore}(u)}{\sum_v \text{typeScore}(v)} \\
& + d \sum_{v \in \text{adj}[u]} \frac{\text{weight}(u, v)}{\sum_{z \in \text{adj}[v]} \text{weight}(z, v)} p(v)
\end{aligned} \tag{4}$$

In Eq. (4), $\text{typeScore}(u)$ indicates the degree of association of a sentence u with a given content type. $\text{typeScore}(w)$, as defined by Eq. (5), is calculated by the degree of association of each word in a sentence u with a given content type.

$$\text{typeScore}(w) = IG(w, t) \log \left(1 + \frac{\text{count}(w, D_t)}{\text{count}(w, D)} \right) \tag{5}$$

Here, $IG(w, t)$ indicates information gain of word w for a content type t . $\text{count}(w, D)$ indicates the number of blog entries that contain the word w in the set of travel blog entries D . D_t is the number of travel blog entries associated with content type t . If the word w often appears only in travel blog entries with content type t , values of both $IG(w, t)$ and $\text{count}(w, D_t)$ will become large, and as a result, $\text{typeScore}(w)$ will also become large. Now, we consider $\text{typeScore}(w)$, which has the highest value among all words in sentence u , as $\text{typeScore}(u)$.

3.4 Reduction of Redundancy

After applying LexRank to a sentence-similarity graph, there might be sentences having high importance scores that are very similar to each other. As a result, there would be redundancy in the summary generated. To resolve this problem, Radev et al. (2000) reranked sentences by taking account of their containment relationship. In the same way, our method rejects sentences and images that are sufficiently similar (their similarity values exceed a threshold value) to sentences or images that have already been chosen as part of the summary.

4 Experiments

4.1 Experimental Settings

We used the travel blog entries collected using Nanbas' method (Nanba et al., 2009), and the content types were assigned using Fujiis' method (Fujii et al., 2016). These entries and their content types were manually checked. We selected 20 areas in Japan, and chose approximately 10 blog entries for each area. We then created correct summaries manually by choosing three images and five sentences for each content type. Finally, we obtained 47 human-produced summaries, which we used in the evaluation of our system.

4.1.1 Evaluation

We conducted both automatic and manual evaluations.

Automatic evaluation

For the evaluation of the text part of computer-produced summaries, we employed ROUGE-N (Lin, 2004), which is widely used as an evaluation metric in text-summarization research and projects such as TAC (<https://tac.nist.gov>). ROUGE-N is calculated by dividing the number of N-word-grams that are contained in both human-produced and computer-produced summaries by the number of word N-grams in a human-produced summary. That is, ROUGE-N is a metric of how well a computer-produced summary covers the word N-grams in a human-produced summary. For the values of N, we used $N = 1$ and $N = 2$.

For the automatic evaluation of the image part of computer-produced summaries, we used recall and precision as evaluation metrics. We asked human subjects to choose representative images for each topic, and used them for the evaluation of the image part of the computer-produced summaries.

Manual evaluation

We evaluated computer-produced summaries manually from the following two viewpoints:

- Are the essential points of blog entries contained in the computer-produced summary? (MANUAL-TEXT).
- Do the images and texts in each computer-produced summary match? (MANUAL-IMAGE-TEXT).

In this evaluation, we asked human subjects to evaluate summaries according to the following procedure.

1. Read all blog entries to be summarized.
2. Read a human-produced summary and five computer-produced summaries (to be described later), evaluating in terms of a five-point scale (MANUAL-IMAGE-TEXT).
3. Rank six summaries (MANUAL-TEXT). [This ranking-based evaluation was employed in the evaluation workshop NTCIR-2 Text Summarization Challenge (Fukushima et al., 2002).] If the qualities of two summaries were considered the same, we allowed the human subjects to rank these summaries equally.

Alternatives

We performed evaluations for the following five methods. For each method, we adjusted the length of the summary and the number of images to be the same as the human-produced summaries.

- **Lead (baseline)**: extract sentences and images from the head of each blog entry.
- **LR (baseline)**: construct a sentence similarity graph and an image similarity graph, and then apply LexRank to each graph [Eq. (2)].
- **LR+IMG (our method)**: construct one graph by connecting the sentence similarity and image similarity graphs, and apply LexRank [Eqs. (2) and (3)].

- **LR+TYPE (our method)**: apply LexRank, while taking account of content types [Eq. (4)]
- **LR+IMG+TYPE (our method)**: apply the LR+TYPE method to a similarity graph in the LR+IMG method.

In conducting hierarchical clustering, we used 0.9 as a threshold value for merging two clusters (see Sect. 3). We standardized on 16 pixels, and sampled every 8 pixels to obtain the SIFT features. Here, SIFT is an algorithm to detect and describe local features in images (Lowe, 1999). We then calculated the BoVW vectors by conducting K-means clustering, fixing 1000 for the cluster numbers (see Sect. 3.2). For the extraction of SIFT features, we used OpenCV software (<http://opencv.jp>). We employed 0.85 as the dumping factor for LexRank (Eq. 2). To reduce the redundancy in computer-produced summaries, we used threshold values of cosine distance = 0.9 for sentences and 0.5 for images (see Sect. 3.4).

We obtained content-type-related words using 1836 travel blog entries (purchase: 147, watch: 1145, experience: 119, stay: 38, and dine: 693). None of these travel blog entries included entries that were used in the summarization.

4.2 Results and Discussion

The evaluation results using ROUGE (automatic evaluation of text parts) are shown in Table 2. Note that both LR+TYPE and LR+IMG+TYPE outperformed two of the baseline methods. We conducted a t-test, which confirmed a significant difference between our methods and these baseline methods.

Table 2. Evaluation results using ROUGE-N (automatic evaluation of text parts)

	ROUGE-1	ROUGE-2
Lead (baseline)	0.318	0.222
LR (baseline)	0.316	0.207
LR+IMG	0.331	0.227
LR+TYPE	0.345	0.240
LR+IMG+TYPE	0.340	0.237

Note: Highest values among all systems are shown in bold.

We show another set of evaluation results (automatic evaluation of image parts) in Table 3. Here, our LR+IMG+TYPE method outperformed other methods, but we could not confirm the statistical significance of this result.

Table 3. Evaluation results using precision/recall (automatic evaluation of image parts)

	Precision	Recall
Lead (baseline)	0.351	0.359
LR (baseline)	0.341	0.341
LR+IMG	0.338	0.342
LR+TYPE	0.351	0.359
LR+IMG+TYPE	0.372	0.367

Note: Highest values among all systems are shown in bold.

We show the results for manual evaluation in Tables 4 and 5. Table 4 gives the average rank of each summary by two human subjects, where a smaller average rank indicates a better summarization. Table 5 gives a five-point scale values of each method, where a larger value indicates a better summarization. We conducted a t-test ($p < 0.05$), which confirmed that there was a significant difference between our methods (LR+IMG, LR+TYPE, and LR+IMG+TYPE) and the Lead method.

Table 4. Evaluation results by human subjects (MANUAL-TEXT)

	Average rank
Human-produced summaries	1.28
Lead (baseline)	4.01
LR (baseline)	3.09
LR+IMG	2.85
LR+TYPE	3.22
LR+IMG+TYPE	2.99

Note: The highest value among all systems is shown in bold.

Table 5. Evaluation results by human subjects (MANUAL-IMAGE-TEXT)

	Average rank
Human-produced summaries	4.33
Lead (baseline)	2.80
LR (baseline)	3.09
LR+IMG	3.12
LR+TYPE	2.96
LR+IMG+TYPE	3.05

Note: The highest value among all systems is shown in bold.

Next, we compared our methods with LexRank (LR) for each summarization type. Tables 6 and 7 show the number of cases for which our methods are better/worse than LR for each content type in TEXT and IMAGE-TEXT evaluations, respectively. For example, “LR < LR+IMG” indicates that LR+IMG outperformed LR, and the italicized cells indicate where our method outperformed or matched LR. Table 6 shows that our LR+IMG method outperformed or matched LR for all content types. However, LR+TYPE could not match LR for any content type. Table 7 shows that all of our methods outperformed or matched LR for content type “Watch,” whereas our methods could not match LR for content type “DINE.” Through further investigation, we found that these results relate to the amount of text associated with each image.

Table 6. Comparison of LexRank (LR) with our methods for each content type (MANUAL-TEXT)

	Watch	Dine	Exp., Buy, Stay	Total
LR < LR+IMG	12	12	4	28
LR > LR+IMG	7	6	3	16
LR = LR+IMG	23	12	15	50
LR < LR+TYPE	7	9	2	18
LR > LR+TYPE	14	9	6	29
LR = LR+TYPE	21	12	14	47
LR < LR+IMG+TYPE	13	15	7	35
LR > LR+IMG+TYPE	13	11	6	30
LR = LR+IMG+TYPE	16	4	9	29

Table 7. Comparison of LexRank (LR) with our methods for each content type (MANUAL-IMAGE-TEXT)

	Watch	Dine	Exp., Buy, Stay	Total
LR < LR+IMG	8	10	4	22
LR > LR+IMG	5	10	3	18
LR = LR+IMG	29	10	15	54
LR < LR+TYPE	6	6	2	14
LR > LR+TYPE	4	11	7	22
LR = LR+TYPE	32	13	13	58
LR < LR+IMG+TYPE	12	9	6	27
LR > LR+IMG+TYPE	9	12	6	27
LR = LR+IMG+TYPE	21	9	10	40

Table 8. Comparison of LexRank (LR) with our methods for each content type, in terms of the number of characters associated with each image

	Less than 100 characters	Over 100 characters
LR < LR+IMG	18	10
LR > LR+IMG	10	6
LR = LR+IMG	30	20
LR < LR+TYPE	11	7
LR > LR+TYPE	20	9
LR = LR+TYPE	27	20
LR < LR+IMG+TYPE	21	14
LR > LR+IMG+TYPE	22	8
LR = LR+IMG+TYPE	15	14

Using the same approach, we investigated the relationship between the amounts of text associated with images and the quality of summaries. Table 8 gives the results of a comparison between the LR method and our methods for different numbers of characters per image. From Table 8, we see that only the LR+IMG method can match the LR method when the number of characters is less than 100, whereas both the LR+IMG and LR+IMG+TYPE methods outperform the LR method when the number of characters is more than 100.

5 System Behavior

In this section, we introduce our system’s behavior in terms of the travel blog entries collected and classified by the Nanbas’ method (Nanba et al., 2009) and the Fujii’s method (Fujii et al., 2016), which were mentioned in the previous section. Figure 2 shows a map that summarizes multiple travel blog entries, as generated by our system. In this figure, blog entries are shown as icons. If we push one of the buttons “watch,” “experience,” “purchase,” “dine,” or “stay” (as listed in Table 1), the blog entries corresponding to this category are shown on the map. Clicking an icon on the map produces a list of the blog entries related to that point.

After clicking a button on the bottom left of the map, a computer-generated summary appears in a pop-up window, which summarizes all the blog entries shown in the map. The blog entries shown in the map will refer to the particular content type that the system user has specified. If the user chooses a different content type, the system will quickly generate another summary from the travel blogs related to that content type. Figures 3 and 4 are the computer-generated summaries for content types “watch” and “dine”, respectively. Although both summaries were generated for the same location, namely “Miyajima” (one of the most famous tourist spots in Japan), the summaries refer to different aspects of a visit to Miyajima.

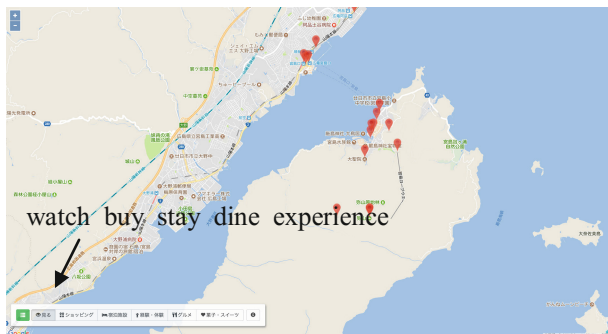


Fig. 2. Travel blog entries in a map for the content type “watch”

6 Conclusions

We considered that travel blog entries are useful information source for travel, because, they provide many bloggers' experiences of travel destinations. Therefore, we have proposed a method for summarizing multiple travel blog entries. Our method is an extension of LexRank to enable generation of a summary text containing images. We conducted experiments that demonstrated that one of our methods, LR+IMG, can outperform baseline methods. Finally, we constructed a summarization system that can summarize multiple travel blog entries in terms of content types for any given geographical region. The system is available on our web site (<http://165.242.101.30/blogMap/>). Our system can generate a summary very quickly if the number of travel blog entries are less than 100. However, when the number of entries is over 100, our system will not generate a summary, because it is quite time-consuming. How to decrease the processing time is our future work.



- This is a firework festival that I wanted to watch before I moved to Hiroshima.
- I went to Miyajima firework festival on August 14.
- My proposal was rejected by my husband and my daughter, and finally we watched firework on a ship.

- Miyajima island is known as one of three most scenic spots in Japan, Itsukushima shrine, and world heritage.
- This is a shrine in Itsukushima (Miyajima island) in Hiroshima.
- In future, we might know the detail of Miyajima a thousand years ago.

Fig. 3. A summary generated from travel blogs on Miyajima for the content type “watch”



- Last February, our family attended Miyajima oyster festival.
 - We went to “the fried oyster” line.
 - We could eat grilled oyster (free), oyster with rice, fried oyster, udon noodle with oyster, and fresh seafood.
-
- We arrived at Miyajima port, but it does not look like a port.
 - We arrived at Miyajima island by ferry. This island is famous for a world heritage, Itsukushima shrine.
 - We arrived at Miyajima at 11:00 am.

Fig. 4. A summary generated from travel blogs on Miyajima for the content type “dine”

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A Synthesis of Technology Acceptance Research in Tourism & Hospitality

Shahab Pourfakhimi¹(✉), Tara Duncan², and Willem Coetzee³

¹ School of Business, University of the Sunshine Coast, Sunshine Coast, Australia

Shahab.pourfakhimi@usc.edu.au

² School of Technology and Business Studies, Högskolan Dalarna, Falun, Sweden

tdu@du.se

³ Department of Tourism, Otago Business School, University of Otago, Dunedin, New Zealand

willem.coetzee@otago.ac.nz

Abstract. This paper presents a systematic review of 74 academic journal articles investigating the theoretical models and determinants of the acceptance and adoption of ICTs within the etourism framework. The most widely used theoretical models of technology acceptance are identified and critically discussed. Furthermore, a synthesis of the most widely reported determinants of technology adoption is provided to illustrate a systematic categorisation of the determinants of the acceptance of new tourism and hospitality technologies. Synthesising these findings provides etourism academia with a summarised, yet comprehensive understanding of the well-established aspects of technology acceptance and invites researchers to shift their attention towards using other methods of inquiry to investigate those aspects of technology acceptance behaviour which remain to be understood.

Keywords: Technology acceptance · Technology adoption · Systematic review · Meta-analysis · Etourism · Technology acceptance model

1 Introduction

Since the development of advanced information technologies, understanding human behaviour with respect to how they perceive, evaluate and adopt new technologies has mobilized the attention of scholars in various academic fields, including information systems, management and marketing. Since the 1970s, the field of technology acceptance research has grown significantly due to the researchers' increasing interest to understand the underlying factors behind the users' adoption of the new technologies. This field of research investigates the adoption of technologies by various groups of users including individuals (consumers) and organisations (e.g. business and enterprises). The field of technology adoption research is significantly affected by a single model originally created to investigate the adoption of information systems in organisation settings [i.e. Davis's (1985) Technology Acceptance Model (TAM)]. Today,

three decades after the emergence of TAM and its theoretical origins, the grand cognitive models of consumer behaviour (Sirakaya & Woodside, 2005) [i.e. Fishbein & Ajzen's (1975) Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) (Ajzen, 1985)], the body of literature in the field of technology acceptance in general, and within the domain of tourism and hospitality in particular, still largely rely on the basic assumptions of these classic models (Ukpabi & Karjaluoto, 2017).

Technology acceptance is among the most well-studied topics in the tourism field (Ukpabi & Karjaluoto, 2017). Pourfakhimi and Ying (2015, p. 865) reported that almost one-third of the papers published between 1994 and 2015 in ENTER conferences, the pioneer platform for tourism research (Buhalis & Law, 2008), were concerned with the study of technology adoption. This paper provides a systematic review of the fragmented yet extensive body of tourism and hospitality technology acceptance research. Using meta-analysis of academic literature, this research aims to provide a general discussion of the widely used theoretical models, and illustrates a systematic synthesis of the most important determinants of travellers' acceptance of new technologies. Due to the multifaceted nature of technology acceptance research in tourism (an amalgam of consumer behaviour, tourism and information systems research), and also the increasing number of studies in this field, the synthesis of literature in this field has been strongly recommended by previous research (Straub & Burton-Jones, 2007).

In addition, despite the existence of numerous generic and comprehensive reviews of tourism research (e.g. Buhalis & Law, 2008; Law, Buhalis, & Cobanoglu, 2014; Pesonen, 2013) as well as extensive meta-analyses of technology acceptance research (King & He, 2006; Legris, Ingham, & Collette, 2003; Marangunić & Granić, 2015), there has been a very limited number of systematic synthesis of technology acceptance research in tourism and hospitality. Perhaps the most extensive systematic review of literature in this field is conducted by Ukpabi and Karjaluoto (2017) who reviewed 71 academic journal articles and categorised them into three groups based on the nature of technology. However, despite the sheer breadth and comprehensiveness of their work, the work provides a limited discussion of the used models and does not distinguish between the intention to purchase a tourism product or service (e.g. the impact of eWoM on booking intention) and the intention to use or adopt a technology (e.g. the adoption of online booking channels).

Given the scarcity of similar reviews, the systematic synthesis of technology acceptance literature has significant theoretical and empirical contributions in the academic field of tourism. From a theoretical perspective, the synthesis in this paper complements the existing research by consolidating the results of an extensive but fragmented body of literature and provides researchers with a comprehensive, systematic and summarised understanding of those aspects of the acceptance of tourism technologies which are well-studied within the last two to three decades. Therefore, this research invites tourism researchers to shift their attention towards the understudied areas of technology acceptance which are particularly overlooked due to the overreliance on a few classical models. From a managerial perspective, this research provides technology developers with a systematic classification of the major antecedents of adoption of technologies. Such an understanding assists developers in product development and marketing, as well as identification of the determinants of users' expectations and satisfaction.

2 Research Method

This paper presents a meta-analysis of academic literature in the field of e-tourism technology acceptance. A combination of systematic keyword-based research and snowball techniques is used to collect the existing academic literature about technology acceptance in tourism and hospitality. Both methods are among the recommended methods for sourcing relevant academic publications for the purpose of conducting a representative and systematic meta-analysis of literature (Greenhalgh & Peacock, 2005; Khan, Kunz, Kleijnen, & Antes, 2003). A list of relevant keywords identified by the authors and later refined and expanded through examining further relevant literature was used in EBSCO and Google Scholar search engines to find an initial group of relevant publications. Both of the above search engines have been previously used in systematic reviews of the e-tourism literature (e.g. by Buhalis & Law, 2008). After several snowballing and citation tracking rounds, an initial collection of 135 articles was created. Subsequently, a screening process based on the following criteria was conducted to select the final studies used in this review. For the purpose of this research, only the full-length, original, English articles published in peer-reviewed academic journals, empirically investigating the acceptance or adoption of an ICT technology within the tourism or hospitality context through an original research were selected. Consequently, a significant number of sourced studies (e.g. Kaplanidou & Vogt, 2006; Sparks, Perkins, & Buckley, 2013; Yang, 2013) were excluded from this research, as they were mainly concerned with investigating the determinants of the purchase of a product or other behavioural intentions, rather than the adoption of a certain technology. In addition, as this review concerns the general acceptance of technologies by travellers, the studies concentrating on a limited aspect of this behaviour (e.g. risk) without considering other factors were also removed from the analysis (e.g. L. H. Kim, Qu, & Kim, 2009b). After the screening stage, 74 articles were finally selected.

3 Technology Acceptance Theoretical Models

The dominant cognitivist school of consumer behaviour research in the 1980s and 1990s has fundamentally affected the development of technology acceptance theories. Among the well-known cognitive consumer theories, TRA and TPB, perhaps due to their simplicity and high predictive power, have particularly influenced the development of numerous technology acceptance models. Flow (Csikszentmihalyi, 1975a), TAM (Davis, 1985), TAM2 (Viswanath Venkatesh & Davis, 2000), TAM3 (Viswanath Venkatesh & Bala, 2008), decomposed model of TPB 'DTPB' (Taylor & Todd, 1995), Unified Theory of Acceptance and Use of Technology 'UTAUT' (Viswanath Venkatesh, Morris, Gordon, & Davis, 2003), UTAUT2 (Viswanath Venkatesh, Thong, & Xu, 2012), UTAUT3 (Al sahouly, 2015), Task-Technology Fit, 'TTF' (Goodhue & Thompson, 1995), Motivational Model 'MM' (Davis, Bagozzi, & Warshaw, 1992), Innovation Diffusion Theory 'IDT' (Rogers, 1983) and Social Cognitive Theory 'SCT' (Compeau & Higgins, 1995) are among the other well-known technology acceptance theories.

TRA postulates that an individual's behaviour is goal-directed (Ajzen, 1985, p. 11), thus users are rational decision makers who make systematic use of the information available to them (Ajzen & Fishbein, 1980, p. 5) under full volitional control (Madden et al., 1992). Based on TRA, the intention to use a technology results in the use of the technology and is perceived as the direct result of the formation of strong and specific attitudes towards the use of that technology. The formation of this attitude is seen as the result of users' evaluative and normative beliefs towards the use of a technology, in other words, the extent a user holds positive beliefs about using a technology, and the extent using that technology complies with the social norms and expectations of their reference social group. Later, to overcome the limitations of TRA in explaining situations without volitional control, Ajzen (1985) added the element of *perceived behavioural control* to the TRA model. The newly formed model, named as the Theory of Planned Behaviour (TPB) postulates intention as the probability that a person will try to perform a behaviour (Ajzen, 1985, p. 29). Based on this model, a users' intention to use a technology is perceived not only as the result of their evaluative and normative beliefs towards it, but also their evaluation of their own ability and authority to use that technology.

TRA and TPB are the theoretical foundations for the development of many of the above technology acceptance models including TFF and TAM, the most widely used model of technology acceptance (Marangunić & Granić, 2015; Peek et al., 2014). Due to its widespread adoption in the academic literature, TAM has gained a paradigm-like status in technology adoption research (Bagozzi, 2007, p. 244). In TAM, the attitude towards using a new technology is seen as a function of users' beliefs about the perceived usefulness and perceived ease of use of that technology (Davis, 1985). While in the original TAM, the adoption of technology was postulated as the direct function of attitude (Davis, 1985, pp. 24–25, 38–40), in the later adaptations, the notion of behavioural intention is reintroduced as the mediator between attitudes and behaviour (Davis, Bagozzi, & Warshaw, 1989). TAM, is, in fact, a reduced version of TRA, limited to the impact of only two certain beliefs on attitude, without taking the impact of subjective norms and perceived behavioural control into account (Taylor & Todd, 1995, p. 148), but this parsimony, is perhaps the most important strength of this theory (Bagozzi, 2007, p. 244).

Several other technology acceptance models are built by extending TRA, TAM and TPB. For example, Taylor and Todd (1995, p. 154) decomposed beliefs, social norms and perceived control elements of TPB into some specific sets of factors to increase the predictive value of these models. UTAUT and UTAUT2 (Viswanath Venkatesh et al., 2003, 2012) are, in fact, rephrased and expanded variations of TPB, extended by adding other cognitive and exogenous constructs to the model. While many of the above models are themselves extensions of prior consumer behaviour models, empowered by Structural Equation Modelling (SEM) and factor analysis techniques, several scholars have further extended these models by adding new constructs and proposing new statistically significant relationships between the new and original constructs (Amaro & Duarte, 2015; H.-B. Kim, Kim, & Shin, 2009a; T. G. Kim, J. H. Lee, & R. Law, 2008b). The volume of literature adding new constructs to TAM is so substantial that TAM-extension can itself be seen as a voluminous field within ITCs research.

Csikszentmihalyi's (1975b) Flow Theory is another popular theory in tourism and hospitality technology acceptance research (e.g. Gao & Bai, 2014; Sahli & Legohérel, 2015). Flow theory is developed to aid understanding human involvements in autotelic (intrinsically motivated) activities (Nakamura & Csikszentmihalyi, 2014). In this theory flow refers to a state of total intrinsic involvement in goal-directed activities when although one is in full control of their actions, due to the high level of engagement, the boundaries between actions and awareness are merged and one concentrates on a limited scope of stimuli (Csikszentmihalyi, 1975a, b; Csikszentmihalyi, Abuhamdeh, & Nakamura, 2014). In this sense, the concept of flow represents a subjective state of intense experiential involvement (Csikszentmihalyi et al., 2014, p. 230), absolute absorption, intense concentration and deep immersion (Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003, p. 161), associated with a sense of control and an altered sense of time (Csikszentmihalyi et al., 2014).

Reaching such a subjective state of optimal arousal is attributed to a match between the perceived challenge or difficulty of a goal-directed task (perceived challenge) and the perceived level of one's own skills and capabilities (perceived competence), when both perceived challenges and competence are above individuals' average skills and challenges and an immediate feedback to evaluate one's progress in the task is available (Csikszentmihalyi, 1975a, 1997; Csikszentmihalyi et al., 2014, p. 232). The application of flow theory in the technology acceptance field is based on the premise that experiencing flow encourages the person to adopt a technology because it promises subjective experiential rewards. Thus, it is proposed that technology characteristics and perceived skills affect the sense of flow, and in turn experiencing a sense of flow influences the technology evaluations and impacts (Trevino & Webster, 1992).

The main dependant variables in most of the above research works are self-reported measures of the actual use (e.g. Escobar-Rodríguez & Carvajal-Trujillo, 2014; Wöber & Gretzel, 2000) or behavioural intention to use a technology (e.g. Fong, Lam, & Law, 2017; J. Kim, 2016). From a consumer perspective, this includes using technologies to purchase a product (e.g. Amaro & Duarte, 2015, 2016) or using them as a source of information (e.g. Ayeh, 2015; Castañeda, Frías, & Rodríguez, 2009). From an organisational perspective, the subject of study could be the use of technologies as a tool to perform work-related tasks (e.g. T. Kim, J. H. Lee, & R. Law, 2008b; Lam, Cho, & Qu, 2007), use management information systems (e.g. Varol & Tarcan, 2009) or promote businesses (Wang, Xiang, Law, & Ki, 2015). Rather than self-reported measures of use and intention, other researchers have gone beyond the traditional frameworks of technology acceptance research and used other measures, such as the number or valence of online reviews about technological products as a measure of consumers' acceptance of technologies (e.g. Wang et al., 2015). Furthermore, by paying a greater attention to the impact of various technical characteristics of the technologies, other researchers (e.g. Herrero and San Martín, 2012; Park, Gretzel, & Sirakaya-Turk, 2007; Wang et al., 2015) provided a more technically in-depth illustration of the determinants of technology acceptance. In the next section, the most widely confirmed determinants of the technology acceptance in tourism studies are reviewed.

4 Determinants of Technology Acceptance

As expressed before, most of the research in this field is based on the addition of a wide range of various factors to the models, often as an attempt to improve the predictive and descriptive contributions of their studies. In most cases, some interrelationships between and within these variables are proposed. As illustrated in Table 2, many of these factors, in spite of different terminologies, have shared meanings and can be grouped into categories of closely-related notions. This classification divides various factors based on their psychological nature into five groups of functional, affective, normative, behavioural beliefs and personal traits and characteristics. A broad theoretical definition of each of these groups of factors are provided in Table 1.

Table 1. The proposed classification categories

Category	Definition
Evaluative functional beliefs	Attributed-oriented, analytical beliefs cognitively associating the technology with a functional attribute (Fishbein & Ajzen, 1975)
Evaluative affective beliefs	Affective, emotive and hedonic responses towards using a technology (Slovic, Finucane, Peters, & MacGregor, 2002)
Normative beliefs	Socially constructed beliefs about the perceived social norms and expectations of the social environment (Fishbein & Ajzen, 1975)
Behavioural control beliefs	Beliefs about the factors that may facilitate or hinder use of a technology (Ajzen, 2002, p. 107)
Personal traits and characteristics	Generalised patterns of an individual’s responses to the environment as well as persistent qualities in one’s behaviour (Kassarjian, 1971, p. 409)

Table 2. The determinants of technology acceptance

Category	Proposed salient belief groups	Example studies
Evaluative (functional) beliefs	Perceived usefulness, performance, performance expectancy, usability, ability	Ryan and Rao (2008)
	Quality (technology, outcome, information services and systems), functionality	T. Kim et al. (2008b)
	Perceived risk, trust, trustworthiness, privacy, credibility, reliability, integrity and security	Amaro and Duarte (2015)
	Compatibility	Lu, Mao, Wang, and Hu (2015)
	Relative advantage	Chen (2007)
	Costs, price, benefit and value	T. Kim et al. (2008b)
	Demonstrability, visibility, observability, communicability, interactivity, and trialability	Herrero and San Martín (2012)
	Task-fit, career-fit, job-fit	H. Y. Lee, Kim, and Lee (2006)

(continued)

Table 2. (continued)

Category	Proposed salient belief groups	Example studies
(Affective/Hedonic) responses	Attitude	Ayeh (2015)
	Playfulness, fun, enjoyment, entertainment	Morosan and Jeong (2008)
	Fulfilment	Wang et al. (2015)
	Flow	Huang, Backman, Backman, and Moore (2013)
	Arousal	W. Lee, Xiong, and Hu (2012)
	Involvement	Chang, Chou, Yeh, and Tseng (2016)
Normative beliefs	Social influence, social benefits	No and Kim (2014)
	Encouragement by others, peer influence, organisation and management influence	Fong et al. (2017)
	Image	Al-hawari and Mouakket (2012)
	Homophily, similarity	Ayeh, Au, and Law (2013)
Behavioural control beliefs	Perceived ease of use, effort expectancy	H.-b. Kim et al. (2009a)
	Self-efficacy, confidence	Lam et al. (2007)
	Facilitating conditions	Wu, Chiu, Yang, and Li (2011)
	Complexity, difficulty to use	Parra-López, Bulchand-Gidumal, Gutiérrez-Taño, and Díaz-Armas (2011)
	Confusion, information overload	Pappas (2015)
	Technical support	Huh, Kim, and Law (2009)
Personal traits and profile	Personal innovativeness, curiosity	Varol and Tarcan (2009)
	Habit	Escobar-Rodríguez and Carvajal-Trujillo (2014)
	Technology experience, expertise, capability	Järveläinen (2007)
	Travel experience	D.-Y. Kim, Park, and Morrison (2008a)
	Offline activities	Lin (2007)
	Price saving orientation	Escobar-Rodríguez and Carvajal-Trujillo (2013)
	Predispositions towards technology	Bonsón-Ponte, Carvajal-Trujillo, and Escobar-Rodríguez (2015)
	Predisposition towards other media	Okazaki and Hirose (2009)

5 Conclusion

The models used in the studies reviewed in this research were on average able to explain approximately 53% of the variance in intention to use a technology within a range of 23% (M.-J. Kim, Lee, & Chung, 2012) to 82% (Escobar-Rodríguez & Carvajal-Trujillo, 2013). This is similar to the results of the meta-analyses of technology acceptance research in other fields (e.g. Samaradiwakara & Gunawardena, 2014). In some cases, the direct comparison of the models has shown that the models with a larger number of variables (e.g. UTAUT) had ironically less predictive power than the more parsimonious theoretical models (e.g. TAM) (e.g. see Huh et al., 2009). If adding new variables to TAM does not necessarily increase the predictive power of the models, then perhaps the only advantages of larger models is their higher ability to explain the underlying determinants of technology acceptance. However, as demonstrated in Table 2, many of the items which have been added to these models either seem to be redundant or can be seen as the antecedents of the factors proposed by TAM or TPB. It is evident that of the number of potential variables that can be added to TAM and TPB is infinite and even the largest models still leave out some important variables (Bagozzi, 2007). Thus, if more parsimonious models are satisfactorily able to predict intention, the focus of technology acceptance researchers rather than extending the existing models with conceptually redundant variables should be directed towards increasing the explanatory power of the models through in-depth exploration of the users' behaviour.

Repeating conceptually identical or similar empirical tests to investigate the impacts of well-established factors such as *ease of use* and *usefulness* of a technology (or other phrases with more or less the same meaning) will never improve our understanding of the users' behaviour. Three decades after the development of TAM such factors are so well-agreed upon and well-established that exploration of their impact on technology acceptance could be perceived as trivial. However, as can be seen in Table 2, extending the classic models with novel factors that are based on in-depth and theoretically robust explorations and are generalisable, distinctive and theoretically independent from the original factors suggested in the classic models can improve our understanding of users' behaviour. Affective and hedonic factors such as hedonic motivations (Morosan & Jeong, 2008) and flow (Gao & Bai, 2014), personal variables such as innovativeness (Varol & Tarcan, 2009), technology experience (Wöber & Gretzel, 2000), travel experience (D.-Y. Kim et al., 2008a; Oh, Lehto, & Park, 2009) and existing technology-related dispositions (Bonsón-Ponte et al., 2015) as well as detailed technical characteristics (Liu & Zhang, 2014; Park et al., 2007) are examples of factors that have indeed broadened our understanding of tourism technology acceptance.

Therefore, if the researchers' aim is to extend our understanding of tourism technology acceptance, taking more novel approaches to investigate the underlying factors behind the acceptance of tourism technologies (e.g. Cázares-Garrido Iliá, 2016; Wozniak, Liebrich, Senn, & Zemp, 2016), beyond what is already verified through three decades of repeated use of a few classical models, will have more constructive contributions in the further development of our academic understanding of travellers'

adoption of e-tourism technologies. Such new inquiries could be generated through taking alternative perspectives towards scientific inquiry (e.g. social constructionism) or be built based on the recent advances in understanding human social behaviour in other academic fields (e.g. neuroscience or sociology).

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Part IV
Social Media

Do DMOs Communicate Their Emotional Brand Values? A Comparison Between Twitter and Facebook

Lidija Lalicic¹(✉), Assumpció Huertas², Antonio Moreno³,
Stefan Gindl⁴, and Mohammed Jabreel³

¹ Department of Tourism and Service Management, MODUL University
Vienna, Vienna, Austria

lidija.lalicic@modul.ac.at

² Departament d'Estudis de Comunicació, Universitat Rovira i Virgili,
Tarragona, Spain

sunsi.huertas@urv.cat

³ Department d'Enginyeria Informàtica i Matemàtiques, Intelligent Technologies
for Advanced Knowledge Acquisition (ITAKA), Universitat Rovira i Virgili,
Tarragona, Spain

{antonio.moreno,mohammed.jabreel}@urv.cat

⁴ Department of New Media and Technology, MODUL University Vienna,
Vienna, Austria

stefan.gindl@modul.ac.at

Abstract. Communication through social media is an effective way to position a destination brand. In particular, the emotional values of a brand trigger a positive reaction from potential visitors. It is important for destinations to align their emotional communication strategies on different social media platforms to enhance their online image. The lack of comprehensive research in this area led this study to analyse the usage of the two most used social media platforms (Facebook and Twitter) among popular European tourist destinations. The study shows how destinations communicate their emotional values differently in Facebook and Twitter. The methodology of analysis allows destinations to compare the values they communicate with those of their competitors, so that they can improve their positioning and present a distinctive attractive personality of their destination.

Keywords: Emotional values · Communication strategies · Social media
DMOs

1 Introduction

Facebook and Twitter are by far the most popular social media platforms used by firms to engage with consumers (Shively, 2014). These platforms are popular marketing tools, they are easy to maintain, they have a low cost and they present an effective large reach. Many *Destination Management Organizations* (DMOs) believe in the effectiveness of social media marketing for building a strong brand. However, the right

communication of a destination brand is a challenge for them. Guerrero-Solé and Fernández-Cavia (2013) analyzed the performance on Twitter of some Spanish destinations and proved that there is room for improvement, in particular in the alignment of the destination image with the social media communication strategies. The literature on *destination branding* has highlighted the role of communication for the successful use of a brand. Brands are vital in the development of desirable destination images and reputation (Moreno et al., 2015). Furthermore, various users of the destination brand can associate and identify themselves with elements represented by the brand (Huertas & Mariné-Roig, 2016a), subsequently influencing the attachment to the brand and the intentions to visit the destination. Destinations can communicate the brand in two ways, through *functional* and *emotional* elements. Both of them should be taken into account when communicating destination brands in order to compete with other destinations (Hosany, Ekinici & Uysal, 2007; Huertas & Mariné-Roig, 2015, 2016b). In particular, Bigné et al. (2009) showed that the psychological and emotional components exercise the greatest influence on the overall image of the destination and on future behavior intentions. By developing a solid brand destination personality, destinations are able to stay competitive in a market with similar destinations (Ekinici & Hosany, 2006; Govers & Go, 2009). The communication of specific emotional brand values through social media generates greater interactivity and, thus, it enhances the brand image for tourism destinations (Huertas & Mariné-Roig, 2015). However, Bigné et al. (2009) and others (e.g., Michaelidou et al., 2013; Huertas & Mariné-Roig, 2016a, b) have demonstrated that DMOs tend to communicate tangible elements more often than the emotional values through social media. This leads to a gap among the communicated brand values and the image that users have about them (De Moya & Jain, 2013; Stepchenkova & Zhan, 2013; Míguez-González & Huertas, 2015). Often, DMOs do not have specific strategies to communicate their brand values nor brand communications strategies for different social media (Moreno et al., 2015; Huertas & Mariné-Roig, 2016a, b). DMOs should speak in a consistent manner in social media platforms in order to create a positive image among all stakeholders. However, despite the importance of social media platforms, there is a lack of studies performing cross-over platforms analysis, particularly in relation to brand communication strategies. In fact, there are few studies analyzing the use of brand emotions in online spheres (e.g., Dickinger & Lalicic, 2016). Hence, this study aims to close this gap by analyzing the emotional communication strategies of the DMOs of popular European destinations (TripAdvisor, 2017) in the two most important social media platforms: Facebook and Twitter. First, the study analyzes the brand emotional values communicated by each destination on each platform, by looking at the semantic relationship between the adjectives used by the destination in its posts and some basic categories of emotional values. Second, the study identifies in which way the communication significantly differs across destinations and across platforms. In doing so, DMOs are provided with practical recommendations on how to align their communication strategies and speak with one single emotional brand message, without having inconsistencies in the overall brand message transmitted to various stakeholders.

2 Literature Review

2.1 Destination Branding and Personal Values

A distinctive destination brand generates favorable associations in the mind of stakeholders, influencing their destination preferences and their final decisions (Hosany et al., 2007). As a result, a growing number of studies related to destination branding have focused on emotional branding. Hankinson (2004) was one of the first that highlighted the creation of emotional ties between the destination brand and its stakeholders. Later, authors such as Laroche et al. (2013), proved the importance of these emotional ties for creating a positive destination image, brand loyalty and tourist purchase decisions. Aaker (1996) introduced the hierarchical model of Customer-Based Brand Equity (CBBE), showing how companies can influence the effectiveness of their branding processes by building their brand but still managing the various brand dimensions, such as brand identity, meaning, responses and relationships. Aaker's (1996) hierarchy is founded by brand salience, which refers to the strength of the presence in the mind of the consumer; however, a firm's aim should be to increase familiarity with the brand through the right and repeated exposure, and creating strong associations with the brand. As a follow-up, there are also a number of studies that have analyzed the communication of destination brands. They have mainly focused on the cognitive, functional or tangible elements of the brand instead of the emotional elements or brand values (Xiang & Gretzel, 2010). The studies that focus on the analysis of the communication of brand values generally define a template to analyze the association of certain values with the content published by the destinations. Another stream of studies (Ekinci & Hosany, 2006; Hosany et al., 2007; Pitt et al., 2007; De Moya & Jain, 2013) have used the *Brand Personality Scale* (BPS) of Aaker (1997), which is based on five dimensions (sincerity, sophistication, excitement, ruggedness and competence). In doing so, the values of human personality have been used to analyze the way in which destinations communicate the emotional values of their brand. Various studies have shown how personality dimensions have a positive impact on the preferences of potential tourists, and generate behavioral intentions to re-visit (Ekinci & Hosany, 2006; Hosany, Ekinci & Uysal, 2007). A variety of studies have analyzed the communication of destination brands through social media (De Moya & Jain, 2013; Oliveira & Panyik, 2015; Huertas & Mariné-Roig, 2016b; Garay & Cànoves, 2017) and most of them also use Aaker's BPS as a reference. In general, the most common methodology of analysis relies on an automatic content analysis, either of a quantitative (De Moya & Jain, 2013) or a more qualitative nature (Oliveira & Panyik, 2015; Garay & Cànoves, 2017). One limitation of this kind of analysis is the difficulty in measuring the communication of emotional values using content analysis software. Other studies have analyzed the communication of the emotional values through a template manually (Huertas & Mariné-Roig, 2016b). However, there are also limitations in the manual approach, given the researchers' subjectivity and the limited number of cases that may be analyzed. One approach to overcome these problems is the development of automatic web analysis tools. For example, some studies have already analyzed the communication of emotional values or the image perception by making advanced automatic web content analysis with sentiment detection (Költringer

& Dickinger, 2015) or semantic analysis (Moreno et al., 2015). However, it is necessary to do more research on the integration of these innovative methods to capture the online communication of emotional brand values of DMOs in a more robust manner.

2.2 Communication of Brand Emotional Values in Social Media

The majority of studies have analyzed how social media influences the creation of a destination brand image among its users and the relationships they create with brands (Govers & Go, 2009; Laroche et al., 2013; Hudson et al., 2015). Laroche et al. (2013), using surveys, demonstrated that brand communities through social media have positive effects on the user-brand relationship, credibility and brand loyalty. Algesheimer et al. (2005) also showed that active participation of users in social media increases the emotional attachment to the brand and the brand loyalty. These authors developed a conceptual model to analyze how different aspects of the relationship of the customers with the brand community influence their intentions and behaviors. Among the second type of studies, some have analyzed how tourist destinations communicate their brand (Huertas & Mariné-Roig, 2016a, b; Moreno et al., 2015). Other types of studies have analyzed the brand destination images created in the mind of users (Jabreel et al., 2017), based upon user-generated content. In some cases, users' surveys and reviews have been used and compared for difference perceptions (Dickinger & Lalicic, 2016). Results showed that the dimensions of excitement, sophistication and competence were significantly more represented in social media than in the conventional survey (Dickinger & Lalicic, 2016). Further studies made a comparative analysis of the contents of both DMOs and its users (De Moya & Jain, 2013; Stepchenkova & Zhan, 2013). For example, De Moya & Jain, (2013) explored how México and Brazil communicate their brand personality through Facebook, and which personality traits their Facebook fans or users associate with them. The results show that these countries communicate distinctive brand personalities on their official Facebook pages. In line with previous studies, the most communicated brand values were sincerity and excitement (Ekinici & Hosany, 2006; Jain & Chan-Olmsted, 2009). These results also coincide with a later research of Huertas and Mariné-Roig (2016a, b) in which, for four types of destinations in Spain, the most mentioned values were related to honesty and sincerity. Interestingly, De Moya and Jain (2013) showed that emotional values communicated by the DMO of México coincided with the messages posted by its users, whereas the brand personality traits in the promotional messages of the DMO of Brazil did not coincide with the messages posted by its users. Stepchenkova and Zhan (2013) also analyzed and compared contents generated by DMOs and users and found differences among them. Interestingly, travelers were more interested in how Peruvian people live their everyday lives, the DMO focused on promoting the distinctive Peruvian culture, traditions and art instead. Then, Moreno et al. (2015) analyzed the destination brand values communicated by the main European DMOs through Twitter. The results showed that the destinations do not use specific adjectives to communicate their identity, but common and generic ones that many destinations want to be associated with. Moreover, the destinations do not seem to have a coherent communicative strategy to try to communicate emotional brand values using Twitter. Lastly, Huertas and Mariné-Roig (2016b) explored how the cognitive elements and emotional values of

the destination brands are communicated through different social media platforms. First, they did not find any remarkable differences in the communication of emotional values through different social media platforms. Second, they did not identify specific strategies concerning emotional content. Their results coincide with those of Moreno et al. (2015), who showed that, despite the different destination types, very similar emotional values were communicated, and there is still a dominant focus on the functional elements.

3 Method

The aim of this work is to analyse how emotional values are communicated by different destinations through Twitter (tweets) and Facebook (posts). The study focuses on the semantic analysis of English tweets and posts sent by official tourist destination accounts on these two social networks. The basic steps of the analysis, described in the following subsections, are the following: (1) definition of the emotional values associated to a destination brand, (2) selection of the destinations to be analysed, (3) retrieval and pre-processing of English tweets and posts sent by official tourist destinations on Facebook and Twitter, (4) semantic analysis of the content of the tweets (this step is the core of the methodology, and it aims to link the adjectives used in the tweets/posts with the emotional values defined in the first step) and (5) interpretation of the results.

3.1 Emotional Values

In this work we have made a slight adaptation of the emotional values defined in Aaker's *Brand Personality Scale* (Aaker, 1997) to its use in the case of destination brands. We have considered the five categories shown in the following list, which are further decomposed in specific subcategories: (1) *Sincerity*: family-oriented, down-to-earth, sustainable, calm, real, traditional, honest, original, wholesome, quality of life, happiness, sentimental, friendly, (2) *Excitement*: trendy, daring, exciting, exotic, fashionable, cool, spirited, dynamic, vital, fresh, young, sensorial, unique, imaginative, creative, up-to-date, independent, contemporary, cosmopolitan, tolerant, hospitable, (3) *Competence*: reliable, hard-working, safe, rigorous, intelligent, technical, corporate, innovative, successful, leader, ambitious, powerful, (4) *Sophistication*: glamorous, luxurious, seductive, smooth, romantic, magical and (5) *Ruggedness*: outdoorsy, get-away, recreational, tough, rugged, non-conformist.

3.2 Selection of the Destinations to Be Analysed

The top 25 European destinations in 2017, according to the user feedback and booking interest measured by Trip Advisor, were considered (TripAdvisor, 2017). We searched manually for their official Twitter destination accounts and we selected those destinations that had sent at least 3000 English tweets. All of these destinations also have corresponding Facebook accounts with posts in English. The 10 destinations that were finally analysed are Amsterdam, Barcelona, Berlin, Budapest, Dublin, Edinburgh,

London, Madeira, Paris and Tenerife. The other 15 destinations do not have official Twitter accounts or they send their tweets mainly in their local language.

3.3 Retrieval and Pre-processing of the Sets of Messages

This study focuses on the Twitter tweets and the Facebook posts that were posted from the official accounts of the 10 selected destinations during 2016. Tweets were retrieved with a tool developed by the authors that allows obtaining tweets that satisfy different constraints (language, time, geo-location, etc.). Facebook posts were obtained with another self-developed tool that accesses Facebook's Graph API. It is designed to provide insights into the activity of public pages. The tool downloads and analyses the posting history of selected pages as well as the fan interactions with the posts (i.e., comments and reactions). The analysis helps to assess the efforts and successes of the page owners, e.g. companies or entities of public interest, by measuring their activity and the engagement and loyalty of their fans. In the pre-processing stage all URLs, usernames, non-alphabetic symbols and stop words were removed. All tweets/posts were converted to lowercase. Words with repeated letters were automatically corrected using a simple algorithm developed by the authors that performs a breadth first search to analyse all the possible ways of eliminating repeated letters in a string, checking in WordNet if they are correct.

3.4 Semantic Content Analysis

The aim of this step is to link the adjectives appearing in the tweets/posts with the categories of emotional values defined previously. Adjectives were chosen because, as shown in previous studies on content analysis of the communication of destination brands (Stepchenkova et al., 2009), they are the words that tend to convey the emotional responses. A standard natural language parser was applied to retrieve the adjectives and count their frequency of use. A direct syntactic mapping was not feasible, as most of the adjectives did not appear directly as categories/subcategories of emotional values. The Wu-Palmer ontology-based semantic similarity measure (Wu and Palmer, 1994) was used to check the similarity between adjectives and emotional values in WordNet. The similarity between two terms c_1 and c_2 is defined as

$$simWP(c_1, c_2) = (2 * N_3) / (N_1 + N_2 + 2 * N_3),$$

where N_1 and N_2 are the number of hypernym links from the terms c_1 and c_2 to their *Least Common Subsumer* (LCS) in WordNet, and N_3 is the number of hypernym links from the LCS to the root of the ontology. This measure ranges from 1 (for identical concepts) to 0 (when the LCS is the root of the ontology, so the concepts do not have any common ancestor). In order to apply this measure, the compared terms must be *nouns*. Thus, both the emotional values and the adjectives had to be transformed into nouns. In the case of the emotional values, these were manually translated to the equivalent nouns (e.g. 'ambitious' was transformed into 'ambition'). The selection of nouns is certainly important. We tried to select nouns as semantically close to the adjective as possible, and we chose a particular meaning (synset) of the noun in the

case of polysemous words. Concerning the adjectives appearing in the tweets/posts, they were automatically transformed into nouns using their derivationally related form or their attribute property in WordNet. After this pre-processing stage, it was possible to apply the Wu-Palmer similarity measure to compare the emotional values and the tweet/post adjectives. In this way, we can assess if the destination communicates certain emotional values and if there is a strategy behind the communication of the brand. Only adjectives with a similarity higher than 0.7 to an emotional value (*emotional adjectives*) were considered in the final steps of the analysis.

4 Results

The number of tweets and Facebook posts and the use of different adjectives are summarized in Table 1, in which the 10 destinations are ranked according to their activity on Twitter and Facebook.

Table 1. Volume of tweets/posts and use of adjectives in the selected destinations

	Twitter			Facebook	
	#Tweets	#Adjectives		# Posts	#Adjectives
Paris	2058	851	London	1323	610
Edinburgh	1935	665	Madeira	1006	1936
Barcelona	1828	654	Edinburgh	847	524
Berlin	1797	621	Dublin	402	251
Dublin	1722	456	Tenerife	398	637
Madeira	1273	514	Amsterdam	386	372
Tenerife	1102	490	Barcelona	319	1337
Amsterdam	940	521	Paris	223	229
London	633	277	Budapest	223	197
Budapest	159	123	Berlin	45	42

In the case of Twitter, the majority of the DMOs are quite active, sending 1000–2000 tweets in 1 year (an average of 3–6 daily tweets). Paris (2058 tweets) and Edinburgh (1935 tweets) are the most active DMOs, whereas Budapest is the least active (only 159 tweets). The use of adjectives follows a similar ratio. DMOs' Facebook activity, on the other hand, shows a different ranking, in which the posting activity of London, Madeira and Edinburgh stands out. Interestingly, the use of adjectives is not aligned with the number of posts. For example, Barcelona posted only 319 times on Facebook during 2016, but it used 1337 different adjectives, whereas the top runner, London, was much more moderate in the use of adjectives (only 610 in 1323 posts). Thus, DMOs not only use the two platforms differently in terms of activity, but they also tend to have a different usage intensity of adjectives in their online communication across the platforms. In order to reveal more insights into the specific use of adjectives, their relationship with the 5 brand dimensions on Twitter and Facebook was analyzed. Taking into account the percentage of emotional adjectives

employed for each category of emotional values, there are only small differences between Facebook and Twitter: sincerity (FB: 38%, Tw: 37%), excitement (FB: 28%, Tw: 26%), competence (FB: 17%, Tw: 11%), sophistication (FB: 10%, Tw: 14%) and ruggedness (FB: 10% and Tw: 9%). Hence, the dimensions of competence and sophistication differ slightly across the platforms. Furthermore, an analysis was performed to see how often the adjectives are actually used in the Facebook posts and tweets. In this case, we can see that this happens almost identically across the two platforms: sincerity (FB: 41%, Tw: 41%), excitement (FB: 23%, Tw: 22%), competence (FB: 18%, Tw: 18%), sophistication (FB: 8%, Tw: 9%) and ruggedness (FB: 10% and Tw: 10%). Lastly, the average number of uses of each emotional adjective by every DMO among the two platform was calculated. A Chi-square analysis showed that significant differences occur across the platforms (see Table 2). For example, Paris uses each emotional adjective more in its communication through Twitter (5.30 uses of each adjective) than for Facebook posts (only 3.17 uses of each emotional adjective) ($p < 0.05$). London, in contrast, uses the emotional adjectives more on Facebook (5.30) than on Twitter (4.28) ($p < 0.05$). Destinations like Barcelona and Edinburgh tend to use similar emotional expressions on both platforms ($p < 0.001$).

Table 2. Average number of uses of each emotional adjective—chi-square analysis

	Ratio Twitter	Ratio Facebook	<i>p</i> -value
Paris	5.30	3.17	<0.05
Edinburgh	5.32	5.95	<0.001
Barcelona	4.38	4.94	<0.001
Berlin	2.08	1.21	0.130
Dublin	6.53	3.79	0.209
Madeira	2.83	4.22	0.23
Tenerife	3.30	3.44	<0.05
Amsterdam	3.57	2.78	<0.001
London	4.28	5.30	<0.05
Budapest	1.57	1.87	<0.001

Figures 1 and 2 display which dimensions are the most often represented in DMOs' online brand communication across Twitter and Facebook, respectively. As seen in Fig. 1, Barcelona is one of the outstanding DMOs in the communication of feelings of sincerity through Twitter. The majority of DMOs send tweets with feelings of excitement, particularly destinations like Paris, Edinburgh, Amsterdam and Barcelona. Expressions related to competence are especially used by the destinations Barcelona, Edinburgh and Amsterdam. The dimension of sophistication is highly used only by the DMO of Barcelona. Lastly, feelings related to the dimension of ruggedness are limited in online communication. The DMOs of Edinburgh, Barcelona and Tenerife are the ones that include relatively more feelings of ruggedness in their tweets.

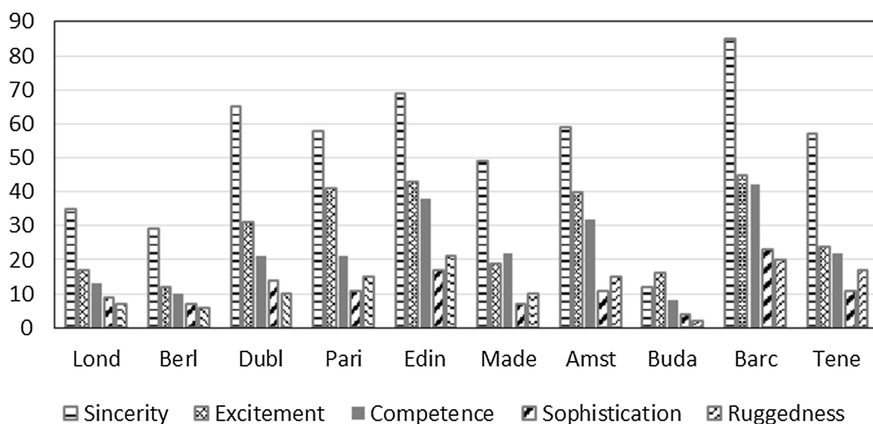


Fig. 1. Brand personality dimensions—tweets

Figure 2 illustrates the most common dimensions of emotional values mentioned in the Facebook posts. The communication of sincerity is much higher than the one of other values among the majority of the DMOs. The dimension of excitement is more homogeneous, than in the case of tweets. Words that reflect the dimension of competence tend to be more popular in Facebook posts by the DMOs of Tenerife, Madeira, London and Edinburgh. The dimensions of sophistication and ruggedness, like in Twitter, are not heavily used among the DMOs. Destinations like London, Edinburgh and Tenerife are the top communicators with regards to ruggedness.

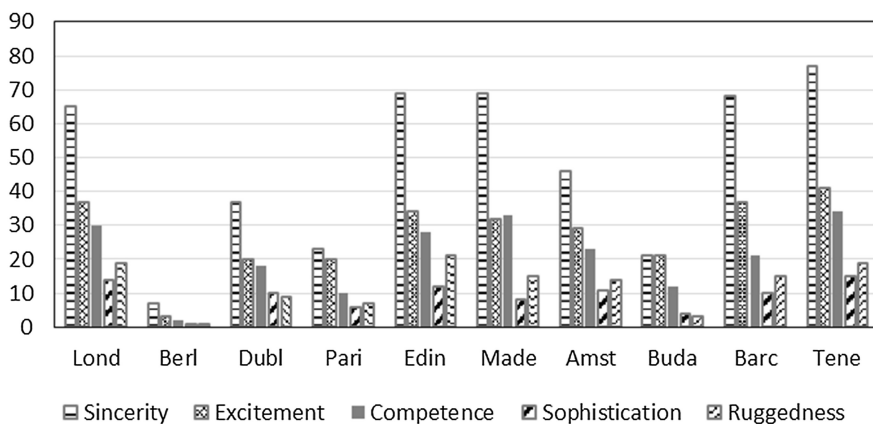


Fig. 2. Brand personality dimensions—Facebook posts

Lastly, in order to understand in which way the DMOs communicate their emotional brand values, also the usage of the specific categories and subcategories in relation to their frequency are listed. Given the space limit, the five most popular subcategories communicated through social media are listed in Table 3.

Table 3. Top 5 subcategories of emotional values mentioned in Twitter and Facebook

Competence		Sophistication		Ruggedness	
Twitter	Facebook	Twitter	Facebook	Twitter	Facebook
Leader	Reliable	Glamorous	Glamorous	Rugged	Rugged
Safe	Hard-working	Smooth	Luxurious	Get-away	Get-away
Innovative	Safe	Magical	Charming	Recreational	Recreational
Powerful	Responsible	Luxurious	Smooth	Tough	Tough
Intelligent	Intelligent	Charming	Romantic	Non-conformist	Non-conformist
Sincerity			Excitement		
Twitter	Facebook	Twitter	Facebook	Twitter	Facebook
Honest	Honest	Fresh	Fresh		
Down-to-earth	Down-to-earth	Contemporary	Unique		
Calm	Original	Creative	Daring		
Original	Calm	Unique	Contemporary		
Happiness	Traditional	Daring	Creative		

Interestingly, there are only slight differences in the reference to emotional value categories in Facebook and Twitter (e.g., the expressions related to ruggedness are identical). However, the dimension of competence tends to be communicated in different ways across the two platforms (concepts such as ‘leader’ and ‘safe’ are the top runners in the tweets, but ‘reliable’ and ‘hard-working’ are more referenced in Facebook posts). Also, for expressions related to sophistication, the emotion ‘glamorous’ is highly referenced in both platforms, but the next running emotions are different (tweets communicate feelings of ‘magical’ and ‘smooth’, whereas Facebook posts focus on feelings like ‘luxurious’ and ‘charming’).

5 Conclusion and Recommendations

The emotional values of a DMO are an important differentiator to stand out in social media and remain competitive. As DMOs tend to communicate their tangible brand aspects more often, this study aimed to explore the communication of emotional brand aspects through Facebook and Twitter. First, the study demonstrates significant differences in the use (activity) and communication (intensity) of emotional brand values through the two platforms. The number of tweets/posts published by DMOs, the number/uses of adjectives and the communicated emotional brand values were analysed. In the case of Twitter, the number of tweets, adjectives and referenced emotional values are quite homogeneous among the observed DMOs. Interestingly, Facebook posts demonstrate discrepancies among the destinations. Second, the study also shows that the number of adjectives and emotional brand values communicated through Twitter is smaller than in Facebook. DMOs do not use the platforms equally, particularly in relation to the number of adjectives and the values communicated per post/tweet. This coincides with the results of previous studies, showing that social media have different characteristics that make them more or less suitable to

communicate brand emotional values as well as showing that Facebook possesses more emotional brand values in their posts than Twitter (Huertas & Mariné-Roig, 2016b). Third, the emotional brand values communicated are very similar for all destinations analyzed. They do not show distinctive strategies of brand communication, as Moreno et al. (2015) showed. The most communicated emotional values are sincerity and excitement, as detected in other studies (Ekinci & Hosany, 2006; Jain & Chan-Olmsted, 2009; Huertas and Marine-Roig, 2016a, b). However, feelings of ruggedness are communicated only in a limited way by a few destinations. This is also in line with other studies (i.e., Dickinger & Lalicic, 2016). However, the study identified differences between the types of emotional brand values communicated across the two platforms. For example, DMOs' communicate through Twitter magical and smooth values, whereas the Facebook communication focuses on luxurious and charming aspects. These results do not coincide with the previous studies, where DMOs did not have distinct strategies to communicate their brand values or communication brand strategies for different social media (Moreno et al., 2015; Huertas & Marine-Roig, 2016a, b). Overall, this study shows that there is a shift, where DMOs (at least the most popular destinations in Europe), are aware of the different potentialities of each social media platform and adapt accordingly different brand communication strategies. However, the study also shows that destinations still do not have a distinctive communication strategy regarding emotional brand values and they still do not take advantage of all the communicative potential that social media has in the communication of emotive destination brands. The study advises destinations to compare their communicated emotional values with competing destinations. In doing so, they can improve their differentiation and present a distinctive attractive personality of their destination online. DMOs are also recommended to verify how their online communicated emotional brand values coincide with their brand strategies and adapt them accordingly. Future research could also include a comparison of DMOs' brand emotional strategies and their online communication behavior, and include new methods such as storytelling. Furthermore, other engagement measurements, such as retweets or likes, can be included to test the effect of communicating brand emotions.

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DMOs' Facebook Success Stories: A Retrospective View

Lidija Lalicic¹(✉) and Stefan Gindl²

¹ Department of Tourism and Service Management, MODUL University
Vienna, Vienna, Austria

lidija.lalicic@modul.ac.at

² Department of New Media and Technology, MODUL University Vienna,
Vienna, Austria

stefan.gindl@modul.ac.at

Abstract. Online marketing strategies are an important part of any destination promotion agenda. DMOs use Facebook to engage with various stakeholders and enhance their image. Given the benefits of this approach, destination managers often are not guided or well informed about success strategies to maintain their Facebook brand pages and effectively communicate, engage and enhance their relationships with their consumers. The lack of empirical longitudinal research led this study to perform a retrospective analysis of the Facebook pages of the 22 most popular tourist destinations in Europe according to TripAdvisor 2017 rankings. The data-driven approach demonstrates which marketing activities triggered various consumer engagement behaviour and, thus, are successful in Facebook spheres. Furthermore, the study allows destinations to benchmark their Facebook presence and position themselves more strategically.

Keywords: Facebook-based marketing · Consumer engagement
Big data analysis · DMOs

1 Introduction

Online marketing tools are overtaking traditional online marketing sites and portals. As companies take notice of the potential benefits of online communities for their consumers, and as a result, they actively engage. However, the engagement in online communities, such as Facebook or Twitter, comes with a set of challenges with regards to successfully engaging consumers, and more important, having consumers returning (Moran & Gossieaux, 2010). Hence, carefully choosing social media tactics that align with a firm's corporate strategy, time and monetary investment are of utmost importance. For example, marketers need to understand how the creative appeal as used in their traditional marketing campaigns work in a social media sphere, but also which communication strategies are effective to engage consumers. In particular, destination management organizations (DMO) promoting tourist destinations have to adapt to this fast changing scenario of marketing and use the online environment more effectively (Roque & Raposo, 2015). Destinations compete on their ability to connect and meet the

need of information with various stakeholders. Hence, the process of destination management includes the optimization of operational performances and building strong brands that respond to the fast changing trends. Tourists tend to visit social media platforms more often than a DMO's website. During the various phases, as Amaro, Duarte and Henriques (2016) demonstrate, travellers use social media communities intensively. The characteristics of social media allows consumers to interact, meet brands and use it fast, with little effort to visit the brand. As a result, engaged consumers via social media have more intense brand relationships. Therefore, Galati et al. (2017) recommend focusing on the communication strategies, such as the quality of the content of messages and posts, the style of writing, and the timeliness of information exchange. These factors can increase consumer awareness and brand loyalty, with the opportunity to increase sales and competitiveness (Ruiz-Mafe, Martí-Parreño & Sanz-Blas, 2014). Hence, DMOs should carefully pay attention to the way they use social media as a part of their marketing strategies (Mariani et al., 2016).

However, even though DMOs accept social media as a beneficial tool as a part of new online marketing strategies, DMOs struggle with understanding its uniqueness (Hays et al., 2013). The understanding is either vague or varied, and the rules for being active in social media are unclear (Hays et al., 2013). For example, firms can easily attract their consumers, however marketing efforts leading to actual consumer engagement are often unauthentic or inconsistent (Kwok & Yu, 2016). Firms focus on the number of followers or likes but without an instrument that would support the assessment of their social media marketing efforts. Also, research lacks behind in providing firms guidelines how to design engagement tactics and the effects on the social media communities. For example, there is only little research related to Facebook brand consumer dynamics and engagement metrics (Jahn & Kunz, 2012; Hays et al., 2013) and to measure companies' social media efforts (Galati et al., 2017). The majority of these studies focuses on who the users are and their motivations to engage, basic descriptive analysis of social media communities with the majority integrating a 1-year time span. As a response, this study performs a retrospective approach of Facebook-engagement across popular tourist destinations. In doing so, the study aims to demonstrate Facebook-based marketing applied by destinations and their consumer engagement metrics. The study goals are two-fold. First, the study investigates the presence of the top 22 destinations as listed by TripAdvisor (2017) and their marketing strategies. Second, it investigates the benefits of Facebook-based marketing activities with consumer engagement measurements. The paper hereby demonstrates how social media analytics, in this case for Facebook, will support the measurement of success or failure of online media strategies for destinations. Through a data-driven approach, the analyses are based upon activities downloaded from the public Facebook pages for their entire history of existence, usually several years, via Facebook's official API (Application Programming Interface), including the messages of the destination, the type (i.e., video, image), the interaction of their users and the emotion tags Facebook provides (i.e., like, love). In doing so, the metrics used will allow to identify which marketing activities trigger different consumer engagement behaviour and how to adapt them in order to maximize their benefits. Through the identification of the best practices for successful Facebook presence, the study will also allow destinations to benchmark their Facebook presence and improve where necessary. Lastly, the study will provide a

set of guidelines enabling destinations to enhance their current online social media strategies. Overall, the study provides an overview of how to systematically identify trends, integrate the most effective engagement tactics and monitor online communities as a part of their online marketing strategies.

2 Literature Review

2.1 Social Media Marketing

Social media, such as Facebook and Twitter, triggered the creation of virtual consumer environments. These environments require companies to integrate new marketing tactics. Firms need to incorporate community building as part of their social media strategies in order to create business value (Ashley & Tuten, 2015). Habibi et al. (2014) visualize a brand community according to brand relationships that can enhance its success, ranging from consumer-product, consumer-brand, consumer-company, consumer-consumer and brand community engagement in general. These relationships need to be understood and integrated as a part of the efforts done by the firm that hosts the community. The majority of firms aim to use social media to enhance consumer engagement (Habibi et al., 2014). However, in order to facilitate higher levels of consumers engagement, firms need to understand the fact that engagement is based on behaviour which goes beyond a single purchase, but focuses rather on the brand or destination per se. As Ashley and Tuten (2015) state, consumers mainly engage in communities including characteristics, like valence (value), type of resources available, scope (temporal and geographic), impact and their own goals for engagement. Firms need to decide about their own consumer engagement behaviour and design their communication marketing strategies accordingly. Kang et al. (2015) refer to three orientations of task-interaction (enhancing consumer engagement), task-self (generating revenues) and self-orientations (increasing brand awareness). These orientations or marketing strategies can be emotional-transformative or functional-informative, addressing the various engagement behaviours consumers seek for. Also, these strategies can focus on the brands' benefits and matches between the consumers' aspirations, insights and experiences. Of course, functional messages are processed on a rational manner, whereas the emotional messages address more the psychological characteristics of the consumer. Similarly, information-based strategies might be better for highly-involved consumers, whereas animation-based are more effective for low-involvement consumers. According to Hassan (2013) resonance, animation, experiential appeals, social causes and incentives increase brand performance. Ashley and Tuten (2015) follow-up stating that a social media presence is also characterized by timing and a focus on a dialogue with the consumer. These elements help to build up the social capital and success of the brand. Overall, online communities, if successfully managed, demonstrate to lead to stronger brand commitment, brand loyalty and re-purchase. However, social media exposure also brings risks, requiring firms to walk the line between privacy and transparency (Fournier & Avery, 2011). Various challenges firms deal with are to, (i) effectively use social media, (ii) grow markets with a creative vision, (iii) involve consumers in telling their stories, and (iv) reinvent the

mass media model (Sheehan & Morrison, 2009; Moran & Gossieaux, 2010). In addition, the non-existence of a universal measurement of return on investment or effectiveness in general makes it hard for firms to investigate their efforts in terms of outcomes (Moro et al., 2016).

In particular, for the case of destinations, value expressive messages are more effective (Mariani et al., 2016). Hassan (2013) demonstrates that DMOs perceive social media as an important marketing tool to help them to position their destination. Milwood et al. (2013) follow-up and identify a difference of social media applications of DMOs, for example, US-based DMOs tend to use social media much more than Swiss DMOs. The different adoption levels of social media across various countries, shows the fluctuation of social media as an integrated part of their online marketing strategies. If using social media communities, the majority engages through promoting their destination (Dwivedi, Yadav & Venkatesh, 2011). DMOs are in fact relying much more on social media marketing activities, in particular Facebook, given its low costs and global reach. However, as Mariani et al. (2016) state, there is only a little stream of empirically based research investigating DMOs social media marketing. Thus, the connection between firms' engagement and consumers' reactions to brand-related information is still a large area to explore in the field of tourism.

2.2 Facebook Engagement

The goal of a Facebook page should be to fully engage, integrate and immerse consumers into an active brand community (Jahn & Kunz, 2012). Even though Facebook pages are in essence online brand communities, they seem to be more a mass broadcasting medium as well. Firms aim to trigger user engagement and influence potential consumers via the community network. One Facebook consumer (or fan) can lead to 20 additional visits to the brand website (Harris & Dennis, 2011). Hence, the dynamics of this novel marketing approach need to be understood. In research, there are two streams around the topic of Facebook-based marketing. First, studies analyse consumers' motivations and effects of engagement of Facebook brand pages. Jahn and Kunz (2012) show how functional and hedonic content drives participants to join a page. General use of online communities related to reasons vary from functional to socio-psychological, hedonistic and identification (i.e., Amaro et al., 2016). The increased knowledge gained through the engagement in Facebook brand pages, leads consumers to have higher level of emotional attachment (Jahn and Kunz, 2012). Issues like trust, strength of the relationship with the brand and perceived enjoyment of being a member affect consumers to accept the Facebook community (Ruiz-Mafe et al., 2014). Interestingly, consumers do not engage with a brand page to develop personal contact or as a space to emotionally express themselves (Ben-Shaul & Reichel, 2017). However, positive association with engaging in the brand page has a positive effect on the loyal attitudes towards the brand (Su, Reynolds & Sun, 2015; Ruiz-Mafe, et al., 2014). Furthermore, consumers' active behaviour shows to be a predictor of consumers recommending, supporting the brand and returning to the page. Facebook consumers can be divided into a matrix of four types based on their consumption level and level of content creation, known as (i) attention seekers, (ii) devotees, (iii) entertainment chasers and (iv) connection seekers (Hodis et al., 2015). Based on this matrix, marketers can choose and/or mix targeted marketing

strategies such as recruiting, empowering, serving and nurturing the specific Facebook segment. Bronner and De Hoog (2011) state identifying the different consumer segments will help the firm to grow and prosper the communication online. The second stream of research relates to functionalities of Facebook influencing consumers' engagement, e.g. to promote an event, publish information, share promotional activities, etc. (Coelho, Oliveira, & Almeida, 2016). Subsequently, a post can be interactive, informative, entertaining and of contrasting content. Of course, the characteristics shape consumers experiences in the community. For example, some elements demonstrate to play a significant role for Facebook (Kang, Tang and Fiore, 2015). First, the topic of the post. Interesting here is that the topic of the post does not seem to be critical for consumers to engage and communicate with and about the brand. However, as Kwok and Yu (2013) show, consumers respond more positive to conversational information than information related to marketing and selling. Second, the content of the post. In this case, visual content and engagement demonstrate that tourists are attracted by images. Kim et al. (2015) show that posts with a photo triggered more comments than text but also from video content. Visual content in combination with moderately long posts shows to have a positive effective on consumers' engagement (Kim et al., 2015; Kwok & Yu, 2016). In addition, visual content in the form of opinion polls and quizzes seems to produce higher level of social activity in the community (Coelho et al., 2016). A study done by Kang et al. (2014) demonstrates that the use of Facebook-based marketing of hotel brands can be effective when including for example humour, posing questions, showing pictures, requesting likes but also emphasizing environmental concerns and discount information are effective tactics. Fourth, performance plays a role, known as image appeal, exclusive appeal and incentives. Even though photos show to increase the sharing numbers, it hinders from the number of discussions triggered (Kang et al. 2014). The level of entertainment has a positive effect on consumer engagement, such as awards and discounts. Kang et al. (2014) identified this as one of the most important reasons to join a Facebook brand community. Fifth, the timing of posting shows to be an influencing factor, like weekdays seem more popular (Coelho et al., 2016; Ben-Shaul & Reichel, 2017). The timing during the day impacts too; evening posts receive much higher reactions than morning posts for example (Mariani et al., 2016). Interestingly, modest posting tends to be more effective than too many posts which shows to be counterproductive. At this point, identifiers such as a like, share with a recommendation or a general share do predict the communication. Facebook-marketing based studies related to DMOs is growing, however in a relatively descriptive mode. A recent study by Mariani et al. (2016) demonstrate in more depth how Facebook-features lead to various engagement behaviour. In their study, a focus on Italian DMOs, photos and videos are the most used and seem to trigger the most comments too. Leung et al. (2013) analyze three airlines' use of Facebook for a period of two months; Pesonen (2011) analyzed Facebook presence of rural based firms. Hence, there are only a few studies that have analyzed the number of media features and possible effects on consumer engagement, demonstrating the need for the study at hand.

3 Methodology

3.1 Data Acquisition

Initially we aimed to include the 25 top European destinations according to TripAdvisor (2017), however, only 22 of them have a Facebook page that is regularly used. The following DMOs are included, listed with their official page name: “Visit London”, “Paris je t’aime”, “Visit Barcelona”, “I Amsterdam”, “Visit Budapest”, “visitBerlin”, “Visit Tenerife”, “This is Edinburgh”, “Visit Madeira”, “Visit Dublin”, “Visit Greece”, “Turismo Roma—official page”, “Incredible Crete”, “Prague.eu”, “Istanbul CVB”, “St Petersburg Guide”, “Visit Lisboa”, “Visit Florence”, “Santorini”, “Visitcorsica”, “Rodos (Rhodes)” and “Visit Malta”. The study follows a data-driven approach and analyses large amounts of interaction data derived from Facebook’s Graph API. The data pool for the analysis uses the activity downloaded from the public pages for their entire history of existence, usually several years. It consists of the messages a DMO’s posts on its timeline, their type (i.e., video, image) and the reaction of their users. The acquired data helps to assess the success of Facebook-based marketing strategies. The paper measures the outbound activity of the page throughout its entire online existence, i.e., the way the page interacts with its fans. The setup of the activity strongly influences how fans perceive the page, for example the timing of posts, as Mariani et al. (2016) demonstrate, is important as this will increase engagement. In this paper the following metrics are included to measure page activity: (1) *frequency* (absolute frequency—total number of posts during the observation period.), (2) *types* (video, image, text, link, event, note, music and offer) and (3) *publication times of posts* (i.e., the hour preferred for posting.) Furthermore, the paper analyses the fans engagement with the page. In this paper the engagement metrics reflect of how well people respond to the activity of a page, i.e., how they interact with the page. Fans can react by using Facebook emojis, the most famous of them the thumb up or “Like” button. Furthermore, fans can comment on the posts of the DMO. We measure fan engagement by giving (1) the number of reactions to all posts, (2) the number of reactions per post type, and (3) the number of reactions per hour. Also in this case, the data is throughout the entire time-span of Facebook activity, rather than just the last year or a specific period as done by other studies.

4 Results

4.1 Page Activity

First, the page activity is analysed based on when the DMOs started to use Facebook as a marketing engagement tool. In fact, the first DMOs (Visit Dublin) started using Facebook in March 2009 and the last DMO (Istanbul CVB) joined Facebook in 2012. The DMOs published 95,535 posts in total. The most active DMO (St. Petersburg Guide) has posted 20,400 posts since its online presence, whereas the least active DMO (Santorini) has only a record of 365 posts throughout their online history. Figure 1 visualises the page activity, aggregated on a monthly basis, over the time span since the

DMOs are online. As seen, for instance, Santorini has a maximum of 25 posts in their most active month, whereas St. Petersburg reached 600 posts in their most active month. In addition, the time series in Fig. 1 display the fluctuations of the DMO’s page activity; showing substantial variations of the posting activities of the DMOs. Some DMOs are very active in the beginning of their online presence (e.g. Madeira, Rhodes, or Santorini) and strongly reduce their activity later on. Other DMOs are rather stable over time and show only minor fluctuations of their post activity. Figure 1 helps to identify similar clusters of DMOs with similar Facebook-marketing behaviour, for example DMOs like Rhodes, London and Crete have a similar amount of sharing, whereas Rome and Prague are similarly active when it comes to postings since 2015.

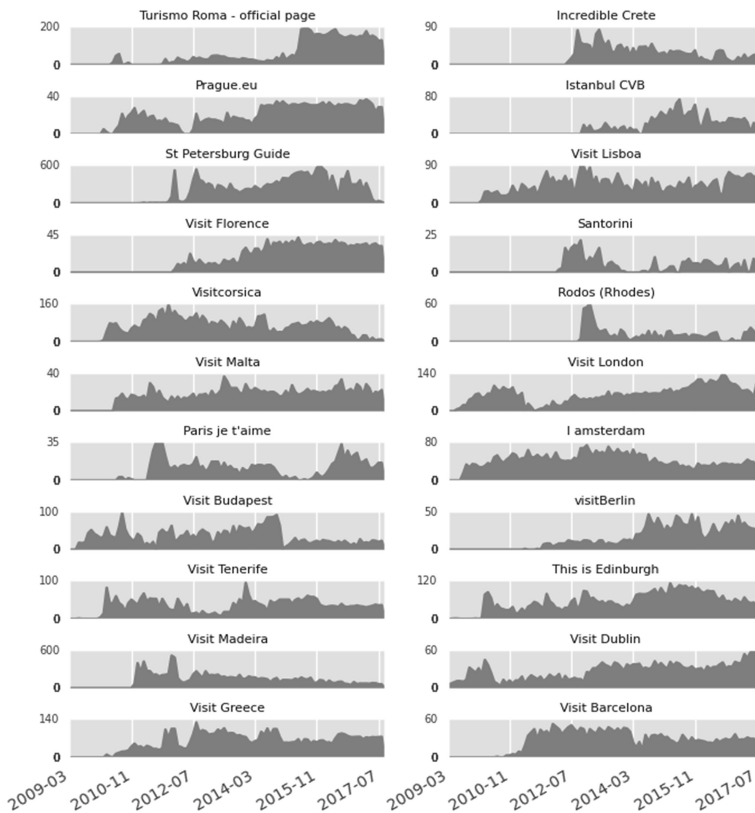


Fig. 1. Post frequencies by DMOs aggregated on a monthly basis

Then, the distribution of the page activity is analysed according to the type of the post. In general, DMOs use photos (63%), links (27%), videos (7%) and status (3%). The minor posts types (events, note, and offer) account for only 0.4% of all the post

types and are therefore left out in the visualisation of Fig. 2. A closer look at Fig. 2 shows that some DMOs tend to use photos much more than others, such as Rhodes, Paris and Lisboa (>50%). Other DMOs use a more balanced approach, for example, Amsterdam uses links and photos quite even when posting. Dublin and Tenerife post much more links than the other DMOs. Also, the timing of posting is analysed, where there are significant differences as well; in the morning (6:00–11:59), the strongest posting hour is between 09:00 and 09:59 (8.3% of all the posts), the afternoon (12:00–17:59) is strongest from 12:00 to 12:59 (7.6%), the evening (18:00–23:59) is between 18:00 and 18:59 (6.3%) and the morning (0:00–5:59) between 05:00 and 05:59 (1.0%). The heat map in Fig. 3 visualizes the posting hours per DMO and reveals peaks. The darkness of the colour indicates the intensity of postings, for instance, a very dark colour represents a heavy posting behaviour. For example, Lisbon tends to post dominantly between 17:00 and 17:59, whereas they hardly post between 22:00 and 04:00.

4.2 Engagement

In this part, the fan engagement is analysed. First, the number of post reactions is assessed. Overall, our data pool consisted of 80,506,867 reactions for all DMOs during their entire posting history, i.e. an average post receives 800 reactions.

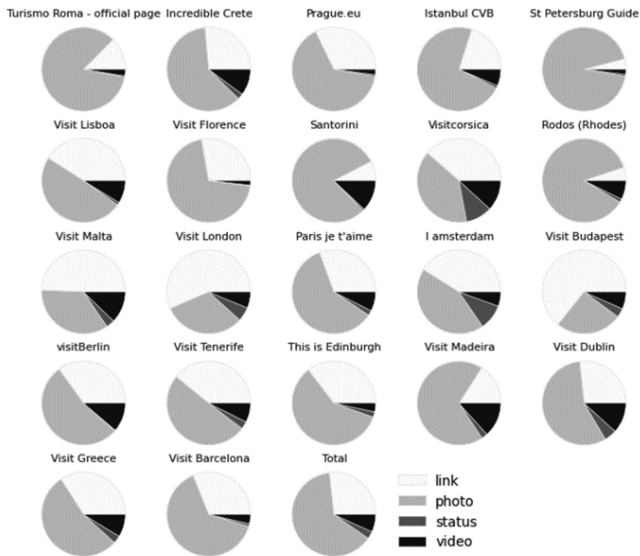


Fig. 2. Page activity per post type

The most popular DMO (St. Petersburg) received 43,203,212 reactions, the least

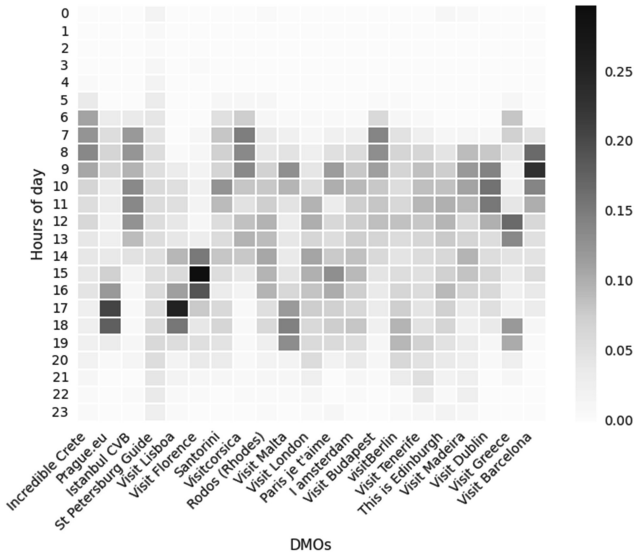


Fig. 3. Distribution of post activity per hour

popular DMO (Istanbul) received 3274 reactions. Figure 4 shows the division of the DMOs post reactions according to their frequencies and time of existence on Facebook. The majority of users start to interact with the DMO’s fanpages a bit later after the page goes online, i.e., the reactions increase significantly from 2012 onwards. There are also various variations in the reactions, for example, Rhodes has a steep curve in 2014, depending on the content published.

In order to understand which post types trigger reactions over time, Fig. 5 visualizes number of reactions according to the type of post from every DMO. Overall, the

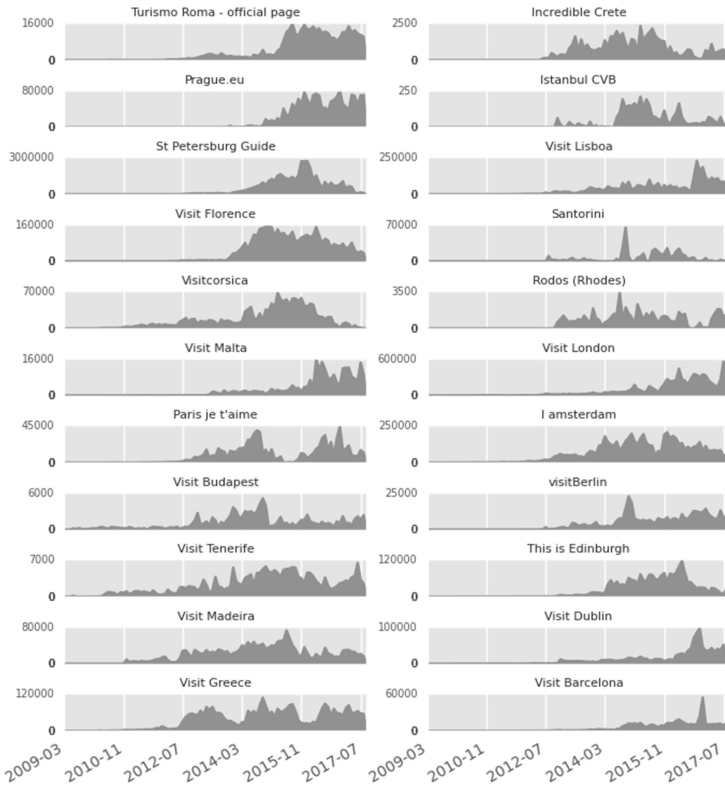


Fig. 4. Post reaction frequencies by DMOs aggregated on a monthly basis

distribution of the reactions coming from DMOs posts is as follows: posts with photos trigger 86.37% of the reactions, links 9.02%, videos 4.43% and the remaining types (i.e. status, event, note, and offer) trigger 0.16% of the reactions combined. As seen in Fig. 5, there is a clear tendency of photos receiving the majority of reactions. Only a few DMOs receive a larger amount of comments from links (i.e., Malta and Budapest). Interestingly, videos do not receive many reactions, some DMOs hardly get any reactions (e.g., London). Furthermore, the reactions are also mapped into the hour of the day. In this case, we can see that the majority of the reactions happen during the morning hours (28.41%), afternoon (39.33%), evening (27.65%) and night (4.62%). Figure 6, shows in a heat map the specific moments where there is high peak of reactions. Only 3 DMOs (Prague, Lisbon, Florence) stand out in receiving the majority of reactions in the late afternoon. This aligns rather well with the posting behaviour of the DMOs themselves, indicating that users respond rather fast and are online around the same time.

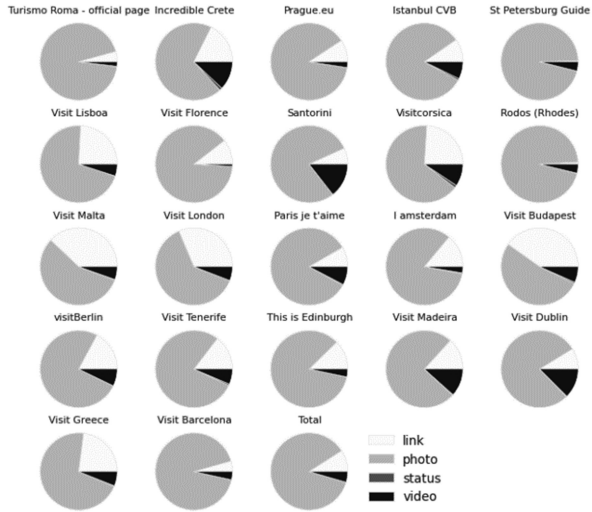


Fig. 5. Distribution of reactions per post type

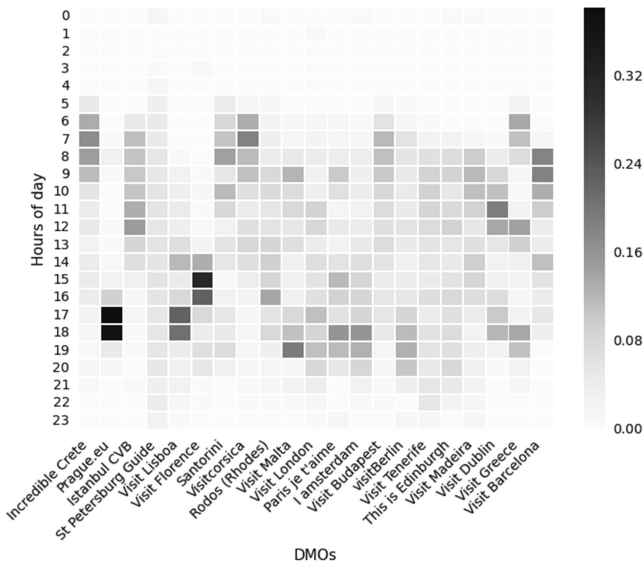


Fig. 6. Reactions per hour day

5 Conclusion and Recommendations

For 10 years, brands have the possibility to engage with their consumers through the creation of a Facebook brand page. This provides an opportunity to perform a retrospective analysis on the usage of Facebook brand pages and their potential to engage with users. The majority, if not all, studies have analysed Facebook based upon a single year of data or a specific time frame. In contrast, this study developed an innovative tool that allows to perform a longitudinal retrospective analysis, thus, covering a brand's commitment with Facebook since the beginning. In doing so, the paper was able to demonstrate a new method to understand DMOs' social media engagement. In addition, the paper discussed DMOs behaviour and users' responses, and discussed successful and failing cases. In this paper, three basic features were outlined to demonstrate the usage of such an innovative tool. For companies such an overview reveals their effectiveness of Facebook-based marketing and enables them to effectively plan for future posting activities and enhance the success of their FB presence. In terms of managerial implications, we recommend that companies start as early as possible with their Facebook activities, as building up a loyal fan base takes time. Furthermore, DMOs are advised to strategically choose their post type, as shown this is of utmost importance to engage fans in various manners. Also, firms need to take the time of posting into account as users tend to respond at certain times only. For theoretical implications, the study enhances the understanding of engagement through platforms such as Facebook. Furthermore, the study provides a large database and perspective of this concept. Future research will include detailed metrics that give deeper insight into user engagement by measuring loyalty or analysing the content of the fan comments. Furthermore, the content, type or the length, and the moment of the posts can be interesting variables to explain the success rate of a post. Lastly, a comparison among different industries and usage of Facebook as an engagement tool will shed further light on the different posting activities and user behaviours.

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Influence of Social Media Engagement on Sustainable Mobility Behaviour in Alpine Regions

Aleksander Groth^(✉), Rosanna Buchauer, and Stephan Schlögl

MCiT Interaction Lab, Department Management, Communication & IT (MCiT),
MCI Management Center Innsbruck, Innsbruck, Austria
{aleksander.groth, stephan.schloegl}@mci.edu,
r.buchauer@mci4me.at

Abstract. Alpine regions are valued for their natural treasures by both tourists and locals alike. In order to preserve their natural resources, higher awareness and practical solutions towards sustainability in general and—especially in the region of Tyrol in Austria—sustainable mobility are in high demand. To foster such awareness, social media offers great possibilities for communication and interaction via online communities, and a strategic employment of such tools could amplify the adoption of a more sustainable travel behaviour among people. A quantitative study, employing the Theory of Planned Behaviour, the influence of attitude, subjective norm and control factors on the behavioural intention to travel more sustainably, moderated by a person’s engagement on social media with sustainability topics, was applied. Results show a positive relation of sustainable attitude, subjective norm and perceived behavioural control towards the intention to travel more sustainably. Over and above, the outcome discloses the impact of individuals’ social media engagement on their behavioural intention. Thus, social media strategies can lead to an intended change in behaviour and foster sustainable mobility.

Keywords: Theory of planned behaviour · Sustainability · Alpine regions
Mobility

1 Introduction

Alpine regions, like Tyrol in Austria, highly rely on the tourism economy and thus on a healthy nature, with e.g. fresh air, clean views, or reliable annual snowfalls. Gradually, climate and environmental change affect those regions, specifically caused by CO₂ (transit) traffic emission; in 2015 as much as 2.6 tons were emitted in Tyrol, almost half of all CO₂ emissions (5.5 tons) produced in that region.¹ Due to its high impact on the environment and nature, the reduction of emissions stands as an important principle of sustainability (Daly, 1990) and consequently promotes a change towards a more

¹ Verkehrsclub Österreich. (2015). Energieverbrauch des Verkehrs seit dem Jahr 1990 fast verdoppelt - Mobilität mit Zukunft. Retrieved from <https://www.vcoe.at/news/details/vcoe-energieverbrauch-des-verkehrs-seit-dem-jahr-1990-fast-verdoppelt>.

sustainable mobility. With the tremendous shift in information distribution and media usage, the so-called mobile generation utilizes social media technologies as their constant companion (Cabral, 2011). In addition, users are highly engaged within their social networks, offering new channels to promote information on sustainability, raise awareness for alpine regions, and protect nature in general. As sustainable thinking is already well accepted within some areas (e.g. hotel rooms, waste prevention), awareness towards a more sustainable behaviour regarding mobility and travelling is comparatively low. Hence, developing strategies to raise such awareness offers possibilities for destinations and destination management organizations (DMOs) to setup and distinguish their marketing campaigns in order to address and broaden their audience. Furthermore, promoters of sustainability are still underperforming on social media (Carpenter, Takahashi, Cunningham, & Lertpratchya, 2016; McAllister-Spooner, 2009). In order to evaluate the effectiveness of such online marketing campaigns, this study investigates the impact of users' social media engagement on the formation of their behavioural intention towards a more sustainable mobility in alpine regions.

2 Related Work

Sustainability concerns many spheres of human life and forms a public issue worldwide. Scholarly literature widely discusses the term due to its complexity, nonetheless, theory does not provide any one clear-cut definition of sustainability (Müller, 2015). The United Nations formed the *World Commission on Environment and Development* in 1980 as a reaction to the tremendous degradation of the human environment and natural resources. Gro Harlem Brundtland, former prime minister of Norway, led this commission and published the so-called Brundtland report with the title "Our Common Future" in 1987. The report thoroughly discusses the main objectives of a sustainable development by searching for a permanent balance of environmental, social and economic interests and sets the premise that "*Sustainable development is progress, that satisfies the needs of the present without endangering the ability of future generations to satisfy their needs*" (Stahlmann, 2008, p. 59).

2.1 Sustainable Mobility in Alpine Regions

"*Actually we know more about the mobility behaviour of bees and other insects in their alpine habitat than about human individuals*" (Tischler & Mailer, 2014). The domain of (applied) mobility is by its nature trans-disciplinary and demonstrates, how current social, economic, political, and environmental issues may provide opportunities for sustainable mobility in the future (Freudental-Pedersen, Hannam, & Kesselring, 2016). In Tyrol, Austria, almost half of all CO₂-emissions per year are emitted by traffic alone and emissions rose by 73% from 1990 until 2015.² Stahlmann (2008) names CO₂ emissions as a key aspect of ecological sustainability. He puts it under the term *ability*

² Umweltbundesamt. (2015). Treibhausgase. Retrieved from <http://www.umweltbundesamt.at/umwelt/luft/treibhausgase/>.

to absorb, which implies producing only the amount of emissions that nature can absorb in aspects of time and amount, hence, the high amount of emissions caused by traffic should be reduced. Sustainable mobility aims to address that need and refers to a mobility that goes hand-in-hand with the requirements for a sustainable development (Høyer, 2000). In 1991, seven alpine states and the European Union signed the *Alpine Convention*, a move towards sustainable development and the realization of a more sustainable transport in alpine regions with the goal of assuring such a sustainable development in one of Europe's most sensitive areas. Its focus was set towards ecological (preservation of natural and cultural values) and economic (balanced competitiveness of the region) sustainability (Bender, 2006; Borsdorf & Lange, 2006). In order to contribute to a sustainable development, alpine regions need to change their mobility concept. Reasons for this change are visible by high air pollution, noise exposure, and constraints in habitability for environmental reasons. In addition, traffic density is high since rural areas are highly dependent on urban centres and cities as they offer jobs and supply capacity and infrastructure. Transport methods responsible for growing congestion in alpine regions are tourist travel, transit, and commuter traffic (Bender, 2006; Høyer 2000). A question still unanswered is, how to address the topic of mobility and how to motivate people towards a more sustainable way of moving between locations.

2.2 Attitude and Behaviour Within Sustainability

Quantitative studies identify a gap between a person's attitude and behaviour (Kollmuss & Agyeman, 2002). Within the context of sustainability and climate change, research shows that even people with high interest towards climate protection still would drive their car often and thus actively pollute the environment. Rajecki (1982, as cited in Kollmuss & Agyeman, 2002) formulates four core reasons for explaining the loose connection of attitude towards climate protection and driving (as behaviour):

- *Direct versus indirect experience*: Direct experience (like seeing a dead fish in the ocean that died because of water pollution) form a stronger relation between attitude and behaviour than indirect experiences (e.g., reading an article about an environmental problem).
- *Normative influences*: Social norms and people, who are important to the individual, affect his or her attitude (e.g., a circle of friends that acts often in a pro-environmental way).
- *Temporal discrepancy*: Attitudes undergo changes over time, especially when they relate to specific incidents (e.g. an opposed attitude against nuclear energy after Chernobyl fades over time).
- *Attitude-behaviour measurement*: The scope of an examination defines its results [e.g., when an examiner asks either about climate protection in general or about reducing emissions as a behaviour (Newhouse, 1990)].

There are many barriers within (e.g., emotions, temperament, attitudes) and outside of a person (e.g., social norms, events) that form this discrepancy between attitude and behaviour. Nevertheless, attitude plays a highly significant role in presupposing a positive behaviour towards the environment (Ajzen & Fishbein, 2011; Breckler, 1984).

Moreover, attitude is not a direct antecedent of behaviour, but rather has an impact on a person's intention to behave in a certain way, which then forms behaviour (Kollmuss & Agyeman, 2002).

2.3 Theory of Planned Behaviour

The *Theory of Planned Behaviour* (TPB) aims to predict and describe human behaviour in particular cohesions (Ajzen, 1991). The model contains five variables, namely *attitude* (level of positive or negative evaluation of a specific behaviour), *subjective norm* (social surrounding and perceived social pressure), *perceived behavioural control* (perceived easiness/difficulty of conducting the behaviour as well as reflections of previous experiences and barriers). All three form a person's *intention* to perform a certain *behaviour*. Additionally, all three predictors are formed by normative, social, and control beliefs. Understanding the attitude-behaviour gap, these salient beliefs form an individual's intention and behaviour by acting as predecessors. Overall, TPB follows the interpretation, that the higher the level of positive attitude, positive subjective norm, and perceived behavioural control, the greater a person's intention to conduct said behaviour. The model assumes, that intention is a direct precondition of behaviour and by intending to behave, execution is most likely to follow. This understanding poses a strong limitation and is an often mentioned point of criticism, as TPB excludes any spontaneous and automated procedures, but concentrates solely on planned situations (Ajzen, 1991). The TPB has been further criticized for neglecting anticipated regret of what has been missed out by choosing one behaviour over the other e.g., in action-theory: opportunity costs (Conner, Sandberg, McMillan, & Higgins, 2006), personality traits of all forms (Eagly & Chaiken 2011), self-identity and role identity (Sparks & Sheperd, 1992), and external resource accessibility and cooperation (Eagly & Chaiken, 2011). Still, empirical research has not yet been able to produce consistent results towards any of those predictors, enabling the TPB to provide an accepted and simplistic understanding of how behavioural intentions are formed (e.g., Crotty, 2012; Sheeran & Orbell, 1999; Sparks & Sheperd, 1992).

2.4 Social Media Engagement

Today, it is comparatively easy to reach large audiences due to the diffusion of social media and widespread access to the world wide web (Stieglitz & Dang-Xuan, 2013). Users of social media are able to directly interact with peers, build communities, and target people in their individual interest space (Carim & Warwick, 2013; Carpenter et al., 2016). Hence, information sharing and interaction is attained with seemingly low effort and costs. Consequently, people, who are engaged on social media, perceive themselves as more powerful in making a significant difference or causing a change, than people who avoid social media as a tool to reach others (Porter, Sweetser Trammell, Chung, & Kim, 2007). Social media and the world wide web went from a place of information towards a stage for influence (Hanna, Rohm, & Crittenden, 2011).

Engagement forms the conceptual framework of social media and embraces interactions as well as relationship building with and through other users. Interactions imply reading articles, clicking the like button on platforms like Facebook or Instagram

or commenting on posts. Moreover, engagement on social media can be understood as a connection between users that can be individuals, brands, or organizations that reach out to their customers and target groups (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). Analysing 100 non-profit organization's use of Twitter, Lovejoy and Saxton (2012) identified three steps for engagement on social media: *information*, *action*, and *community*. *Information* calls for publishing relevant content in order to inform the public and raise awareness; a first step towards changing behaviour (Djordjevic & Cotton, 2011). *Action* implies the inspiration to transform this information into actual behaviour, e.g. donating money or volunteering for an event. Finally, *community* stands as a unique characteristic of social media. It involves the building and feeding of information to an interested group of people by interacting and exchanging within this network.

Furthermore, social media enables users to attend and interact within various communities online, whereas each group treats a specific topic and depicts the ties with other communicators (Carpenter et al., 2016). Thus, groups regarding sustainability, climate change, as well as mobility behaviour render to push *information* and *action* in this area. Most of the engagement on sustainability issues revolves around environmental activism (Pickerill, 2001) and actions, focusing on minimizing the negative outcomes of people's behaviour (Kollmuss & Agyeman, 2002). Mobility management campaigns for instance follow the goal to minimize emissions by encouraging people to travel, commute at low-emissions, and change their overall mind-set (Hiselius & Rosqvist, 2016).

2.5 Influence of Social Media Engagement on Behavioural Intention

Typically, people are not oblivious to the negative impact of leisure and touristic travel on the environment. Moreover, specifically adapted information campaigns could have an influence on a tourist's mobility behaviour (Holden & Linnerud, 2011). Such campaigns can go viral through social media, but minding the attitude-behaviour gap, obvious discrepancies between environmental concerns and behaviour are prevalent (Kollmuss & Agyeman, 2002). Naturally, people with a high environmental awareness are more open to policies that support pro-environmental behaviour, making the public's approval for regulations, such as higher fuel taxes or similar legal and political changes, crucial (Schade & Schlag, 2016). Consequently, a higher engagement towards sustainability on social media could lead to a higher cognitive involvement regarding awareness on social media sites, forums, and weblogs (Stieglitz & Dang-Xuan, 2013). Furthermore, messages distributed via social media turn out to be more effective in influencing knowledge, attitude, and behaviour towards the environment than traditional educational campaigns (Marcell, Agyeman, & Rappaport, 2004). Carpenter et al. (2016) advice, that in order to reach the audience and initiate engagement on sustainability, communicators need to comprehend the culture and communication on social media in order to influence awareness, attitude and consequently actions.

Still, when moving people to engagement and to further action, a phenomenon called *moral licensing* becomes effective (Merritt, Effron & Monin, 2010). When

individuals engage on social media through collective action, these attributed actions sum-up over time. Hence, several positive actions at one point release guilt feelings for negative actions at a later point in the mind of the person. Thus, activism campaigns often cause a simple shift in actions without getting rid of the problem due to this moral licensing effect. For example, people may alter their commuting habits towards lower emissions and at the same time cause more emissions in their leisure travel by flying more often or for longer distances. Alternatively, people may also engage more intensively in sustainability communities online, which may convert the feeling to reduce or stop their engagement in real life towards a more sustainable lifestyle. Consequently, the intended behavioural outcome towards reducing emissions or to exert a more sustainable lifestyle is reduced (Holden & Linnerud, 2011).

3 Methodology

In order to analyse the effect of social media engagement on the formation of behavioural intentions towards a more sustainable mobility behaviour, the Theory of Planned Behaviour (Ajzen, 1991) has been adapted towards the context of mobility and sustainability. *Social Media Engagement* (SME) has been integrated as a moderating variable on all three independent variables of *Attitude* (ATT), *Social Norm* (SN), and *Perceived Behavioural Control* (PBC) towards a *Behavioural Intention* (BI) to change. The study was set up and conducted employing a quantitative research methodology, testing and validating a number of hypotheses (Veal, 1997).

3.1 Proposed Research Design

Drawing upon the presented theory and the presented theoretical model (see Fig. 1), the following hypotheses were developed:

- H1: *Attitude* (ATT) positively influences the *Behavioural Intention to travel* (BI) at low-emissions.
- H2: *Subjective Norm* (SN) positively influences the *Behavioural Intention to travel* (BI) at low-emissions.
- H3: *Perceived Behavioural Control* (PBC) positively influences the *Behavioural Intention to travel* (BI) at low-emissions.

By describing the effects of social media on the formation of behavioural intentions in the previous work above, *Social Media Engagement* (SME) may act as a moderating effect on the formation of intentions to travel at low-emissions. A moderator is a variable that influences the relationship between an independent and a criterion variable in terms of either direction and/or power (Baron & Kenny, 1986). Hence, the impact of SME on the independent variables ATT, SN and PBC influence on BI is observed. As literature shifts between a positive and negative impact (e.g. moral licensing effect), H4 to H6 are formulated as undirected hypotheses.

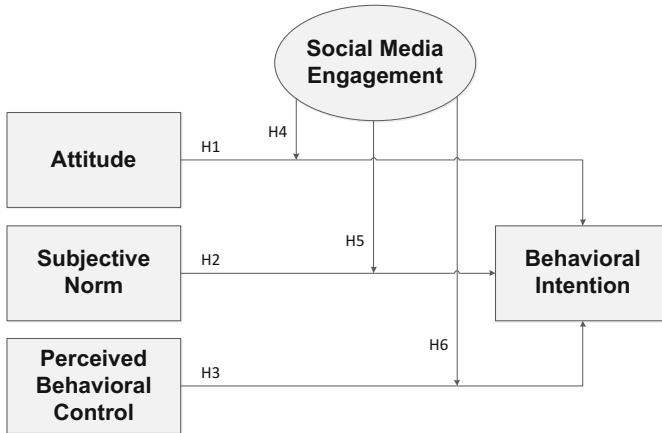


Fig. 1. Proposed research model, referring to Ajzen (1991)

- H4: *Social Media Engagement (SME)* affects the influence of *Attitude (ATT)* on *Behavioural Intention to travel (BI)* at low-emissions.
- H5: *Social Media Engagement (SME)* affects the influence of *Subjective Norm (SN)* on *Behavioural Intention to travel (BI)* at low-emissions.
- H6: *Social Media Engagement (SME)* affects the influence of *Perceived Behavioural Control (PBC)* on *Behavioural Intention to travel (BI)* at low-emissions.

3.2 Study and Questionnaire Design

A questionnaire survey was designed in order to test all proposed hypotheses above (see Table 1).

Table 1. Questionnaire items and corresponding constructs

Construct	Statement
ATT	ATT1: My travelling at low-emissions has a positive impact on the environment
	ATT2: My travelling at low-emissions is (very bad—very good)
	ATT3: If I travel at low-emission that would be (very bad—very good)
	ATT4: If I travel at low-emission that would be (very pleasant—very unpleasant)
SN	SN1: People I care about think that I should travel at low-emissions
	SN2: Regarding mobility behaviour, I want to behave according to the expectations of the people I care about
	SN3: Most of my friends travel at low-emissions
	SN4: Regarding mobility behaviour, I want to be like the people I care about
	SN5: The people I care about favour my travelling at low-emissions
	SN6: Most people like me have travelled at low-emissions for the last three months, if there was the transport possibility in their surroundings

(continued)

Table 1. (continued)

Construct	Statement
PBC	PBC1: I expect to have opportunities within my surroundings that enable me to travel at low-emissions
	PBC2: Means of transportation at low-emissions in my surroundings would help me to travel at low-emissions
	PBC3: For the last three months, I have travelled at low-emissions when there was the transport possibility in my surroundings
	PBC4: I am confident that I can travel at low-emissions
	PBC5: Travelling at low-emissions depends on myself
BI	BI: I intend to travel at low-emissions
SME	How often are you ...
	SME1: active on FACEBOOK on sustainability related topics?
	SME1.1: reading/seeing posts on sustainability
	SME1.2: liking posts on sustainability
	SME1.3: commenting posts on sustainability
	SME1.4: actively posting/sharing posts on sustainability
	SME1.5: sharing posts on sustainability with my family/friends (offline)
	How often are you ...
	SME 2: active on INSTAGRAM on sustainability related topics?
	SME2.1: reading/seeing posts on sustainability
	SME2.2: liking posts on sustainability
	SME2.3: commenting posts on sustainability
	SME2.4: actively posting/sharing posts on sustainability
	SME2.5: sharing posts on sustainability with your family/friends (offline)
SME3: Are you engaged on sustainability related topics in blogs/forums?	
SME4: Are you watching videos on sustainability related topics on YouTube?	

Except for ATT2, ATT3, and ATT4, all items within ATT, SN, PBC, and BI were assessed using a seven-point-Likert scale ranging from “strongly disagree” to “strongly agree”. All items within SME ranged from “never” to “very often” on a seven-point-Likert scale. In addition, participants had to provide information regarding their everyday mobility behaviour and demographic information such as age, gender, and place of residence. The questionnaire was distributed online via Facebook, E-Mail, and in selected online forums covering the topic of sustainability.

4 Results

Overall, 203 participants completed the questionnaire with 54.7% being female and 45.3% male. More than half of the participants (57.1%) were between 20 and 29 years of age (33.5% were 30–49 years old). The majority of respondents live in the alpine

region (72.4%), thereof almost 40% in a city and 32.5% in a rural area. In terms of social media activity, most of the participants (70%) use Facebook one or more times per day. Instagram splits the participants into two large groups, namely those who use Instagram one or more times per day (40%) and those who never use it at all (40%). Twitter is hardly used by any of the participants (75% never use it). Blogs are visited one or more times per weeks by 23.6%, forums by 20.7% of respondents.

4.1 Reliability and Regression Analysis

H1 to H3 were tested in SPSS via a multiple regression analysis and function as a precondition for testing H4 to H6. First, the relationship between ATT, SN, PBC and BI was examined and in a second step, SME was inserted as a moderator analysis. A moderating effect exists, if the value of the moderator variable affects the relation between predictor and outcome variable. *Cronbach alphas* for all variables were above 0.6, with the lowest reliability found in ATT (0.613) and the highest in SME (0.900). First, an ANOVA of the independent constructs aimed at evaluating the relationship with the dependent variable. Results showed that all three independent variables exhibited a direct significant influence on BI ($p = 0.000$). Goodness of fit was evaluated by a regression analysis, with the resulting R^2 explaining 59.3% of the total variance of BI. Regression coefficients were positive and significant, proving all three predictor variables have a positive impact on BI. p -values of ATT and PBC (both $p = 0.000$) were significant, although SN shows a non-significant p -value ($p = 0.825$). Additionally, a stepwise regression was applied to obtain more insights with respect to the impact towards BI. Hereby, the p -value of SN differs from the results of the previously calculated multiple regression models, when only ATT ($p = 0.000$) and SN ($p = 0.001$) are inserted. Consequently, all three predictors influence the outcome variable BI, with SN showing no significant effect, when PBC is inserted. Ajzen³ recognizes this effect, as all three predictors are conceptually independent, but may inter-correlate empirically, since the same aspect is able to influence the predecessors of ATT, SN and PBC, which are behavioural, normative as well as control beliefs. Hence, Hypothesis 1–3 are accepted. Second, the moderator SME was added to the model. An ANOVA showed significant results for all independent variables (all $p = 0.000$) towards BI and a regression analysis calculated with ATT * SME was able to explain 49.6%, SN * SME 37%, and PBC * SME 59.5% of BI's variance. Table 2 shows the results of the moderator analysis including regression coefficients of BI.

³ <http://people.umass.edu/aizen/faq.html>.

Table 2. Regression coefficients of BI

	Regression coefficient B	Std. error	Beta	T	Sig.
(Constant)	-1.631	0.785		5.597	0.000
ATT	1.213	0.145	0.922	8.659	0.000
SME	1.565	0.330	1.334	4.740	0.000
ATT * SME	-0.225	0.057	-1.298	-3.943	0.000
(Constant)	0.786	0.597		1.316	0.190
SN	1.042	0.158	0.842	6.586	0.000
SME	1.337	0.214	1.140	6.237	0.000
SN * SME	-0.236	0.052	-1.076	-4.504	0.000
(Constant)	-1.328	0.710		-1.871	0.063
PBC	1.200	0.127	1.000	9.438	0.000
SME	1.313	0.356	1.120	3.685	0.000
PBC * SME	-0.197	0.059	-1.189	-3.336	0.001

^aDependent variable: BI

None of the regression coefficients were equal to zero and thus significant. All interactions (ATT * SME, SN * SME and PBC * SME) show a negative direction. Figure 2 depicts the moderating effect of SME on each independent variable towards BI.

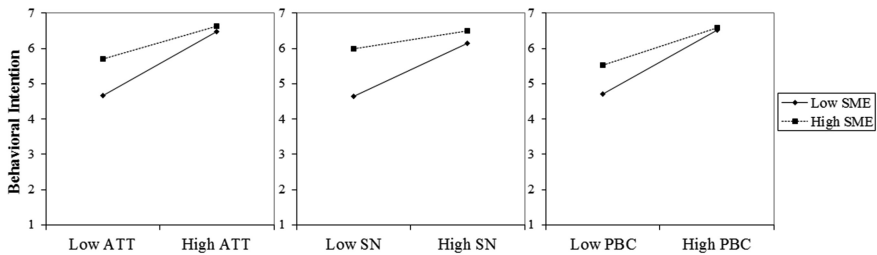


Fig. 2. Moderator effects ATT, SN, and PBC

Concluding, the study outcomes identified a moderating effect of SME on ATT, SN, and PBC towards BI, hence Hypothesis 4–6 may be accepted. In the case of the predictor of ATT, a SME value below average reveals a stronger effect on the increase of BI than a higher engagement (increase of 0.85 compared to 0.43). SN and PBC reveal similar results. Low values on SME lead to a stronger effect on the increase of BI than a high value. Moreover, the decline of the predictors influence is comparable between all three independent variables. In detail: ATT, from 0.85 to 0.43 (fall by 0.42 units), SN and PBC fall by 0.43 and 0.36 units.

5 Concluding Remarks, Limitations and Future Directions

Overall, a sustainable attitude positively influences the intention to travel in a more sustainable way, where a higher engagement on social media leads to higher attitude of behaving more sustainably. Presumably, this derives from a higher knowledge as well as higher awareness of sustainable travel options. Moreover, the social surrounding and its approval of sustainability has a positive influence on the deliberation of sustainable mobility and the perceived control of being able to travel at low-emission, influences the intention to do so. In addition, PBC has an effect on SN and ATT. Hence, people relate their control (e.g. a well-developed public infrastructure of travelling from villages to cities) to their SN (approval of others, if it is possible to use public transport) and their ATT (e.g. supporting a sustainable travel option like public transport). Participants had to assess their own behaviour and results show, that they (un-)consciously integrate the control aspect of being able to travel at low-emission into their behavioural and normative beliefs, which influences their ATT and SN and consequently their BI. Findings regarding the moderating effect of SME support the *action* function of social media (Carpenter et al., 2016). Thus, reading an article about sustainability or engaging in other ways on social media positively influences the intention to travel more sustainably, already with a relatively low SME. Interestingly, a rise in SME decreases this positive effect. A SME value of 3.46 (slightly above the study's average) results in a smaller increase of BI. Thus, by engaging more on sustainable topics online, participants demonstrate a smaller positive effect on their BI. Consequently, the positive effect of sustainability posts on social media wears off as users engage more. In terms of SN, SME results in an increased intention to behave more sustainably regarding mobility. Hereby, the positive effect also declines with a higher SME. Hence, the effect of the perceived social pressure on BI depends on the SME. This draws towards an impression that an engagement in online social networks results in higher BI to behave more sustainably in the beginning. However, the effect decreases the more interaction and engagement the user displays. Finally, yet importantly, the moderating effect of SME on the PBC results in an increase of BI. Similarly, this effect becomes weaker as the SME increases. Nonetheless, the effect also declines stepwise the more the users engage.

All findings support literature, that pro-environmental behaviour is only partly explained by environmental knowledge. As basic sustainability knowledge is a necessity, the existence of vast environmental knowledge does not enhance environmentally friendly behaviour (Kollmuss & Agyeman, 2002). Consequently, a higher interaction online and a supposed education by reading sustainability articles and increasing one's knowledge does not 'automatically' result in a higher positive impact on the influence of perceived ability to travel more sustainably and ultimately the intention to do so. However, the requirement of basic knowledge in order to increase environmentally friendly mobility behaviour concurs with the high positive effect of a low SME on PBC and BI. Theory explains the diminishing effect of engagement on social issues like sustainability through the evocation of positive emotions about the individual itself (Rotman et al., 2011). In combination, a *moral licensing effect* seems to be at work. People seem to substitute their real-life sustainability behaviour (traveling

at low-emissions) with sustainable behaviour online (interacting in sustainability groups). Especially for alpine regions highly relying on tourism, concentration on social media communication, promotion, as well as engagement with individuals on sustainable topics seems highly advisable. However, as the decline of the positive effect of SME on the BI shows, the challenge of connecting an environmental strategy with online communication in order to engage people towards a more sustainable mobility behaviour remains unclear.

In summary, study results provide findings that encourage a focus on social media for organizations in sustainability and tourism. Particularly younger people (mobile generation) invest a huge amount of time in social media and online communities every day. To positively influence their attitude, subjective norm, and perceived control towards sustainable mobility is key to create a movement towards a more sustainable travel behaviour and ultimately sustain our precious alpine regions.

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The Role of Perceived Online Social Capital in Predicting Travel Information Engagement

Junjiao Zhang¹(✉), Naoya Ito², and Jihong Liu³

¹ Graduate School of International Media, Communication, and Tourism Studies, Hokkaido University, Sapporo, Japan

junjiaozh@imc.hokudai.ac.jp

² Research Faculty of Media and Communication, Hokkaido University, Sapporo, Japan

naoya@imc.hokudai.ac.jp

³ School of Media Science, Northeast Normal University, Changchun, China
liujh829@nenu.edu.cn

Abstract. By combining perceived online social capital and the Elaboration Likelihood Model (ELM) of persuasion, this study constructed an integrated model to explore the antecedents and consequences of online social capital in travel information engagement on social media. Data (N = 578) were collected through Web-based survey and paper-and-pencil survey in China. Results of Structural Equation Modelling (SEM) supported that both bridging and bonding social capital contributed significantly positive effects to consumer engagement on social media. The two forms of social capital were positively influenced by argument quality and perceived information usefulness. Source credibility positively affected bonding social capital but had no effect on bridging social capital. The findings also show that bridging social capital is more effective in predicting consumer engagement than bonding social capital.

Keywords: Perceived bridging social capital · Perceived bonding social capital
Travel information engagement · Persuasive messages · Elaboration likelihood model

1 Introduction

Consumer engagement through computer-mediated communication is highly interactive, social, and context specific (Dessart, Veloutsou, & Morgan-Thomas, 2016). Travel-related social media encourage consumer empowerment and in turn facilitate two-way interactions between consumers and tourism brands (Harrigan, Evers, Miles, & Daly, 2017). Therefore, to enhance the effectiveness of social media marketing, consumer engagement is becoming more important for travel brands to develop and maintain consumer relationships (So, King, & Sparks, 2014).

Consumer engagement includes both personal engagement and interactive engagement, focusing on information adoption and information generation, respectively (Fang, Zhao, Wen, & Wang, 2017; Wang, Zhang, Suomi, & Sun, 2017). Following this perspective, consumer engagement in travel information could be a persuasive

communication, which is motivated by information-related factors as well as social connections. This study therefore makes an effort to construct a cognitive process of consumer engagement in travel information by integrating the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986) and the concept of social capital. Although the ELM has been used in a wide range of consumer behavior research, its prediction power in consumer engagement is still expected to be explored in more empirical studies since it focuses more on information adoption. Furthermore, social capital, as the outcome of social network and trust, is always considered complex and more connected with social network sites like Facebook (Ellison, Steinfield, & Lampe, 2007), resulting in limited literature on its role in information cognitive processes. Given it is closely associated with social connections, this study argues that social capital contributes to consumer engagement in travel information on social media. Therefore, the research question is: How does perceived social capital on social media predict consumer engagement in travel information?

To address the literature gap, this study develops an integrated model using the ELM and social capital to predict the cognitive process of consumer engagement in travel information on social media. It suggests information-related factors (i.e., argument quality, source credibility, and perceived information usefulness) as the antecedents of perceived online social capital and proposes behavioral engagement intention as the consequence of perceived online social capital.

2 Theoretical Background and Hypotheses

From a marketing perspective, consumer engagement refers to the sum of consumers' behavioral manifestations toward a brand beyond purchase-related transaction, which results from motivational drivers (van Doorn et al., 2010). That is, consumer engagement tends to be behavioral focused, context specific, and depends on active and continued interactions between a subject and an object in certain circumstances. As a result, it is particularly viewed as active participation, which includes both personal engagement (e.g., adoption, use, and WOM referral) and interactive engagement (e.g., discussion, content sharing, problem solving) (Fang et al., 2017). Following this view, consumer engagement on travel-related social media can be determined by the combination of information/eWOM use and information/eWOM generation (Wang et al., 2017). Based on these interpretations, behavioral engagement intention in this study will be measured with the manifestations of liking, following, sharing, commenting, and posting.

Although consumer engagement contributes to huge benefits in practice and is attracting increasing attention from scholars, many empirical studies in this domain relevant to travel information have focused on technology adoption (e.g., Chung, Han, & Koo, 2015). Technology adoption closely involves in taking and using travel information, while engagement behavior makes more efforts in consumers' continued interaction and socialization (Fang et al., 2017). To better understanding consumers' behavioral maps, this study uses behavioral engagement intention to clarify the cognitive process of travel information on social media, expecting to establish a more effective and predictive model.

2.1 Elaboration Likelihood Model

As one of the most feasible persuasion theories, the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986) illustrates a dual-route persuasion process of attitude formation and behavioral change. It posits that persuasion could occur with a more effortful thought or a less effortful thought, resulting in a central route and a peripheral route, respectively. The central route needs individuals to critically assess argument quality embedded in messages, which includes not only information quality but also argument strength. In the peripheral route, individuals follow simple cues such as source credibility of the messages, which is measured by trustworthiness and competency of source attributes. Sussman and Siegal (2003) extended the ELM to the information adoption model (IAM), which shed high light on the mediating role of perceived information usefulness between persuasive messages and information adoption. It is more straightforward in measuring attitudes and beliefs.

The predictive ability of the ELM has been demonstrated in social psychology and marketing science including tourism (Chung et al., 2015). In the specific contexts of social media, researchers found that the predictive power of source credibility is higher than that of argument quality in processing travel information (Zhang, Ito, Wu, & Li, 2017). It thus motivates the research of consumer engagement in travel information to gain more insights in social cognitive factors in attitude change. Based on the ELM, mediation variables associated with social influence, such as social relationships (Chung et al., 2015), attachment (Chung & Han, 2016; Kim, Chung, Lee, & Preis, 2016) and gratification-related motivations (Hur, Kim, Karatepe, & Lee, 2017), have been explored to construct more effective communication in consumer engagement in travel information. However, like the research of consumer engagement, the exploration on social cognitive factors is still underway. As an empirical study, this study proposes that perceived online social capital is an important factor than perceived information usefulness in encouraging consumer engagement in travel information on social media.

2.2 Social Capital

At the individual level, social capital is commonly defined as the sum of resources that can be accessed, accumulated, or mobilized through one's social network and relationships for some purposeful action (Lin, 2008). Thus, social capital is generated through social interaction but depends upon the quality of social relationships and the nature of one's social network (Ellison, Vitak, Gray, & Lampe, 2014; Lin, 2008). Trustworthiness, reciprocity, and obligations are key constructs when it comes to accessing social capital (Moscardo, 2015). Putnam (2000) separated social capital into two distinct dimensions: bridging and bonding. Bridging social capital is described as weak ties or relationships between individuals, which provide less emotional support (Ellison et al., 2007). In contrast, bonding social capital stems from one's close relationships and is described as strong ties or relationships between individuals with high trust, high connectivity, and shared norms (Ellison et al., 2007).

A large body of literature confirmed the relationship of social media usage and social capital, particularly the specific online social capital (Facebook-enabled) (Ellison et al., 2007; Ellison, Vitak, et al., 2014; Horng, Wu, & Liang, 2016). One of the

common results is that there may exist a virtuous circle between them in which they enhance each other. In tourism research, Moscardo (2015) established a framework with two feedback loops connecting trust to social capital. It suggests that trust is the critical catalyst to create and access social capital, and in turn the successfully generated social capital can reinforce trust to offer expected reciprocal exchanges. Following these previous studies, social capital could be understood as an outcome of social network and trust and it would encourage social media use. However, social capital has always been considered as complex and less effort has been put on the role of social capital in predicting information cognitive processes. Considering the significance of social capital for social media marketing, this study attempts to build an integrated model combining the ELM and perceived online social capital to explore the role of social capital in consumer engagement.

2.3 Persuasive Messages and Information Usefulness

In the ELM, persuasive messages are determined by argument quality and source credibility embedded in information. Highly perceived argument quality means the information is informative and persuasive, which facilitates consumers to hold positive beliefs in the information usefulness. On the other hand, consumers are inclined to believe that the information is helpful and valuable when it is generated by sources which are perceived as expert, trustworthy, and attractive. The two distinct routes have been identified to be effective in examining consumers' assessment of travel information (Chung et al., 2015; Kim, Chung, et al., 2016; Tseng & Wang, 2016). For instance, Tseng and Wang (2016) indicated that information quality and source credibility could persuade consumers to confirm their confidence in the usefulness of travel information on travel websites. Zhang et al. (2017) further noted that Chinese consumers tend to assess travel information from credible sources and they may also use argument quality to process useful travel information. Therefore, the following hypotheses are proposed:

- H1 Argument quality positively affects perceived usefulness of travel information.
- H2 Source credibility positively affects perceived usefulness of travel information.

2.4 Persuasive Messages and Online Social Capital

Argument quality and source credibility are two primary indicators of information credibility (Cheung, Luo, Sia, & Chen, 2009), which could be interpreted as trust on informative contents and sources (Jun, Kim, & Tang, 2017). Persuasive messages are therefore likely to contribute to the formation of online social capital. First, consumers' information behavior on social media is goal-directed. They try to acquire travel information from external sources to reduce their perceived risk. Thus, increased interaction and bridging social capital will be built and developed along with their appeal for high-quality information (Chung & Han, 2016). Second, social credibility of persuasive messages largely influence social interaction through affective response, which is deemed as a factor motivating emotional expectation (Chung & Han, 2016; Chung et al., 2015). Hence, travel information recommended by celebrities or experts

may lead to both information support and emotional support, which then drive the bridging and bonding social capital perceived by the recipients (Chung & Han, 2016). Moreover, research on the effect of social capital on brand attitudes through branded e-stickers proposed that strong ties (reference ties) are effective in forming favorable attitudes toward a brand (Lee, 2017). Despite this, if unreliable information exists within bonding (close peers) in the brand community, the strong ties may be unstable and weaken the connection to the brand. In this framing, argument quality and source credibility may mutually influence bonding social capital on social media. Hence, this study proposes:

H3a–3b Argument quality of travel information has a positive effect on perceived bridging social capital and perceived bonding social capital on social media.

H4a–4b Source credibility of travel information has a positive effect on perceived bridging social capital and perceived bonding social capital on social media.

2.5 Information Usefulness and Online Social Capital

Perceived usefulness of travel information describes to what extent consumers believe that social media is useful to enhance their task performance. It thus supports the utilitarian motivation to engage in social media (Kim, Chung, et al., 2016). Meanwhile, social media also embraces the affective motivations to support consumers establishing relationships with known or unknown people (Chung et al., 2015). Ellison, Gray, Lampe, and Fiore (2014) indicated that the information utility of Facebook could enhance both bridging and bonding social capital between users. From the technology acceptance perspective, researchers argued that the higher usefulness is perceived, the greater affective responses (Chung et al., 2015; Kim, Chung, et al., 2016; Nusair, Bilgihan, Okumus, & Cobanoglu, 2013). That means useful information would facilitate consumers to access more connected relationships for meeting their task performance. The following hypotheses are raised:

H5a–5b Perceived usefulness of travel information has a positive effect on perceived bridging social capital and perceived bonding social capital on social media.

2.6 Outcome: Behavioral Engagement Intention

This study sets perceived information usefulness as an important factor mediating the influence of persuasive messages. Filieri (2015) tested the influence of perceived website trust of TripAdvisor, instead of perceived usefulness, on consumers' adoption of recommendation and their intention to create WOM. Results revealed that trust encourages consumers to follow others' advice and to post positive WOM. The prediction of information usefulness has also been confirmed to drive continued usage of mobile tourism shopping (Kim, Chung, et al., 2016). This study assumes:

H6 Perceived travel information usefulness has a positive effect on behavioral engagement intention.

For online social capital, numerous studies have verified the effectiveness of social capital in travelers' bridging and bonding attachment on social media (Chung & Han,

2016; Kim, Lee, & Bonn, 2016a, b), continued usage intention (Chang & Zhu, 2012; Hur et al., 2017), and information sharing intention (Hur et al., 2017; Shi & Lai, 2017). Researchers also found that the two forms of social capital serve different roles in predicting consumers’ behavioral engagement. Horng et al. (2016) noted that bridging social capital is more associated with giving intention related to social commerce than bonding social capital. Kim, Lee, and Bonn (2016b) found that bridging social capital affects more interpersonal and group attachment than bonding social capital did in seniors’ loyalty to social network sites for tourism. Shi and Lai (2017) suggested that higher social tie strength and topic relevance are the most important factors to foster receivers’ retweeting behavior. Which kind of social capital is more effective is still a research question that needs to be further examined. This study follows the common findings and proposes:

H7a–7b Perceived bridging social capital and perceived bonding social capital positively affect behavioral engagement intention.

Previous research has suggested that consumers’ age, gender, and socioeconomic status may moderate the intention to social media engagement (Chang & Zhu, 2012; Fang et al., 2017). For instance, Fang et al. (2017) found that female and users with a higher education level tend to engage more in mobile travel applications. To control for the inconclusive impacts from demographics, this study adds age, gender, education, and monthly income as control variables to the research model.

3 Methodology

3.1 Data Collection and Sample

Data collection was administered through a multi-method survey approach. A web-based survey and a paper-and-pencil survey were conducted in Mainland China during July 2017. 585 respondents were obtained through the web-based questionnaire distributed via an online survey software. 147 respondents were collected through the paper questionnaire at a university in Mainland China. Respondents who had no experience in using social media for travel information activity and those who did not answer three or more of the questionnaire items were excluded. This left us with a sample of 578 with an average age of 27.28 (from 17 to 56) for further data analysis (Table 1).

Table 1. Demographic characteristics (N = 578)

	Frequency	%		Frequency	%
<i>Gender</i>			<i>Occupation</i>		
Male	233	40.3	Student	238	41.2
Female	345	59.7	Private enterprise	159	27.7
<i>Age</i>			Government or Public sector	124	21.5
≤ 18	11	1.9	Self-employed	21	3.6
19–22	142	24.6	Unemployed	10	1.7
23–29	251	43.8	Retiree	6	1.0

(continued)

Table 1. (continued)

	Frequency	%		Frequency	%
30–39	142	24.6	Others	19	3.3
≥ 40	32	5.5			
<i>Monthly Income</i>			<i>Education</i>		
≤ 1000	182	31.5	Primary school and below	3	0.5
1001–3000	84	14.5	Junior school	5	0.9
3001–5000	109	18.9	Senior school	21	3.6
5001–8000	96	16.6	Junior college	75	13
8001–10,000	43	7.4	University	323	55.9
>10,000	64	11.1	Postgraduate	151	26.1

3.2 Measures

Constructs in the research model (Fig. 1) were measured with multiple items, which were adapted from previous relevant studies with necessary modifications (Table 2). Particularly, argument quality was assessed as a second-order variable (i.e., perceived informativeness, perceived persuasiveness) (Zhang, et al., 2017). Respondents were asked to rate all items on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Items in English were first translated into Chinese by an English teacher and then back translated by another Chinese-English bilingual scholar.

Table 2. Measurement items

Construct/item	Loading
Argument quality (AQ) (CR = 0.943, Cronbach’s α = 0.891)	
PI1 The travel information on social media is accurate	0.718
PI2 The travel information on social media is relevant to my needs	0.729
PI3 The travel information on social media is comprehensive	0.752
PI4 The travel information on social media is up-to-date	0.733
PP5 Arguments of travel information on social media are convincing	0.888
PP6 Arguments of travel information on social media are strong	0.845
Source credibility (SC) (CR = 0.901, Cronbach’s α = 0.911)	
SC1 Users providing travel information are knowledgeable on travel topic	0.726
SC2 Users providing travel information are experienced	0.748
SC3 Users providing travel information are trustworthy	0.893
SC4 Users providing travel information are reliable	0.912
SC5 Users providing travel information and I share similar viewpoints	0.727
SC6 Users providing travel information and I share similar interests	–
Perceived bridging social capital (BRI) (CR = 0.885, Cronbach’s α = 0.891)	

(continued)

Table 2. (continued)

Construct/item	Loading
BRI1 Interacting with people on social media makes me want to try new things	0.771
BRI2 Interacting with people on social media makes me interested in what people unlike me are thinking	0.835
BRI3 Interacting with people on social media makes me feel like part of a larger community	0.844
BRI4 Interacting with people on social media makes me feel connected to the bigger picture	0.793
BRI5 Talking with people on social media makes me curious about other places in the world	–
BRI6 I am willing to spend time to support general community activities on social media	–
<i>Perceived bonding social capital</i> (BON) (CR = 0.893, Cronbach's α = 0.898)	
BON1 There are several people on social media I trust to help solve my problems	0.795
BON2 There is someone on social media I can turn to for advice about making very important decisions	0.784
BON3 When I feel lonely, there are several people on social media I can talk to	0.792
BON4 If I needed an emergency loan, I know someone on social media I can turn to	0.629
BON5 The people I interact with on social media would put their reputation on the line for me	0.785
BON6 The people I interact with on social media would be good job references for me	0.783
<i>Perceived information usefulness</i> (PIU) (CR = 0.880, Cronbach's α = 0.876)	
PIU1 The travel information on social media is informative	0.787
PIU2 The travel information on social media is valuable	0.874
PIU3 The travel information on social media is helpful	0.866
<i>Behavioural engagement intention</i> (BEI) (CR = 0.885, Cronbach's α = 0.892)	
BEI1 The travel information provided on social media motivates me to take action	0.750
BEI2 I have followed the travel information from others on social media	0.795
BEI3 I am willing to agree and give "like" to travel information on social media	0.793
BEI4 I am willing to share my travel-related experiences by social media	0.684
BEI5 I am willing to post my comments on travel information through social media	0.757
BEI6 I am willing to repost travel information on social media	0.718

Note SC6, BRI5, and BRI6 were removed for confirming the reliability and validity of the data. Model fit: $\chi^2(379) = 957.471$, $\chi^2/df = 2.526$, $p < 0.001$, GFI = 0.897, NFI = 0.927, CFI = 0.953, RMSEA = 0.051

4 Data Analysis and Results

4.1 Measurement Model

AMOS 23.0 was employed to test the measurement and structural models. Confirmatory factor analysis (CFA) with maximum likelihood estimation was conducted to estimate the construct validity. Results of the CFA showed that most of the factor loadings exceeded 0.70 (Table 2). Both composite reliability (CR) and Cronbach’s α value of each construct were higher than 0.70. Further, average variance extracted (AVE) for all the constructs exceeded 0.50. Thus, an adequate convergent validity was confirmed. Meanwhile, Table 3 performs that the square root of the AVE for each construct is larger than its correlations with other constructs, suggesting a good discriminant validity.

Table 3. Results of discriminant validity testing

Variable	<i>M</i>	<i>SD</i>	AVE	AQ	SC	BRI	BON	PIU	BEI
AQ	4.62	1.03	0.892	0.945					
SC	4.72	1.04	0.649	0.796***	0.805				
BRI	5.10	1.12	0.658	0.587***	0.498***	0.811			
BON	4.30	1.28	0.583	0.527***	0.475***	0.690***	0.763		
PIU	5.25	1.03	0.711	0.655***	0.621***	0.598***	0.444***	0.843	
BEI	4.84	1.10	0.563	0.601***	0.616***	0.734***	0.612***	0.727***	0.751

*** $p < 0.001$. The boldface diagonal elements are the square root of AVE

4.2 Hypotheses Testing

Figure 1 illustrates the hypotheses and the results of the path analysis, demonstrating an acceptable model fit: $\chi^2(476) = 1075.275$, $\chi^2/df = 2.259$, $p < 0.001$, GFI = 0.900, CFI = 0.952, NFI = 0.918, SRMR = 0.043, RMSE = 0.047. Results of the standardized path coefficients indicated that most of the hypotheses except H4a were supported. Specifically, perceived information usefulness was significantly influenced by argument quality ($\beta = 0.286$, $p = 0.001$) and source credibility ($\beta = 0.445$, $p < 0.001$). Therefore, H1 and H2 were supported. Regarding to the antecedents of perceived online social capital, argument quality positively and significantly affected both perceived bridging social capital ($\beta = 0.308$, $p = 0.001$) and perceived bonding social capital ($\beta = 0.257$, $p = 0.01$), supporting H3a and H3b, respectively. Source credibility had a positive effect on perceived bonding social capital ($\beta = 0.213$, $p < 0.05$), but not as the expectation, it did not contribute a significant effect to perceived bridging social capital ($\beta = 0.066$, $p > 0.05$). Thus, H4b was supported while H4a was not supported. Perceived information usefulness positively affected perceived bridging social capital ($\beta = 0.355$, $p < 0.001$) and had a slight but significant effect on perceived bonding social capital ($\beta = 0.146$, $p = 0.05$). Therefore, H5a and H5b were supported. Perceived information usefulness ($\beta = 0.423$, $p < 0.001$) had a significant and strong effect on behavioral engagement intention, supporting H6. Also, the positive

effects of perceived bridging social capital ($\beta = 0.341, p < 0.001$) and perceived bonding social capital ($\beta = 0.202, p < 0.001$) on behavior engagement intention were confirmed. Accordingly, H7a and H7b were supported. In addition, the proposed model explained 71.3% of the variance in behavioral engagement intention.

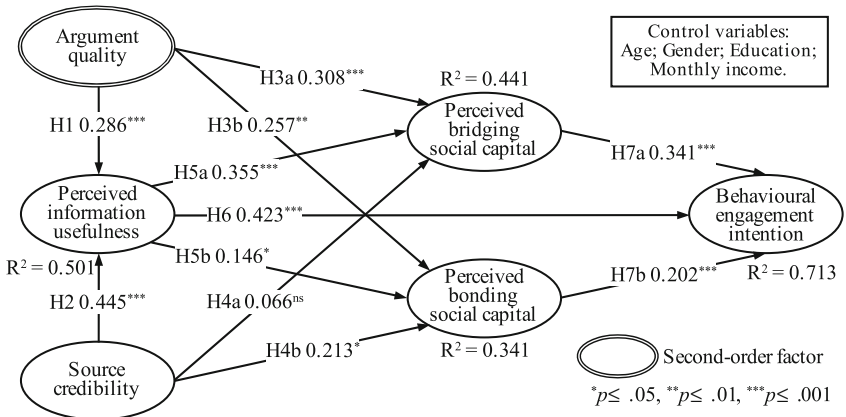


Fig. 1. Results of the structural equation model

4.3 Post-hoc Analysis

Based on the ELM, the foundation process of the proposed model concentrated on the information-oriented factors especially the utilitarian aspect of the information (i.e., perceived usefulness). Since the direct effect of source credibility on perceived bridging social capital (H4a) was not significant, a mediation test was necessary to take more insights in the potential influence paths. The SPSS PROCESS macro (Model 4) (Hayes, 2013) was used to interpret whether perceived information usefulness mediates the relationships between persuasive messages and online social capital. As shown in Table 4, the mediation effects of perceived information usefulness were identified. Particularly, source credibility had a higher indirect effect on perceived bridging social capital than argument quality did.

Table 4. Indirect effects through perceived information usefulness

Path	Perceived bridging social capital			Perceived bonding social capital		
	β	SE	95% CI	β	SE	95% CI
Argument quality	0.281	0.041	[0.205–0.367]	0.159	0.050	[0.060–0.259]
Source credibility	0.331	0.042	[0.252–0.415]	0.165	0.051	[0.065–0.266]

Note Bootstrap resample = 5000. Control variables were taken into account when calculating the estimates. The mediation effect would be statistically significant when zero is outside of the confidence interval (CI)

5 Discussion and Conclusion

This study explored an integrated a model based on the ELM and social capital theory to verify how perceived online social capital predicts consumer engagement in travel information on social media. Results support that both bridging and bonding social capital contribute significantly positive effects to travelers' behavioral engagement in social media and highly increase the interpretation power of the proposed model (71.3%). Specifically, argument quality and information usefulness have positive and significant effects on both bridging and bonding social capital, in which their effects are greater on bridging social capital. Source credibility positively affects bonding social capital but has no contribution to bridging social capital. As mediators, information usefulness and bridging social capital serve as the most effective predictors of travelers' intention to engage in social media. Therefore, this study enhances the proposition that travel brands can advance consumers' engagement through improving their perceived social capital between themselves. Accordingly, this study has several theoretical and practical implications.

This study contributes to building a conceptual model for examining how social capital predicts travelers' engagement on social media, extending the ELM with a concept of social influence. Although the ELM has high validity in structuring travelers' adoption of information via social media, there is a lack of research investigating the role of social capital in this process. The core nature of social media matches to the idea of collaborative creation and content dissemination (Westerman, Spence, & Van Der Heide, 2012). This study therefore makes a try to explore a more effectively theoretical model of traveler engagement on social media.

One of the notable findings of this study lies on the significantly positive linkages between social capital and information-related factors. First, all the primary constructs in the ELM, argument quality, source credibility, and perceived information usefulness, highly contribute to the formation of bridging social capital on social media. It in turn drives travelers to actively participate and engage in social media. These findings develop the role of social capital with more straightforward linkages to information-oriented factors and their outcomes. Second, bridging social capital is found more effective than bonding social capital to be a consequence of persuasive messages as well as an antecedent of engagement intention. Thus, these findings reinforce previous findings that bridging social capital are more effective in predicting planned consumer behavior on social media (e.g., Hornig et al., 2016).

Another notable finding is that source credibility of travel information has no direct effect on travelers' perceived bridging social capital. A post hoc test revealed that perceived information usefulness has the highest mediating effect between source credibility and perceived bridging social capital. There may be two possible explanations for these findings. First, source credibility is closely associated with affective considerations, resulting in more emotional support perceived by the recipients. However, perceived bridging social capital is described as weak ties which create less or no emotional support but more information support (Williams, 2006). Second, in the formation of social capital, having social connections to network is necessary but not sufficient condition, because social capital is used to achieve some goals and solve

problems (Moscardo, 2015). It also needs the adequacy of connection quality. In this line, for travelers, perceived information usefulness is a motivation to search and share information on social media, and thus is the crucial reason to meet some goals and solve the problems in decision making. Therefore, it can be a mediator to encourage bridging social capital between travelers.

Accordingly, this study suggests several practical implications for travel brands and tourism marketers. First, social capital can be used as a powerful communication tool to establish and enhance consumers' interaction between other consumers and between brands. To achieve higher social capital and more continuing intention, it requires tourism marketers to make more efforts to recommend accurate, relevant, and credible information to consumers and improve the helpfulness of the information. As such, consumers may be active to join the interaction with other consumers and in turn be willing to participate in the brand community. Second, useful information is the key factor to establish the linkage between consumers in brand community on social media, especially for the consumers most of whose followings are validated accounts. That is, although they keep bonding connections in community, if they perceive much incredible and useless information in the interaction, they may deny further developing their bridging connections in this community. Therefore, tourism brands can apply behavior data mining techniques to manage consumer profiles and use the results to recommend more personalized and relevant information.

The main limitation of this study is that it focused on the general context of social media in China. Although consumers always combine several social media platforms to search or share travel information, different platforms are considered different in the strength of social capital. For instance, Sina Weibo and Wechat are viewed depending on bridging and bonding connections, respectively. Therefore, comparative research is necessary and needs to verify the applicability of the proposed model in different social media platforms.

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Can You Identify Fake or Authentic Reviews? An fsQCA Approach

Kyungmin Lee¹, Juyeon Ham², Sung-Byung Yang³,
and Chulmo Koo⁴(✉)

¹ Graduate School, College of Hotel and Tourism Management, Kyung Hee University, Seoul, Republic of Korea

kahwea@khu.ac.kr

² Smart Tourism Research Center, College of Hotel and Tourism Management, Kyung Hee University, Seoul, Republic of Korea

juyeon.ham@khu.ac.kr

³ School of Management, Kyung Hee University, Seoul, Republic of Korea

sbyang@khu.ac.kr

⁴ College of Hotel and Tourism Management, Kyung Hee University, Seoul, Republic of Korea

helmetgu@khu.ac.kr

Abstract. This research identifies two types of review patterns, authentic and fake, based on configurations among reviewers and review content elements. We also explain what fake review is with IMT as theoretic background. The results, which are based on the fsQCA method, identify the combinations of configurations for authentic and fake reviews. Each pattern has unique characteristics. Authentic reviews' patterns are explained by personality theory (i.e., five factor model). Authentic reviews represent personalities that are different, similar to individuals, while fake reviews are composed of three kinds of promotional reviews and are characterized by a reviewer's low credibility. The fake review pattern is explained by HSM and ELM. This research confirms that different patterns seem to exist for authentic and fake reviews, although authentic reviews may be cited in reverse fake reviews via algorithms. Another finding is that the review business has expanded to the business of social networking.

Keywords: ELM (Elaboration likelihood model) · Fake review · fsQCA (Fuzzy set qualitative comparative analysis) · HSM (Heuristic-systematic model) · IMT (Information manipulation theory) · Review personality

1 Introduction

Amazon is suing more than 1000 people for allegedly writing fake product reviews for cash (Woollacott, 2017). Yelp has relied heavily on authentic reviews to provide trustful recommendations. In order to support that Yelp has different strategies to prohibit fake reviews; it filters suspicious reviews as fake reviews. With that phenomenon in the market, academic efforts are also ongoing to detect fake reviews. Yet, there are difficulties to research fake reviews: (1) It is difficult to define what fake is;

(2) the definition is focused on practical aspects rather than academic theory; (3) several terms are adopted to indicate fake reviews; (4) prior research is mainly dealing with how to detect fake reviews.

First of all, it is difficult to define a fake review because fake reviews may not have misleading information and may instead be considered as normal information to consumers (Mayzlin et al., 2014). For example, employees of local restaurants occasionally review their venues by using real information to promote it, and those promotional reviews may be recognized as normal information for potential consumers rather than being considered suspicious because the employee is not a customer (Mayzlin et al., 2014). Secondly, without an academic background, some practitioners have noted practical matters such as extreme language style and jargon terms. We find a gap between the theoretical and practical definitions of what fake reviews are. Moreover, prior studies adopt several terms to refer to fake reviews, such as incentivized, deceptive, fraud, filtered, promotional, not recommended review or deceptive opinion spam. Without an explicit definition of each word with a rigorous classification, people can become confused about what a fake review is. Finally, prior studies have focused mainly on detecting fake reviews with several models and algorithms (Luca & Zervas, 2016; Mukherjee et al., 2013; Ott et al., 2011; Zhang et al., 2016). Hence, research is needed to investigate how to define a fake review and to provide standards on how to differentiate authentic and fake reviews. This research attempts to define and identify what a fake review is based on theory and prior studies dealing with fake reviews. To create a rigorous definition for fake reviews, we refer to the Information Manipulation Theory (IMT) and we apply principles of how fake reviews can be sorted.

The hospitality business has characteristics that are firmly associated with intangible features in most product and service environments; hence, the review's influence on the consumers is extreme (Cantalops and Salvi, 2014) even if the review is suspected to be a fake review. The intangible nature leads to subjectivity, and subjectivity leads to one's understanding even though the reviews are different from others and may even be fake ones (Braun et al., 2002). However, only a few studies have been dealing with the effect of fake reviews in the hospitality industry; examples are studies by Filieri (2016) and O'Connor (2008). Recently, researchers focusing on the hospitality industry have become concerned about the possible effects of fake reviews on potential consumers. Thus, we aim to investigate the effect of fake reviews in a hospitality business environment.

In addition, Yelp offers a user-friendship network function to make better credible recommendations and has expanded the social integration networking platform as well as the review-sharing business. For example, in Yelp, readers could perceive a reviewer who has many friends as credible because of the number of friends. The friendship network function acts as a proof to trust and as evidence for genuine reviews.

To conduct our fake review research, we crawled a real data set from Yelp.com and used fsQCA (Fuzzy set Qualitative Comparative Analysis). fsQCA is a suitable methodology for multileveled variables (Roig-Tierno et al., 2017). Since fake review is a multidimensional concept, fsQCA is an appropriate approach to research fake reviews. It analyzes data and identifies several conditions that prompt a certain outcome, whereas a regression analyses investigates a dependent variable with several

independent factors (Pinto and Picoto, 2016). These conditions function as a casual construction to lead to an outcome. fsQCA is applied to a qualitative study of macro social phenomena to examine how different integrative parts of a case fit together both contextually and historically.

We have raised three research questions: (1) How can we define fake reviews based on a theoretical background? (2) Do authentic and fake reviews have different configurations with regards to several elements? We found different configurational elements of genuine and fake reviews. Through the answers to those questions, we attempt to identify what a fake review is, supported by prior theoretical background and which symmetrical aspects occur in authentic and fake reviews based on real data from the hospitality industry. We then highlight the results and discuss academic and practical implications.

2 Theoretical Background and Propositions

2.1 Information Manipulation Theory (IMT) and Fake Reviews

IMT (Information Manipulation Theory) is one of the conceptual theories regarding deception. It describes deceptive messages’ nature and inferential process, such as when people mislead others and deceivers play with manipulated information (Levine, 2014). This information consists of multiple dimensions (Levine, 2014), which is aligned with maxims proposed by Paul Grice, a philosopher (Yeung et al., 1999). McCornack who first developed IMT, suggests that deceptive messages are constructed by four multidimensions (Levine, 2014). These four dimensions are based on “Grice’s Maxim”: (1) quantity, i.e., the amount of relevant information; (2) quality, i.e., the authenticity of information; (3) manner, i.e., the way in which information is presented; and (4) relation, i.e., the relevance of information (Yeung et al., 1999). Furthermore, McCornack concludes that information manipulation is the violation of any or all of the expectations about information quantity, quality, manner, and the relation during interactions between speakers and listeners (McCornack, 1997). We show Grice’s maxims of communication in Table 1.

Table 1. Communication maxims (extract from Grice, 1975)

Linguistic principle	Criterion	Violations
Quality	Truth	Exaggeration, fantastic description
Quantity	Informativeness	Redundancy, repetition, excessive brevity
Manner	Relevance	Digression
Relation	Clarity	Vagueness, obliqueness, metaphor

To construe what a fake review is based on a theoretical background; namely the IMT the structure of fake reviews is associated with the violations of one of the communication maxims. We employ IMT to define fake reviews as reviews that violate at least one aspect about quality, quantity, manner and relation. A fake review may be

associated with exaggeration when the quality principle based on truth is violated or a redundant presentation style when quantity has been breached. For example, prior research shows that fake reviews are represented in an extreme way using exaggeration and fantastic descriptions. Based on the definition and representation style of fake reviews, we suggest the following proposition:

Proposition 1 *Based on IMT, fake reviews have several manipulation patterns.*

2.2 Friendship Network and Self-construal

Yelp has a unique function i.e. the user-friendship network to offer more credible recommendations and to build communities. This friendship network is available due to ‘people’ and ‘group’ socialization. Prior studies on socialization have highlighted the importance of the people domain for socializing in successful relationships (Chao et al., 1994). Additionally, the importance of the group domain to form an effective network is important for individuals to tell the difference among each other and to stimulate socializing (Ostroff and Kozlowski, 1992). Thus, Yelp has characteristics as a social network to build trustworthiness which is harmed by fake reviews. This research attempts to investigate the relevance of the friendship network and fake reviews. We suggest the proposition:

Proposition 2 *Yelp has expanded to a social network platform as well as to a review-sharing business.*

The concept of the people domain is associated with independent self-construal, and the group domain is connected with interdependent self-construal. The present study suggests that Yelp’s friendship network observes making friends as a people domain and sharing reviews as a group domain. In this sense, this study compares independent self and interdependent self-construal in both authentic and fake review contents.

Independent self-construal implicates an aspect of oneself that is distinct from others and self-reliance (Lalwani et al. 2009). Interdependent self-construal is related to a view of oneself that is a part of a linked social relationship and observes that an individual’s behavior is determined by others’ thoughts, feelings and actions (Lalwani et al. 2009). According to several researchers, these distinctions in self-construal are revealed in information processing, in semantic constructs, and in cognitive processes (Hannover & Kuhnen, 2004).

In addition, self-construal has shown the degree an individual thinks of her/himself as more independent or interdependent self-construal, which can be manipulated by priming tasks such as reading stories or circling the pronouns I/We in a text (Gardner et al., 1999). It has also been implemented in the opposite way, in which I or We pronouns in reviews inform independent or interdependent self-construal traits. However, considering the different natures of authentic and fake review, independent and interdependent self-construal have disparate aspects. For example, interdependent self-construal is more frequently disclosed in fake reviews due to vagueness as a violation of the relation linguistic principle in IMT.

To compare the configurations of authentic and fake reviews, we assign eight elements consisting of three parts: four elements of the reviewer, two variables of the

review and two more factors of the review contents. In the first part, authentic and fake reviews have four factors of the reviewer: (1) self-disposure, i.e., whether a reviewer presents himself, such as his face, or just goods so that the reviewee cannot presume anything about the reviewer; (2) the number of friends, i.e., how many friends are related to the reviewer; (3) the number of reviews, i.e., linked with experts or the sincerity of reviews; and (4) the number of photos also associated with knowledgeable or earnest aspects. In the second part, there are two factors regarding reviews: (1) the star rating, one of the heuristic cues related to the quality of the object being reviewed, and (2) the review length, which is associated with the quality of the review. For the last part, the two elements of review contents are (1) independent self-construal, and (2) interdependent self-construal. Thus, we suggest the following proposition:

Proposition 3 *Different combinations of the reviewer, review factors and self-construal lead to authentic reviews and fake reviews.*

Prior research has utilized fsQCA to assess a firm's performance in terms of high versus low performance (Pinto and Picoto, 2016). Pinto and Picoto (2016) suggest a symmetrical configuration between high- and low-performance firms and find results that reinforce the symmetrical configurations. Thus, we suggest Proposition 4, which explains the symmetrical relationship between authentic and fake reviews based on Yelp's use of an algorithm to divide reviews.

Proposition 4 *Configurations for authentic and fake reviews performance are symmetrical.*

3 Research Procedures

3.1 fsQCA (Fuzzy Set Qualitative Comparative Analysis)

QCA (qualitative comparative analysis) is an analytic tool that fuses both quantitative and qualitative methodologies (Verissimo, 2016). It allows researchers to investigate patterns with multilevel explanations and influences (Woodside, 2013). This method allows a detailed analysis of how conditions contribute to a particular result and extracts an understanding of how to combine causes and results (Xie et al., 2016). Thus, QCA allows us to work with a high level of causal complexity (Rihoux & Ragin, 2008).

Among the QCA methods, fsQCA (fuzzy set QCA) is based on the fuzzy set theory (Verissimo, 2016). It is a rigorous tool for complex theory applications (Woodside, 2013), because it consists of assigning variable values between 0.0 and 1.0 (Woodside & Zhang, 2012). fsQCA is appropriate for studying not solely the detached effect of several variables but explores the possible interactions between the variables (Xie et al., 2016). It provides one or more adequate antecedent combinations to acquire an outcome, such as $X1 * X2 * \sim X3$ sufficient for an outcome (Y). In the formula used in this method ($X1 * X2 * \sim X3 \rightarrow Y$) X1, 2, 3 are the antecedents and Y is the outcome: * is union and \sim indicates negation, which means the opposite value to X3 ($1 - X3$) (Xie et al., 2016). Hence, fsQCA is a suitable method for investigating the configurations of authentic and fake reviews and for comparing the patterns. fsQCA offers two

types of configurations, i.e., necessary and sufficient conditions, which are marked though presence, absence, and does-not-matter conditions (Pappas et al., 2016). Core elements indicate a strong casual condition; further peripheral elements are weaker casual components (Fiss, 2011).

3.2 Data Collection

For the development of the fake review detecting model, prior research has been used and the same number of authentic reviews and fake reviews. According to Yelp.com, roughly a quarter of all reviews are filtered as fake (Yelp, 2017b); however, if we use the actual ratio of Yelp, the data seem to have an imbalanced bias.

We collect our data set from two different sources: Yelp.com’s recommended reviews and not recommended reviews on “Mon Amin Gabe”, which was the most-reviewed restaurant in Yelp’s Dataset Challenge, round 9 (Yelp, 2017a). In this challenge, Yelp released its data to obtain new ideas and insights from students, who used these data for research. We determined which restaurant was the most reviewed on Yelp through the challenge’s data set. We gathered the fake reviews as well as authentic reviews on 3 October; 7003 authentic and 801 fake reviews. To avoid an imbalance bias, authentic reviews were randomly cut down to 801 reviews. Ultimately, we had 1602 reviews; 801 were genuine reviews, and 801 were fake reviews from Yelp.

4 Research Results

4.1 Data Analysis

For the data analysis, we adopt two different methodologies, one is fsQCA and the other is LIWC. First, fsQCA is used to analyze patterns among the eight elements, and LIWC2015 (Linguistic Inquiry and Word Count 2015) is used to review the content. LIWC is a suitable tool for analyzing computerized text modules to identify which words are related to psychologically relevant categories, such as emotions (LIWC, 2017). Table 2 shows the descriptive statistics for each of the variables in both authentic and fake reviews.

Table 2. Descriptive statistics for the variables of authentic and fake reviews

	Authentic/fake			
	Mean	Std. deviation	Minimum	Maximum
Self-disclosure	2.04/1.32	1.11/1.26	0/0	3/3
Number of friends	123.17/31.40	291.47/148.12	0/0	4126/3364
Number of reviews	147.56/23.27	236.76/78.33	1/1	1663/1392
Number of photos	192.20/7.90	637.10/50.03	0/0	8274/1164
Star rate	2.16/4.33	1.04/0.94	1/1	5/5
Review length	117.38/44.37	96.24/51.80	9/2	629/369
Independent self	3.50/2.93	2.74/4.46	0/0	20/50
Interdependent self	1.82/1.29	2.11/2.46	0/0	10.34/15.38

After analyzing with LIWC2015, we move on to fsQCA, which analyzes a data set to identify conditions. Causal configurations will be combined with one another to produce an outcome (Pinto and Picoto, 2016). The transformation of factors into a calibrated set is completed by an fsQCA algorithm through setting three standards: full membership, the crossover point, and non-full membership, which determines whether the data will “be in” or “be out of set” (Rihoux & Ragin, 2008). fsQCA demands that the outcome and the independent measures are defined with calibration into fuzzy sets. After calibrating, this algorithm generates a truth table of 2^k rows, where k indicates the number of outcome predictors and each row reveals each possible combination (Pappas et al., 2016). The truth table indicates the frequency and consistency. Frequency depicts the number of observations with each combination, and consistency describes the degree of combinations with regards to the theoretic relationships expressed in the solution (Fiss, 2011).

4.2 Results

The outcome of the analysis for authentic and fake reviews is shown in Table 3. The black circle (●) indicates the presence of a condition, whereas the crossed-out circle (⊗) refers to the absence of it (Fiss, 2011). Core elements of a configuration are identified with large circles, whereas peripheral elements are marked with small ones, and blank spaces mean it is a does-not-matter situation (Pappas et al., 2016). The solution table suggests values for each configurations’ consistency and for the overall solution, which should be above the threshold (>0.75) (Verissimo, 2016).

In Table 3, we demonstrate the value of the authentic and fake reviews solution; the overall solution consistencies are 0.950 and 0.839 for authentic reviews (left side of Table 3) and fake reviews (right side of Table 3), respectively. Moreover, the value of each configuration for authentic review’s consistency is above 0.938. For fake review’s, the consistency is above 0.880. All values are above the threshold. Additionally, the coverage of this overall solution means that authentic and fake reviews can be regulated based on the configurations, and this notion of coverage is comparable to the R-squared value in correlations (Woodside, 2013). The results reveal that the overall solution coverage of authentic reviews is 0.366 with four solutions, and that of fake reviews is 0.122 with four patterns.

Table 3. Configurations for authentic and fake reviews

Configuration Elements		Configurations for Authentic Review				Configurations for Fake Review			
		Conscientiousness	Openness	Agreeableness	Extraversion	Low Reviewer Credibility	Visual Promotion	Friendship Network Promotion	Community Promotion
Reviewer	Self Disclosure	●		●	●	⊗	⊗	⊗	⊗
	Number of Friends	●	●	●	●	⊗	⊗	●	⊗
	Number of Reviews	●	●	●	⊗	⊗	⊗	●	⊗
	Number of Photos	●	●	●	⊗	⊗	●	⊗	●
Review	Star Rate			⊗	●		●	●	●
	Review Length	●	●		●	⊗	⊗	⊗	⊗
Review Contents	Independent Self		●	⊗	●	●	⊗	⊗	⊗
	Interdependent Self		⊗	●	⊗	●	⊗	⊗	●
Consistency		0.960	0.967	0.953	0.938	0.880	0.930	0.917	0.925
Raw Coverage		0.303	0.180	0.074	0.034	0.086	0.059	0.051	0.056
Unique Coverage		0.120	0.033	0.010	0.020	0.033	0.013	0.014	0.005
Overall Solution Consistency		0.950				0.839			
Overall Solution Coverage		0.366				0.122			

Note Full black circles refer to the presence of a condition, crossed-out circles indicate its absence, and blank spaces mean “does not matter”; i.e., the element may be either present or absent. Large circles represent core elements, whereas peripheral elements are represented by small circles

4.2.1 Configurations for Authentic Reviews

To explain each of the configurations for authentic reviews, we employ one of the personality theories, i.e., the Five Factor Model (FFM), which is an approach for representing the structure of human traits. The model affirms that five factors describe most personality traits: Openness to Experience, Extraversion, Agreeableness, Conscientiousness, and Neuroticism (Roccas et al., 2002). To adapt this FFM for review personalities, especially for authentic reviews, we label four patterns of authentic reviews: conscientiousness, openness, agreeableness and extraversion.

According to FFM, an individual who scores highly on conscientiousness is careful, responsible, organized and sincere (Roccas et al., 2002). The configurations of authentic reviews show that if all four of the reviewer’s elements reveal who the reviewer is and the review is abundant in review content regardless of self-construal, then the review has a conscientiousness authentic review personality. We confirm that four of the reviewer elements being present and the review length are a core-presence element in the conscientiousness authentic review. Openness to experience is associated with intellectual, imaginative, sensitive and open-minded individuals (Roccas et al., 2002). An openness authentic review means that the review has fluent contents as well as enough images. Thus, an open authentic review suggests a certain pattern with photos and review length as core-presence elements. The concept of agreeableness in the five factor model implies that individuals have a tendency toward being good-natured, obedient, modest and cooperative (Roccas et al., 2002). Agreeable authentic reviews focus on the number of friends and an interdependent self rather than independent self-construal contents. Independent self-construal is a core-absent element, and interdependent self-construal is a core-presence element in agreeableness of authentic reviews. Extraversion indicates that individuals tend to be sociable, talkative

and active (Roccas et al., 2002). In this research, an extraversion authentic review means the review contents are plentiful and the reviewer is sociable and active. Extraversion reviews show a certain pattern, where the number of friends and the review length elements are core-presence elements. The number of reviews is a core-absence element, and interdependent self-construal is a peripheral-absence element. Thus, through the configurations for authentic reviews, we confirm that reviews have personalities like individuals or brands do. Furthermore, if a review seems to have more personality, it is considered an authentic review.

4.2.2 Configurations for Fake Reviews

Regarding the configuration of fake reviews, we now determine why reviews are filtered due to suspicion about their authenticity. We explain each fake review configuration with the most prevalent dual-process theories, i.e., the Heuristic-Systematic Model (HSM) and the Elaborate Likelihood Model (ELM). Dual-process theories provide a basic understanding of how individuals process information and make decisions through mechanisms in the individual's information processing strategies (Bhattacharjee & Sanford, 2006). These two models highlight similar mechanisms, which are systematic processing in the HSM and the central route in the ELM. Individuals put high cognitive effort during information processing, whereas heuristic processing in the HSM and peripheral route in the ELM demonstrate that individuals intensify heuristic cues during quick judgment (Zhang et al., 2014).

First, if the review does not reveal the reviewer at all, review contents are not sufficient, it is considered as low credibility. Zhang and Watts (2008) confirm the effect of information quality as a form of systematic processing and source credibility as a form of heuristic processing to adopt online reviews. In this research, the first configuration of fake reviews reveals low credibility of the reviewer. Even though only systematic cues are disclosed, both independent self and interdependent self-construal are core-presence elements. Four of the reviewer variables are peripheral-absence elements in the first configuration of a fake review, which indicates that heuristic processing regarding the reviewer is important to be a fake review and is related with source credibility. We label this first pattern as low reviewer credibility. Additionally, Zhang et al. (2016) highlight that fake reviews have two types, one of which is promotion reviews with positive reviews. Mayzlin et al. (2014) investigate promotional reviews that are rated with positive star ratings. The last three configurations of fake reviews are divided into promotion reviews. Because a star rating is a core-presence element in all of the last three configurations and the star rating is one of the peripheral cues to make a quick judgment in ELM, we suggest that those three patterns have been allocated due to promotional purposes. More specifically, the second pattern of fake reviews has the unique characteristic that the number of photos and star rating are core-presence elements. We label this a visual promotion fake review. The number of photos is also a peripheral cue that focuses on a visual aspect. We confirm that peripheral cues are important to fake reviews, and moreover, we suggest that the balance between systematic and heuristic processing information is important for allocating fake reviews. The first pattern of fake reviews consists of only systematic information without heuristic cues, and the second review focus only on heuristic cues. Furthermore, in the third configuration, the fake review is specialized based on the

number of friends and star rating. These two are core-presence elements in friend network promotion fake reviews. As we aforementioned about friendship network, the number of friends has a key role as proof of trust and it is linked with promotion in fake reviews. According to Yang et al. (2015), Yelp has been expanded to social networking functions via making friends. They conceptualize it as friendship networking. Thus, we classify this third pattern of fake reviews as friendship network promotion.

Additionally, in the second pattern for a fake review, star rating as well as the number of photos are core-presence elements. We label this as a visual promotion review. In the third pattern, the number of friends and the star rating are core-presence elements; we classify it as a friendship network promotion. In the third pattern, a number of friends and star rating are core-presence elements, and the other elements are core or peripheral-absence elements. We call this friendship networking promotion review. The last pattern of fake reviews can be explained with HSM. Not only heuristic processing by a number of photos and star rating but also interdependent self-construal is a core-presence element in systematic procession. These exist in the last configuration for a fake review. Consequently, we identify it as a community promotion. Finally, the fourth configuration for a fake review is explained with ELM and IMT. This pattern has unique characteristics that are combined in incongruity in ELM and violate the relation principle in IMT. This configuration for fake reviews shows a violation of the clarity criterion; it has a core-presence element in interdependent self-construal instead of the independent self. That is, this fake review is written focusing on interdependent self-construal to vagueness and to promote the community. Thus, we label it as a community promotion fake review.

5 Conclusions

5.1 Discussions

This study aims to understand what fake reviews are and the differences between them and authentic reviews among eight variables. To investigate those questions, this research adopted fsQCA to determine the configuration of fake reviews and compare authentic and fake reviews with IMT as a theoretical background.

According to IMT, fake reviews must violate one of four linguistic principles: quality, quantity, manner and relation, with exaggeration, redundancy, digression and vagueness being forms of violations for each of the principles. Among the four patterns of fake reviews, most fake review patterns have a core-absence element in the review length, which is related to the quantity principle. In addition, most configurations of fake reviews have the characteristic peripheral-absence element and self-disclosure. In these patterns, the number of reviews is associated with the relation principle, and self-disclosure is linked with the manner principle, which is related to how present the reviewer is. We can define a fake review with an academic background, IMT, as a review having presented violations for any of the four linguistic principles. We insist that Proposition 1 is supported based on these results.

From the configuration of authentic reviews, especially authentic reviews with agreeableness and extraversion, we confirm that Yelp is not only a review-sharing

business; it has expanded to a social networking platform. Authentic reviews with agreeableness show there are two core-presence elements, not the number of reviews but the number of friends and interdependent self-construal. Furthermore, in the extraversion review configuration, the number of friend element is a core-presence element. The number of reviews is a core-absence element. We confirm that the function of Yelp is not only review sharing but also expanding network via friends, even though Yelp is based on a review-sharing business. Following authentic review patterns, in the fake review configurations, we also confirm that there are both characteristics: review sharing and social network traits in Yelp. Agreeableness and extraversion patterns in authentic reviews as well as friendship networking and community promotion configurations in fake reviews prove that Yelp has expanded to a social network platform. Thus, Proposition 2 is supported.

Based on the results, authentic reviews' patterns are explained with personality theory, namely, the five factor model (FFM), which means authentic reviews have review personalities like individuals or brands, including conscientiousness, openness, agreeableness and extraversion. In contrast, patterns of fake reviews are explained as dual-process theories, namely, HSM and ELM. If a review does not have any reviewer information as heuristic cues and focuses only on systematic cues, the credibility of the source may be suspicious. As one type of fake review, promotional fake review patterns are investigated in this research; Variations are presented focusing on the visual, friendship networks or the community through central or peripheral routes and systematic and heuristic cues. From these results, we show that Proposition 3 is supported.

In this research, we use real data from Yelp. It utilizes the algorithm to divide authentic and fake reviews. These two types of reviews can be divided with symmetrically opposite patterns. According to Pinto and Picoto (2016), investigating the symmetrical configurations of high- and low-performance firms, the results reinforce the symmetrical configurations. However, we find that there are partially symmetrical patterns in authentic and fake reviews in these research results. Thus, Proposition 4 is partially supported.

5.2 Implications and Limitations

This study contributes academically and practically. First, for academic implications, this research analyzes what a fake review is based on a theoretical background. We suggest that adopting IMT for the definition of a fake review provides a reasonable academic foundation. Regarding the methodology, we adopt fsQCA to compare configurations of authentic and fake reviews. fsQCA is a suitable method for analyzing a multidimensional environment. In particular, most of the prior research on fake reviews has focused only on how to detect them with modeling and on what happens rather than the theoretical background. Our theoretical arguments and the method are combined and applied to a hospitality context. Regarding the results of this study, we find that patterns of authentic reviews have personalities similar to individuals and prove this finding by adapting FFM to authentic review patterns.

In terms of practical contributions, this research uses authentic and fake review data from Yelp. This means that our results can be applied to and reflect a restaurant business world. For example, if a review has personality aspects, it can be considered

as an authentic review; in contrast, if a review has an imbalance in systematic or heuristic information, the review can be considered as a fake review. Thus, the managers of a review-sharing platform can use this information in their platform's system, such as by encouraging reviewers who have many friends to write with interdependent self-construal to highlight aspects of agreeableness. In addition, they should know what patterns for fake review exist before developing a policy to restrain fake reviews. For example, if the review violates the quantity linguistic principle, the platform can develop a policy such as a system of the platform that prohibits fewer than fifty words.

Although fsQCA is an appropriate way to investigate fake reviews and compare the configurations of authentic and fake reviews, this study also has limitations. This study analyzes real reviews on Yelp; however, the data set was gathered from one restaurant's reviews. Thus, it is difficult to generalize this research to overall authentic and fake reviews in several areas. Future research can provide basic knowledge regarding how to control fake reviews.

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Household Food Waste, Tourism and Social Media: A Research Agenda

Jamie Murphy¹✉, Ulrike Gretzel², Juho Pesonen¹,
Anne-Liise Elorinne³, and Kirsi Silvennoinen⁴

¹ Business School, Centre for Tourism Studies, University of Eastern Finland,
Kuopio, Finland

{james.murphy, juho.pesonen}@uef.fi

² USC Center for Public Relations, University of Southern California,
Los Angeles, USA

gretzel@usc.edu

³ School of Applied Educational Science and Teacher Education,
University of Eastern Finland, Kuopio, Finland

anna-liisa.elorinne@uef.fi

⁴ Luke—Natural Resource Institute Finland, Helsinki, Finland

kirsi.silvennoinen@luke.fi

Abstract. Despite major and ongoing strides in sustainability research, food remains an under-researched area in tourism. Food plays an important and often contradictory tourism role, with positive personal experiences and negative sustainability consequences. This conceptual paper encourages dialog and begins a new sustainable tourism research stream exploring the intersections among household food waste, tourism and social media. The paper proposes four research agenda items and possible future research ideas. The findings give academics and practitioners practical and theoretical insights and implications for current and future ways, such as social media, to address household food waste in tourism.

Keywords: Household food waste · Tourism · Social media · Sustainability

1 Introduction

Underscoring sustainable tourism's importance, the United Nations General Assembly declared 2017 as the International Year of Sustainable Tourism for Development (United Nations, 2016). Among other things, successful and especially long-lasting behavior change is critical for sustainable tourism (Font & McCabe, 2017). Pro-environmental behaviours tend to drop and negative environmental consequences tend to rise when people go on holiday, such as consuming more environmentally damaging food (Gössling et al., 2011; Juvan & Dolnicar, 2017). Similarly, a European survey of 391 tourists found 39% of respondents really concerned about avoiding food waste at home, versus just 27% really concerned when on holiday (De Luca et al., 2017).

Tourism norms often “embrace material culture, global corporations and luxury brands, while simultaneously contributing to unsustainable sociologies of space, in which frequent movement is a norm, where unsustainable consumption is maintained through goods sourced from global hinterlands,” and the individual is no longer responsible for consumption outcomes (Gössling 2017a, p. 11). A recent study, which clustered tourists’ justifications for environmentally unsustainable behaviours into three segments, supports these observations (Juvan et al., 2016). Two segments, *government blamers* and *struggling seekers* deny individual control of their negative environmental behaviours. *Impact neglectors*, the third segment, deny their behaviours’ negative consequences.

Psychological, social and economic impacts aside, tourism’s environmental impacts include emitting greenhouse gas and depleting scarce resources—fisheries, forests, land, species, water, energy and food (Gössling & Peeters, 2015; Juvan & Dolnicar, 2017). Of these scarce resources, perhaps the least research and greatest need relates to food consumption in tourism, which should double from 39.4 to 82 metric tons from 2010 to 2050 (Gössling et al., 2011; Gössling & Peeters, 2015). Research assumes that foodservice providers prepare the vast majority of tourist meals (Gössling et al., 2011). Yet households, rather than foodservice providers, provide the vast majority of food waste (Visschers, Wickli, & Siegrist 2016; Parfitt, Barthel, & Macnaughton, 2010).

Reducing and managing household food waste (HFW) is a major solution to the global paradox of food waste and hunger. HFW does the most economic, social and environmental harm relative to other food loss and waste (Block et al., 2016; Papargyropoulou et al., 2014; Porpino, 2016; Visschers, Wickli, & Siegrist 2016). HFW drivers, barriers and subsequent solutions are diverse, complicated, interrelated and many (Aschemann-Witzel, 2016; Hebrok & Boks, 2017; Quedsted et al., 2013; Young et al., 2017a, b; Visschers, Wickli, & Siegrist, 2016).

In addition to foodservice providers, tourism households—e.g., Airbnb, self-catering accommodation, cabins, camping, boats, houseboats, second homes, couchsurfing and visiting friends and relatives—add to the food waste stream. In Finland for example, second homes are the most widely used tourist accommodation (Finnish Research Institute, 2017). Yet to the authors’ knowledge, no research has examined household food waste (HFW) in tourism nor compared tourism food waste by households versus foodservice providers. Emerging research has, however, examined social media and sustainable tourism.

Social media’s powerful communication capabilities and effects seem boundless, such as fake news on Facebook influencing the U.S. presidential election (Allcott & Gentzkow, 2017). Social media could also influence sustainable tourism, such as food waste, positively or negatively (Gössling 2017b). User-generated content posted via social media can influence tourist decision-making (Xiang & Gretzel, 2010). Yet social media may hinder critical debate and negatively influence cognitive, personal and social norms related to sustainable lifestyles (Gössling 2017a).

Three recent articles merged Facebook and HFW. The first article, a field study using social influence theory, argued that “social media such as Facebook cannot replicate enough of the interaction shown by face to face social influence interventions to change reported behaviour more than the control group” (Young et al., 2017a, b, p. 201). Grainger and Stewart (2017) challenged this statement as premature given the

last decade's behaviour change literature in psychology and medicine. Questioning the study's methodological and analytic aspects, they argued that the jury is still out on social media's potential to influence HFW behaviours. The third article concurred with the second article's call for further research of effective food waste interventions, particularly evidence-based research using social media to reduce HFW behaviours (Young, Russell, & Barkemeyer, 2017a, b).

This conceptual paper proposes a research agenda as a small step towards stimulating debate and helping address two research gaps, HFW in tourism and using social media to influence HFW behaviours. The literature review opens with an overview of the food supply chain (FSC), then discusses food waste and a food waste hierarchy that prioritises reducing HFW. Next, a review of HFW behaviours examines psychological, contextual and socio-demographic factors related to HFW. Based on this review, the paper proposes four research agenda items, three related to HFW in tourism and the fourth related to using social media for HFW interventions. The paper closes with brief conclusions, limitations and rich future research suggestions.

2 Literature Review

2.1 Defining Food Waste

From one-third to one-half of the world's food, about 1.3 billion tons annually, is lost or wasted (Aschemann-Witzel, 2016; Papargyropoulou et al., 2014). Food waste's definition has evolved since the 1981 United Nation Food and Agriculture Organization's "wholesome edible material intended for human consumption, arising at any point in the food supply chain that is instead discarded, lost, degraded or consumed by pests (Van Alfen, 2014, p. 339)." Extensions to this definition include edible material discarded due to consumer demand for convenience or perfect appearance (Van Alfen, 2014, p. 339), fed to animals or food processing by-products diverted from the human food chain (Stuart, 2009).

Total food loss and waste is higher in developed countries than in developing countries (Papargyropoulou et al., 2014). *Food loss* occurs in the FSC's early phases such as rotting in the field or due to pests prior to harvest (Aschemann-Witzel, 2016; Parfitt, Barthel, & Macnaughton, 2010; Papargyropoulou et al., 2014). Harvesting damages crops and reduces yields, followed by spoilage and pests during storage and transportation. Processing and quality control further reduce the quantity of available food. *Food waste* occurs in the final FSC phases, marketing and consumer purchasing/consumption (Block et al., 2016). As globally more people today die from obesity than from starvation (Harari, 2016), food waste's definition merits including overnutrition, the per capita energy value gap—from 700 to 1500 calories—between food consumed and food needed (Aschemann-Witzel, 2016; Papargyropoulou et al., 2014; Smil, 2004).

Food loss has little relationship with tourism relative to food waste, which occurs in the last two FSC phases—retail and consumption. Tourists buy food at retail outlets, dine at restaurants and prepare meals in second homes, recreational vehicles, friends' homes, self-catering accommodations and camp sites. Compared to stakeholders early

in the FSC or the foodservice industry late in the FSC, western households waste more food (Visschers, Wickli, & Siegrist 2016). Indeed, households are a major food waste culprit in developed countries (Parfitt, Barthel, & Macnaughton, 2010).

This conceptual paper's focus, HFW, occurs during the squander sequence—consumer behaviours in the food pre-acquisition, acquisition, consumption and disposition stages (Block, et al., 2016). Households acquire food from retail stores, foraging, home gardens and takeaway outlets (Parfitt, Barthel, & Macnaughton, 2010). Households dispose food indirectly, such as feeding animals or the compost bin, and directly through the sewer, kerbside collections, food waste collections and household waste recycling centres (Parfitt, Barthel, & Macnaughton, 2010). Food waste can be *avoidable* as is or was edible, *possibly avoidable* depending on personal preferences i.e., bread crusts or potato skins, or *unavoidable* such as bones or coffee grounds (Silvennoinen et al., 2015; Parfitt, Barthel, & Macnaughton, 2010). This paper extends the traditional household to temporary households formed during tourism activities.

2.2 Economic, Environmental and Social Impacts and a Food Waste Hierarchy

Food waste has at least three broad negative impacts—economic, environmental and social. Social impacts include the ethical and moral aspects of wasteful practices contrasted with images of abject poverty (Aschemann-Witzel et al., 2015; Papargyropoulou et al., 2014). Discarded food in North America, 30–50% of it's food supplies, could feed the world's hungry three times over (Stuart, 2009). Food waste economic impacts include waste disposal costs, higher food costs, reduced food sector sustainability and reduced household income (Aschemann-Witzel et al., 2015; Visschers, Wickli, & Siegrist 2016). Razing forests and native land to feed landfills or incinerators is wrong economically, socially and environmentally (Graham-Rowe, Jessop, & Sparks, 2014).


Food waste environmental impacts include misusing scarce resources such as land, energy and water, emitting greenhouse gases, adding to landfills and polluting water above and below ground (Sarker, 2017; Young et al., 2017a, b). Each FSC stage—farming, processing, manufacturing, transportation, storage, refrigeration, distribution and retail—generates greenhouse gas (Graham-Rowe, Jessop, & Sparks, 2014; Papargyropoulou et al., 2014). Methane gas—21 times more harmful to the environment than carbon dioxide—from landfills is the US's third largest human-related methane source and 34% of all methane emissions (Sarker, 2017).

Instead of landfill, HFW can go to council food waste collections or home compost bins. Rather than disposal, much of HFW's environmental impacts relate to food production and supply (Graham-Rowe, Jessop, & Sparks, 2014; Papargyropoulou et al., 2014). The largest environmental benefit comes from not wasting food in the first place. Not wasting food reduces “the energy, water and other resources used to grow, harvest, transport, process and sell the food, as well as emissions associated with storage and cooking in the home” (Quested et al., 2013, p. 43).

Based on a literature review and interviews with food waste specialists, Papargyropoulou and colleagues (2014) proposed a food waste hierarchy of five tiers for preventing and managing food waste. The hierarchy considers social, environmental and economic dimensions of sustainability, giving a holistic approach towards

managing food waste. Others, such as the U.S. Environmental Protection Agency (2017), have amended the hierarchy to the six tiers in Table 1.

Table 1. Food waste hierarchy

 <p>Best option</p> <p>Worst option</p>	Source reduction	Reduce the volume of surplus food
	Feed hungry people	Donate to food banks, soup kitchens, shelters, etc.
	Animal feed	Divert food to animal feed
	Industrial use	Render waste fats and oils, energy via biogas or anaerobic digesters
	Composting	Soil and garden enrichment
	Landfill/incineration	

Source reduction is the top tier and best option. Tourists could buy or cook less food. Operators could advise guests of nearby shops or food supplies in the accommodation to discourage bulk buying, and that if in doubt, leave rather than throw food away upon departure. The second tier, *feed hungry people*, distributes food surplus to groups affected by food poverty. The third through the fifth tiers—*animal feed*, *industrial use* and *composting*—salvage some value from the food while reducing the need for landfill. The sixth tier and worst option is transporting the waste to *landfill/incineration*.

2.3 Understanding Avoidable Household Food Waste Behaviours

Understanding the myriad factors—contextual, historical, social, socio-demographic and psychological—related to avoidable HFW is important to design effective interventions (Segrè et al., 2014). Research often draws on the Theory of Planned Behaviour (TPB) and its components (Canali et al., 2016; Young et al., 2017a, b). The TPB posits that three factors—subjective norm, attitude and perceived behaviour control—lead to behavioural intentions, which then lead to actual behaviours (Ajzen, 1991). Perceived behaviour control also influences behaviour directly. The TPB assumes volitional control, that is, conscious reasons and attitudes towards behaviours such as food waste (Block et al., 2016).

In addition to conscious factors, heuristics and biases drive subconscious and unintentional behaviours (Tversky & Kahneman, 1974). For example after San Francisco legislated mandatory composting, HFW concern decreased; composting *licensed* increased food waste (Block et al., 2016). Habits increase food waste through routinely cooking and offering excess food during holidays (Block et al., 2016; Canali et al., 2016; Porpino, 2016). Retailers increase unintentional food waste through promotions, prepacked items, large package sizes and impulse buying (Graham-Rowe et al., 2014; Koivupuro et al. 2012; Parfitt, Barthel, & Macnaughton, 2010). Thus, HFW scholars often extend the TPB with non-cognitive factors such as habit, emotion and being a good provider (Graham-Rowe, Jessop, & Sparks, 2015; Russell et al., 2017; Visschers, Wickli, & Siegrist 2016).

Contextual and socio-demographic factors relate to both psychological factors and HFW itself. For example, HFW behaviors can vary by food category (Visschers, Wickli, & Siegrist 2016) and stages in the consumer decision making process (Block et al., 2017). Governmental policy, such as San Francisco's mandatory composting, can increase food waste. Middle school students discarded 73% of the mandated vegetables put on their plates in U.S. government-sponsored lunches, the cafeterias' largest proportion of food waste (Block et al., 2016). Finally, research results often find positive relationships with HFW and household size, children at home, shared housing, grocery spend and package size, and negative HFW relationships with age and weekly shopping trips (Boulet, Wright, & Rickinson, 2016; Koivupuro et al., 2012; Visschers, Wickli, & Siegrist, 2016).

Research seems inconclusive on gender's relationship with HFW (Boulet, Wright, & Rickinson; Koivupuro et al., 2012; Visschers, Wickli, & Siegrist 2016), while knowledge tends to show a positive relationship (Boulet, Wright, & Rickinson, 2016; Koivupuro et al., 2012; Parfitt, Barthel, & Macnaughton, 2010; Parizeau, Massow, & Martin, 2015). One reason for the inconclusiveness is bivariate versus multivariate tests, with the former finding more significant factors (e.g., see Visschers, Wickli, & Siegrist 2016). Yet few food waste studies use multivariate analysis (Popino, 2016). Another reason is the difficulty of operationalising variables consistently, such as knowledge, the role of gender and waste per capita versus waste per person.

3 A Research Agenda

The complexity of HFW and subsequently addressing HFW offers rich and diverse research challenges in general, and in tourism. This brief agenda focuses on two interrelated areas, HFW in tourism and social media interventions for the waste hierarchy's top priority, preventing food waste. The hierarchy's latter five tiers are one of several future research opportunities noted in the Conclusion.

Research Area 1: The sources and extent of household food waste in tourism

Scant if any research examines HFW in tourism. While households have established patterns, tourism households are temporary in both their setting and composition. These temporary characteristics provide challenges as well as unique opportunities for behavior change. Further, most sustainable behavior research in tourism has focused on hotels/restaurants, which provide clear departures from the home; self-catering settings are much closer to a home.

Perhaps technically not HFW, camping food waste seems an under researched and critical future research area. Food waste can be especially problematic in ecologically sensitive areas and areas without proper waste management such as coastal areas, national parks or remote islands.

This paper proposes tourism households—Airbnb type rentals, other self-catering accommodation, boats, houseboats, cabins, second homes, camping, couchsurfing and visiting friends and relatives; do other sectors exist? How large is tourism HFW and what are its characteristics? How much, how often and what kind of food waste do these sectors generate? Descriptive research, qualitative and quantitative, seems a

relevant first step. Finally, will trends such as “traveling more like a local” change food waste behaviors?

Research Area 2: The drivers of and barriers to household food waste in tourism

Ample research cited in this paper examines the drivers of and barriers to HFW but never in a tourism context. For example children in the household and shared households relate positively to HFW (Boulet, Wright, & Rickinson, 2016; Visschers, Wickli, & Siegrist, 2016), but how do different tourism party compositions impact HFW? How do psychological barriers to HFW, conscious and unconscious (Block et al., 2016; Porpino, 2016; Visschers, Wickli, & Siegrist, 2016), apply to tourism?

Possible tourism HFW examples include diffusing sustainability obligations to businesses, attenuating the consequences of one’s actions by making them invisible and moral licensing that justifies one’s consumption patterns (Juvan et al., 2016; Gössling 2017a, b). For example when tourists think a product is sustainable, they may increase consumption such as using more water or energy in eco-lodges, or consuming more food and drink with lower calories or alcohol content (Font & McCabe, 2017).

Psychological drivers, such as the need for extra-ordinary experiences of tasting new or local foods, may play an important role with tourism food waste and merit further research. Research shows that pro-environmental behaviours tend to drop when people go on holiday, such as consuming more environmentally damaging food (Gössling et al., 2011; Juvan & Dolnicar, 2017; De Luca et al., 2017). Similarly, routinely cooking excess food is a common holiday tradition (Block et al., 2016; Canali et al., 2016; Porpino, 2016). The notion of co-creation is also important as research on Airbnb shows that cooking dinner together is a common form of co-creation between hosts and guests (Yao, 2015).

Research Area 3: Modeling and changing household food waste in tourism

Given HFW’s complexity, qualitative research should examine the historical, cultural and contextual frameworks of eating, communing, wasting and conserving. In tandem, research should consider and test a range of contextual, social, socio-demographic and both conscious and unconscious psychological factors in theoretical models (Block et al., 2016; Segrè et al., 2014). Several theories can help explain food waste behaviour, such as consumer culture (Aschemann-Witzel et al., 2015; Gössling, 2017a, b), planned behaviour (Canali et al., 2016; Visschers, Wickli, & Siegrist, 2016; Young et al., 2017a, b) and cognitive dissonance (Juvan & Dolnicar, 2017). Modeling must consider that tourism segments differ in justifying their sustainability practices (Juvan et al., 2017), different environmentally sustainable tourist behaviours have different drivers (Juvan & Dolnicar, 2017) and HFW practices differ by food group (Visschers, Wickli, & Siegrist, 2016).

Nudging, a behavioural economics approach relying on choice architecture and positive reinforcement, can change behaviours regardless of conscious or unconscious drivers (Block et al., 2016; Juvan & Dolnicar, 2017; Thaler & Sunstein, 2009). Research has shown that nudging can reduce restaurant food waste (Kallbekken & Sælen, 2013) and alter food menu choices (Filimonau et al., 2017). Social media has

the possibility to nudge and slowly change consumer behaviour. Nudging however remains but one piece to a difficult puzzle (Hall, 2013).

Which theories—consumer culture, planned behaviour, cognitive dissonance, nudging, and others—or combinations of theories are effective, and why?

Research Area 4: The intersections among social media, food, food waste and sustainable tourism

As with any innovation, the uses and impacts of social media continue to evolve. A growing impact related to food is how social media and photography facilitate social comparison (Lo & McKercher, 2015). What photos do tourists choose to share, such as foodporn, and why? Furthermore, social media may evolve the tourist gaze into a networked neo-tribal gaze that influences behaviour (Dinhopl & Gretzel, 2018).

Social media seem to play an important role in shaping negative tourism norms (Gössling, 2017a) and tend to reduce social sustainability—understanding, respecting, tolerating and preserving host community authenticity, culture, values and well-being (Gössling, 2017b). Social media present across four major social sustainability themes: glamorization of travel and tourism (Instagram, FlyerTalk, FlightMemory), traveller identity (Facebook, Instagram, Wayn), social status and competitive travel (Facebook, FlightMemory, FlyerTalk), and social connectedness (Facebook, Instagram) (Gössling, 2017b). How prominent are social media practices that glamorize travel or portray identities, such as foodporn, during travel? And do these practices facilitate or hinder sustainable behaviors?

As uncovering and publicly outing unsustainable behaviors is a popular social media sport, to what extent are tourists' social media posts 'policed', especially when they travel to undeveloped countries (Gretzel, 2018)? Do Airbnb hosts displaying breakfast tables laden with food influence HFW or Airbnb's ability to manage their reputation? Food waste police could also draw on a successful experiment, which captured and shared images of disposed waste via an online social network, to reduce household waste (Comber & Thieme, 2013). Although social media have proven their immense potential for activism, little research exists on social media activism in tourism.

The nexus of learning and social media seems promising as ever more people indicate that they turn to social media for news as well as entertainment. Tourists escaping from busy lives could have free time for engaging with sustainability-related content available via social media. Social media content can be particularly engaging due to multimedia affordances. Further, social media can be persuasive technologies, offering psychological rewards for sustainable behaviours such as badges or quizzes, or taking advantage of gamified learning and behaviour change (Fogg, 2002).

Finally, the social medium and culture may relate to sustainable tourism initiatives. For example a study found that sustainability motivations, particularly responsibility motives, differed between attitude commitment towards Twitter and Facebook (Minton et al., 2012). The authors surmised the differences could be due to Facebook communication being deeper than via Twitter. The authors also found country-level differences across South Korea, Germany and the United States.

What social media work best for changing food waste behaviours: where, why and how? The scientific community should examine the roles of different social media

actors in reducing HFW. How can governmental organizations, public bodies, destinations, businesses, influencers, communities and online travel agencies use their social media channels to reduce HFW in tourism?

4 Conclusions, Limitations and Future Research

Mandatory recycling and the challenges to feed a global population of nine billion are two predictions for the year 2050 (Parfitt, Barthel, & Macnaughton, 2010; Pizam, 1999). Preventing HFW, the food waste hierarchy's top tier, will increase food supplies and decrease land, landfill, energy and water needs. This conceptual paper takes a small step towards understanding tourism HFW, and how social media can address such HFW.

This paper and its agenda can guide current and future academics and practitioners. Academics could increase HFW attention in both the classroom and their research; a paucity of HFW research exists in business disciplines (Porpino, 2016). Practitioners could incorporate HFW in both their tactical and strategic planning. Employees, customers, regulatory bodies and society, would appreciate and notice companies that take a proactive rather than reactive approach to HFW.

Among the paper's limitations are little data and HFW research in tourism (Gössling et al., 2011). Porpino's (2016) meta-analysis of HFW research serves as a blueprint for future HFW research and underscores the need for evidence-based research and multivariate analysis. "Experiments and interventions in particular can contribute to a shift from analysis to solutions" (Aschemann-Witzel et al., 2015, p. 6457). At the same time, the discussion above highlights the need for more cultural understandings of food consumption, HFW and social media use to gain deep insights into drivers.

Future research could examine hospitality food waste. Possible research streams include conceptualising hospitality food waste (Papargyropoulou et al., 2016), reducing hospitality food waste (Derqui, Fayos, & Fernandez, 2016; Pirani & Arafat, 2016), managing employees (Strotman et al., 2017), designing menus to reduce food waste (Filimonau et al., 2017), and food waste in catering and hotel buffets (Häyhtiö, 2016; Heikkilä et al., 2016; Juvan et al., 2017; Kallbekken & Sælen, 2013; Lorenz et al., 2017).

This conceptual paper focused solely on the food waste hierarchy's top tier, prevention. Future research could examine hospitality and tourism food waste across the other tiers and their use of social media. For example, ResQ <resq-club.com> uses Facebook, Instagram, a website and mobile app to divert inexpensive quality food that European restaurants will soon discard to feed the hungry. Recycling also offers rich research opportunities in general (Miafodzyeva & Brandt, 2013; Varotto & Spagnolli, 2017) and in hospitality and tourism (Singh, Cranage, & Lee 2014).

Lastly, research should add health costs to HFW's environmental, economic and social costs. Fresh, healthy foods such as vegetables are often wasted and most individuals would benefit from eating more of these foods (Connell et al., 2017).

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Part V

**Social Media and Technology
in the Hospitality Industry**

Insights into Online Reviews of Hotel Service Attributes: A Cross-National Study of Selected Countries in Africa

Dandison Ukpabi¹(✉), Sunday Olaleye², Emmanuel Mogaji³,
and Heikki Karjaluoto¹

¹ University of Jyväskylä, Jyväskylä, Finland
{dandison.c.ukpabi, heikki.karjaluoto}@jyu.fi

² University of Oulu, Oulu, Finland
sunday.olaleye@oulu.fi

³ University of Greenwich, Greenwich, UK
e.o.mogaji@greenwich.ac.uk

Abstract. Online travel reviews are paramount to trip planning because they help consumers' form images of destinations. Despite ample studies on hotel service attributes, knowledge is scarce regarding culturally nuanced attributes, including security perceptions. This study examines consumers' perceptions of service attributes and security/safety concerns of hotels in Africa. Data were extracted from three hotel categories (3, 4, and 5-stars), which were based on TripAdvisor rankings from Egypt, Ghana, Kenya, Nigeria, and South Africa. A hybrid analysis revealed that hotel service attributes and security/safety are cardinal evaluation criteria for visitors to Africa. Additionally, our study reveals that most negative reviews were from 5-star hotels and Egypt received more positive reviews in all the service attributes than other countries.

Keywords: Online reviews · TripAdvisor · Service attributes · Security Revisit

1 Introduction

Customers' perceptions of a hotel's service quality are an embodiment of its image and are often used as evaluation criteria for patronage (Kandampully, Juwaheer and Hu, 2011). Interestingly, the diffusion of information and communications technologies (ICT), especially its paradigmatic exordium into the social web, has fundamentally transformed the dynamics of word of mouth (Ukpabi and Karjaluoto, 2016). Consequently, with a single click of the mouse, a consumer's positive and/or negative comments about a hotel's service quality are made available on a global scale. Thus, the evaluation of a hotel's service quality, which is a critical element of its image, has gone beyond its immediate geographical space to a global audience. Accordingly, tourism review sites, such as TripAdvisor, Lonely Planet, Oyster.com, etc., which also provide hotel reviews, have experienced exponential growth in recent years. Contemporarily, the tourism industry has been most affected by issues of terrorism and global insecurity (Chan and Lam, 2013). When security breaches occur, tourists either

reduce their travel times or choose destinations that are considered safe. Interestingly, a critical search of peer-reviewed publications on Google Scholar regarding hotel service quality in Africa returned only one exploratory study, which was conducted in a single market and which stated that the results could not be applied outside Mauritius—the country where it was conducted (Ramsaran-Fowdar, 2007). Accordingly, in evaluating how online reviews on TripAdvisor shape a hotel's image, O'Connor (2010) argued that management should consistently monitor online reviews to instigate remedial actions regarding customer complaints. However, O'Connor's (2010) study was drawn from a single London hotel market and therefore calls for a cross-market comparison of online reviews. In appraising the quality of online service reviews, Browning, So, and Sparks (2013) suggested that core services can induce positive service quality attributes; however, they also suggested that future studies should consider how core and staff service impact quality attributions. Finally, in a study of safety and security perceptions of Hong Kong hotels, Chan and Lam (2013) argued that managers' provision of safety and security systems should be in tandem with customers' expectations, and they called for a study that embraces the cross-market evaluation of customers' perceptions of security and safety in hotels.

Consequently, in aggregating the above gaps in the literature, this study addresses the following objectives: to understand customer perceptions of service quality dimensions and their differences across hotels in Africa; to examine the role of perceived security in visitor attraction and to analyze how service quality dimensions influence revisit/recommendation intention. Against this backdrop, our study makes key contributions to the literature as it advances knowledge and understanding of hotel service attributes in Africa and provides a critical analysis of different hotel services and compares them against other countries, which provides hands-on materials to travelers and managers regarding specific destinations that perform exceptionally well in certain hotel services. This study proceeds as follows: Sect. 2 discusses the theoretical background. We outline the methodology in Sect. 3. We proceed to data analysis and results in Sect. 4 and conclude with the discussion in Sect. 5 where we also highlight the theoretical and managerial implications.

2 Theoretical Background

Consumers' assessments of service quality are a determinant of the consumption context. Thus, for products, which mainly comprise tangible goods, easily discernable attributes, such as taste, price, and smell, constitute consumers' evaluation of overall service quality (Browning, So, and Sparks, 2013). However, service quality evaluations of intangible goods have constituted major academic debate in the last decade. This debate is understandable, considering the difficulty with which consumers judge both good and bad service due to their abstract and elusive nature. Accordingly, SERVQUAL typologies (Parasuraman, Zeithaml, and Berry, 1985, 1988) have been subject to both theoretical and operational criticisms (Buttle, 1996).

Due to the unique nature of the tourism and hospitality sector, scholars have broadened service quality dimensions to fit the tourism research stream such as Getty and Thompson's (1994) LODGQUAL and Salazar, Costa, and Rita's (2010)

HOLSERV. Browning, So, and Sparks (2013) argued that consumers' online reviews of hotel services often fall into core and relational services. Core services embrace a firm's critical value delivery mechanisms, which mainly comprise the "hard" components of their services. Relational services that are embedded in their "soft" components include skills that are often espoused through customer-employee interactions. Empirically, Salazar, Costa, and Rita (2010) found that in selecting hotels, feelings, staff, facilities and room were rated as critical hotel service attributes while location was not considered very important. This is however contrary to O'Connor (2010), who found that location was the most important consideration. Similarly, Ladhari (2009) found that guests satisfaction with a hotel was fundamentally linked to their emotion. Using a data mining approach, Guo, Barnes and Jia (2017), found that ease of checking in and out, resort facilities and communication were top on customers satisfaction. Finally, in examining cultural factors, Viglia and Abrate (2017) found that European visitors ranked TV availability, parking and wi-fi more important than other factors.

Destination safety and security significantly influence guests' hotel selection (Chan & Lam, 2013). As a result, destinations that have suffered security breaches, such as terrorist attacks, kidnappings, and violence, are often avoided. To provide information about safe destinations for its members, TripAdvisor often displays a "Security Alert" for countries that it considers to have security risks. This information is provided to help members take additional security precautions when visiting such destinations (TripAdvisor.com, 2017). Among the various places perceived as targets by terrorists, hotels have often witnessed the most violent attacks, with outbreaks cutting across countries. For instance, Africa suffered attacks at the Corinthia Hotel in Libya (2015), the Soviva and Imperial Marhaba Hotels in Tunisia (2015), the Radisson Blu Hotel in Mali (2015), and the Splendid Hotel in Burkina Faso (2016) (Aljazeera.com, 2017). The Brussels and Paris attacks in 2015 and 2016, respectively, led to a sharp decline in hotel occupancy rates across Europe (RT.com, 2016). Notably, Asia and America have also suffered attacks, such as the Jakarta (2016) and San Bernardino, California (2015) attacks, which adversely affected tourism at those destinations. While there are many travel review sites, TripAdvisor has witnessed phenomenal growth in recent years. TripAdvisor currently has approximately 435 million reviews that cover 6.8 million tourism destinations, which expanded from 51.4 million unique users in 2011 to 390 million unique users in 2017 (TripAdvisor.com, 2017). Notably, issues of content credibility have challenged the *modus operandi* of TripAdvisor as they have faced sanctions in some countries for defamatory content (Ayeh, Au and Law, 2013).

3 Methodology

Three hotel categories (3, 4, and 5-stars) were selected based on TripAdvisor rankings from five African countries: Egypt, Ghana, Kenya, Nigeria, and South Africa. Egypt was chosen because—as an ancient civilization—it has remained a global attraction, with tourism contributing significantly to its gross domestic product (GDP) (El-Gohary, 2012). In Ghana, the recent discovery of oil and its exploration in commercial quantities have provided the Ghanaian economy with a steady influx of foreigners, which has significantly increased its tourism earnings (Bybee and Johannes, 2014). Nigeria's

undisputed reputation as the most populated country in Africa, in addition to the ubiquity of multinational oil companies, has positioned the country as a strategic tourism hub in Africa. The Eastern African block is highly reputed for wildlife tourism, and Kenya reportedly dominates in terms of visitor attractions (Homewood, Trench, & Brockington, 2012). Finally, we chose South Africa because of its efficient infrastructure.

Data extractions were based on reviews from 1st January to 31st December, 2016. Two coders were involved with an arbitrator, and the coding procedure involved manual and NVivo 11, a computer-assisted coding program, which was used to prevent inconsistencies between human coders. To ensure intercoder reliability, the coders agreed on the coding scheme, exchanged text for comparison, and sent it to a neutral member of the research team for necessary text reconciliation. The study used content analysis due to its flexibility and a procedure of inquiry that fits qualitative, quantitative, and mixed methods (Mogaji, Farinloye and Aririguzoh 2016; White and Marsh, 2006). Additionally, we used Ncaputre, a freeware browser extension to import the extracted data from TripAdvisor website into NVivo to glean insights from the qualitative data. We explored the themes that necessitate hotel revisit. Furthermore, we employed regression analysis to understand the in-depth relationship of variables that related with hotel revisit. Multiple regression is the appropriate quantitative analysis for this study because the independent variables (predictors) were 11 to predict the dependent variable (hotel revisit intention).

Although this hybrid method has been used widely across different research streams, it was necessary to interpret the coding of textual material from the TripAdvisor reviews and make replicable and valid inferences. Thus, the coding comprised the content of the hotels' reviews regarding the general quality of their experience. Of the 59,805 reviews available, 1021 were found useful based on strict selection criteria, which comprised basic demographic details, such as age, gender, and location. In line with the same approach adopted by Lee, Law and Murphy (2011), it was considered that those who had provided their demographic details to TripAdvisor could be taken as real and genuine, and the reviews about their hotel experiences could be considered authentic. The Excel 2016 Analysis Toolpak and NVivo 11 (Ruggiero and Green 2017) were used to analyze the obtained data, with NVivo specifically used for review coding, generate themes and generate demographic data.

4 Data Analysis and Results

Per our objectives, we developed a coding scheme of hotel services based on extant studies (Browning, So and Sparks, 2013; O'Connor, 2010; Salazar, Costa and Rita, 2010). Accordingly, for each of the five countries, we identified and coded the following themes: security/safety, location, room service, toilet/toiletries, price, breakfast/food, drinks/beverages, staff, Internet/Wifi, swimming pool, and gym. Specifically, security/safety was coded based on reviews such as 'the hotel had armed guards', 'there were thorough security checks at the airport and entrance to the hotel', 'CCTV camera were available'. Importantly, each service was identified based on whether it was used either positively or negatively. Additionally, reviews that indicated intention to either revisit or recommend were identified and coded as either positive or the negative.

Table 1. Demographic distribution of the reviews

Country	Gender		Age					Grand total
	Male	Female	18–24	25–34	35–49	50–64	65+	
Egypt	218	116	13	116	125	70	10	334
Ghana	79	22	1	30	41	24	5	101
Kenya	120	83	8	57	77	57	4	203
Nigeria	166	49	2	42	119	50	2	215
South Africa	95	64	1	23	52	64	19	159
Sub-Total	678	334	331	203	159	216	101	1012

Table 1 shows the gender and age brackets of hotel visitors to Egypt, Ghana, Kenya, Nigeria, and South Africa. The male visitors (678: 67%) to hotels in Africa outnumbered the female visitors (334: 33%), with those between the ages of 35–49 being the highest number of visits to the countries examined, except for South Africa, which had the most visits from those within the age bracket of 50–64. Egypt had the highest visits from those within the age bracket of 35–49, with 125 (38%) visitors, and Nigeria followed with 119 (55%) visitors. Egypt also had the highest number of young adult visitors (18–24 age bracket) with 13 (4%). In all, Ghana had the lowest number of hotel visitors of the countries reviewed, with 101 (10%).

Table 2. Perception of hotel services in five African countries

Themes	Egypt		Ghana		Kenya		Nigeria		South Africa	
	+	–	+	–	+	–	+	–	+	–
Security/safety	140	10	25	7	27	2	43	1	37	–
location	160	11	83	–	23	3	62	13	117	4
Room service	165	36	50	42	129	22	104	19	121	19
Toilet/toiletries	32	18	16	16	2	6	18	6	47	–
Price	42	47	13	14	14	4	33	8	32	19
Breakfast/food	301	6	145	46	119	6	182	14	109	20
Drinks/beverages	50	–	12	12	20	–	5	2	71	–
Staff	116	5	39	12	103	10	5	3	45	22
Internet/Wifi	35	16	14	18	12	13	28	10	16	13
Swimming pool	38	2	17	7	19	2	62	2	14	7
Gym	24	3	18	2	4	4	28	4	14	–
Revisit Intention/recommend	75	2	14	17	66	3	55	2	38	2

Notes + Positive; – Negative

Consumer experiences with hotel services, as revealed by their positive and negative reviews in Table 2, showed more positive reviews than negative. Across the five countries studied, security, location, breakfast/food, and staff received the most positive reviews. In Egypt, while the reviews were all positive concerning drinks/beverages, those dissatisfied with the price was higher than the positive reviews. In Ghana, the reviews were all positive regarding hotel locations. Furthermore, visitors to Egypt, Kenya, and South Africa expressed maximum satisfaction with drinks and beverages. However, for visitors to Ghana and Egypt, price was reviewed as negative. Interestingly, the views expressed by some scholars regarding the slow adoption of information and communications technology in Africa (Ukpabi & Karjaluto, 2017) appeared in our analysis. Accordingly, visitors to Ghana and Kenya expressed dissatisfaction with the Internet/Wifi. Furthermore, to meet one of our objectives regarding revisit and recommendation intention, we identified and coded all reviews that contained comments such as the following: “I will visit again,” “I will recommend this hotel,” “I will tell my friends about this hotel when they visit,” etc. Thus, regression and ANOVA tests were conducted to obtain the statistical significance of service dimensions in predicting revisit and recommendation intention (see Tables 3 and 4). Table 3 shows that the overall model of hotel services in Africa was statistically significant. Egypt was statistically significant, $F(11, 3612) = 164.6, p < 0.01$, and the other countries were as follows: Ghana $F(11, 840) = 39.8, p < 0.01$, Kenya, $F(11, 2688) = 141.7, p < 0.01$, Nigeria $F(11, 3492) = 144.2, p < 0.01$ and South Africa $F(11, 1212) = 78.9, p < 0.01$.

Table 3. ANOVA of scale and hotel services in Africa

	Egypt		Ghana		Kenya		Nigeria		South Africa	
	df	F	df	F	df	F	df	F	df	F
Between groups	11	164.6	11	39.8	11	141.7	11	144.2	11	78.9
	3612		840		2688		3492		1212	

The results indicated that the independent variables of security, location, room service, toilet, price, food, drinks, staff, Internet, swimming pool, and gym (see Fig. 1) explained the variation in the dependent variable of hotel revisit. Based on the above results, the study model is fair to middling for further hypotheses testing. Additionally, we rejected our null hypothesis that hotel services are not statistically different in Egypt, Ghana, Kenya, Nigeria, and South Africa and accepted the alternative hypothesis: Hotel services are different. To determine the difference, we examined the *t* statistics and the *p*-values of the services separately.

Table 4. Regression for hotel services in Africa

Items	Egypt	Ghana	Kenya	Nigeria	South Africa
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Security/safety	<0.01	<0.01	<0.01	<0.05	ns
Location	<0.01	<0.01	ns	ns	<0.01
Room service	ns	ns	ns	ns	ns
Toilet/toiletries	ns	<0.01	ns	<0.01	ns
Price	ns	ns	ns	ns	ns
Breakfast/food	ns	ns	ns	ns	<0.05
Drinks/beverages	ns	<0.01	ns	ns	ns
Staff	<0.01	ns	<0.01	ns	ns
Internet/Wifi	ns	ns	ns	<0.05	ns
Swimming pool	ns	<0.01	ns	ns	ns
Gym	ns	ns	ns	<0.01	ns
Observations	302	71	225	292	102
Revisit intention/recommend (variance) (%)	79	95	46	82	52

Notes Dependent variable: revisit intention; Predicators: security, location, room service, toilet, price, food, drinks, staff, Internet, swimming pool, gym; Two-tailed test; *ns* Not significant

The above Table 4 reveals three factors that predicted revisit to Egypt. Out of the eleven criteria used to predict hotel revisit, hotel location was the highest predictor of hotel revisit intention, followed by security assurance and staff. Location positively predicted hotel revisit in Egypt $t = 9.34$ ($p < 0.01$). The security perception was significant $t = 5.38$ ($p < 0.01$) and staff $t = 2.97$ ($p < 0.01$). Overall, the predictors explained 79% of the variance of hotel re-patronage. However, the variables were perceived differently in Ghana, which had negative significant results. The safety confidence in Ghana was $t = -7.64$ ($p < 0.01$). As with Egypt and South Africa, location was the highest predictor of hotel revisit $t = 7.78$ ($p < 0.01$). Toilet, drinks and swimming pool were significant $t = -5.20$, ($p < 0.01$), $t = -6.98$, ($p < 0.01$), $t = 2.80$, ($p < 0.01$). This negative result may correlate to hotel visitors' discomfoting experiences in Ghana regarding security, toilet, and drinks, which likely cause them to not revisit. These visitors have lost any hope of seeing improvements upon future visits. The model predicted 95% of the variance of the dependent variable. Kenya and Egypt outpaced the other countries that were examined in this study regarding excellent staff reviews $t = 9.34$ ($p < 0.01$).

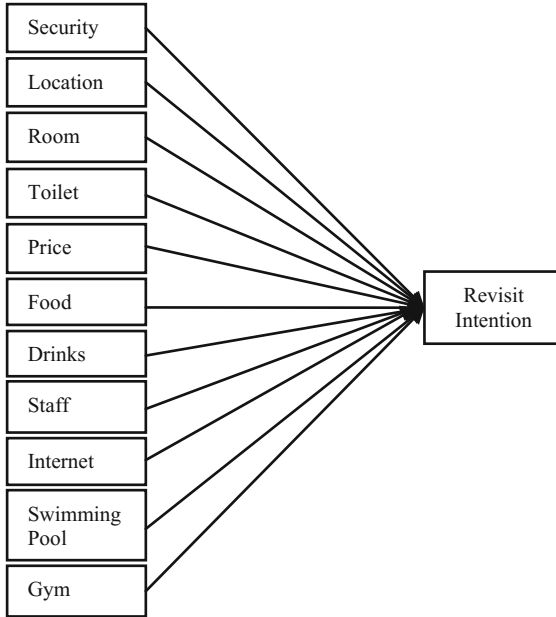


Fig. 1. Conceptual framework

Safety perception was also significant ($t = 4.08, p < 0.01$). Egypt’s hotels and visitor’s security personnel make pleasing visitors a priority. Excellent staff and positive security perceptions encourage travelers to visit Kenya, and 46% of the variance could be explained with revisit intention. Interestingly, gym was the highest predictor of revisit intention in Nigeria ($t = 10.22, p < 0.01$); toilet ($t = 10.02, p < 0.01$), security ($t = 2.06, p < 0.05$), and Internet access ($t = -2.55, p < 0.05$) were negatively associated with revisiting and recommending. A total of 82% of the variance of revisit intention was explained. Factors that encouraged tourists to revisit hotels in South Africa included the strategic location and delicious meals from a standard restaurant. Location ($t = 6.88, p < 0.01$) and food ($t = 2.63, p < 0.05$) positively predicted hotel revisit in South Africa. Strategic hotel location in South Africa was the highest predictor of hotel revisit, and the 52% variance of hotel re-patronage could be explained by the predictors.

Table 5. Path coefficients of the variables for the five countries

BETA					
	Egypt	Ghana	Kenya	Nigeria	South Africa
Security	0.30	-1.7	0.45	0.12	n.s.
Location	0.51	3.2	n.s.	n.s.	0.66
Room	n.s.	n.s.	n.s.	n.s.	n.s.
Toilet	n.s.	-0.34	n.s.	0.32	1.09
Price	n.s.	n.s.	n.s.	n.s.	n.s.
Food	n.s.	n.s.	n.s.	n.s.	0.18
Drinks	n.s.	-0.41	n.s.	n.s.	n.s.
Staff	0.10	n.s.	0.17	n.s.	n.s.
Internet	n.s.	n.s.	n.s.	n.s.	n.s.
Swimming pool	n.s.	0.20	n.s.	n.s.	n.s.
Gym	n.s.	n.s.	n.s.	0.45	n.s.
Adjusted R ²	0.79	0.95	0.46	0.82	0.53

Table 5 is the path coefficient of the tested variables for the five countries. The adjusted R² would have been an effective criterion for comparing the models but due to a difference in the sample size, there is a tendency of model estimation and this may create an assessment bias. For example, Egypt, Ghana, and Nigeria recorded high adjusted R² while Kenya and South Africa are moderate. The study based the model comparison on three criteria of intuitive moderateness, simplicity and relevance and usefulness of the model for decision makers. Based on these 3 criteria, Ghana and Nigeria had more significant variables than the other three countries.

5 Discussion

This study examined reviews on Trip Advisor for 100 hotels across 5 African countries to provide empirical evidence of service quality issues that are pertinent to Africa. Across the different levels of hotels in each of the countries studied, breakfast/food, staff, and room service dominated in the 5-star hotel categories. In Egypt, 3-star hotels performed better than 4-star hotels in the same service attributes. Ghana, Kenya, and South Africa saw similar performances among 5-star hotels. However, Nigeria was quite different, with the 4-star hotel categories outperforming both the 5-star and 3-star hotels. Finally, location, consistent with O'Connor (2010) and security significantly predicated revisit intention to Egypt. Moreover, for Nigeria and Kenya, the regression test indicated that security was negatively significant. This implied that increased security issues, such as terror attacks, can scare potential visitors and increasingly prevent them from traveling to these countries. Again, staff significantly predicted revisit to Egypt and Kenya as well as positively predicted revisit to the other countries studied. Importantly, these findings are crucial considering the lack of studies on hotel service quality in the investigated regions, especially on a cross-country comparative basis which implied that visitors and managers do not have the requisite information

regarding critical service quality attributes that underpin attractiveness to the region. We believe our study has filled this gap and added to the emerging research stream, which is exploring user-generated content on social media platforms (Tham, Croy and Mair, 2013).

5.1 Theoretical Implications

The physical appearance of the hotels was determined to be a primary measure of hotel quality in Africa; responsiveness, assurance, and empathy were not particularly evident in tourism reviews, while reliability was neither well presented by the hotels nor acknowledged by the visitors. This provided some theoretical implications regarding using SERVQUAL as a model in exploring hotel services; Wu and Ko's (2013) three major dimensions of hotel service quality could be specifically suitable. Alternatively, Salazar, Costa, and Rita's (2010) HOLSERV items could offer more interesting insights, considering that the most prominent themes in our study, such as location, breakfast/food, and staff, relate more specifically to the HOLSERV dimensions. Our study found that consumers' perceptions of these service attributes were mostly positive with most of the variables positively predicted intention to revisit for most of the countries. Thus this finding is consistent with prior studies that providing value-creating and excellent hotel services will positively influence revisit intention (Amin et al. 2013). As anticipated, hotel star rating was a critical determinant of satisfaction. In Ghana for instance, where majority of the reviews were from 5-star hotels, reviews on price were mostly negative in addition to most of the variables indicating consumers' unwillingness to revisit. Consumers who patronize 5-star hotels pay more, have higher expectations and are more likely to express dissatisfaction and cognitive dissonance when the price paid does not match the service. Interestingly also, our regression results of these service attributes varied across the studied countries. For instance, while location, security assurance, and staff were critical factors for revisiting both Egypt and South Africa, visitors to Ghana and Nigeria were unsatisfied with the security systems in those countries' hotels. Consistent with extant studies, security has unarguably become a prominent theme, implying that increasing waves of terrorism have made safety and security concerns an integral part of evaluating hotel services, which has advanced our understanding of one of the main challenges of the industry in recent years (Guillet et al., 2011). Security issues are still a primary concern for visitors, and this creates challenges for managers and governments regarding how best to protect tourists and offer reassurances that efforts are being made to ensure their safety. This could include references to security processes in marketing communication campaigns, either through images or text that describes the hotels and/or the country. Notably, there were more negative perceptions of price and Internet/Wifi than in other sectors. The availability of Internet/Wifi is considered paramount in hotels and event centers (Lee & Lee, 2017). In line with extant studies, slow adoption of ICT by businesses in Africa negatively affects their productivity and revenue (Ukpabi & Karjaluoto, 2017). The challenges that most businesses in Africa are facing include the absence of a policy framework on the development of the ICT sector, especially in ensuring a robust national broadband policy. Consequently, businesses, at great cost, struggle to ensure that Internet is available for their operations. Additionally, in line

with the arguments of previous studies on the role of food quality in influencing revisit and recommendation intention (Rand, Heath, and Alberts, 2003), our study found that breakfast/food attracted the most positive comments, with some reviewers predicating their revisit to the quality of food served. Finally, our study extends the debate on the reliability of TripAdvisor as an e-WOM platform for travellers. TripAdvisor has come under severe criticisms for absence of customer review validation procedure and has attracted mixed feelings from scholars and the industry (Ayeh, Au and Law, 2013). This finding corroborates Agusaj, Bazdan and Lujak (2017) who quantitatively analysed the reviews on TripAdvisor and Booking.com and found that TripAdvisor is still as reliable as Booking.com.

5.2 Managerial Implications

This study offered several managerial implications, especially from the perspective of policy makers and practitioners. In Egypt, the performance of the different classes of hotels was even, with no sharp differences in their service quality evaluation, when compared to the other countries studied. This implies that the Egyptian economy is supported by tourism, and there is strategic attention paid to both the development and improvement of hotel services, irrespective of the category, to meet the needs of different classes of visitors. Thus, visitors can patronize Egyptian hotels, according to affordability, without compromising quality. However, for countries like Ghana, Kenya, Nigeria, and South Africa, the lack of a strategic framework in the industry precipitated the development of high-class hotels that only cater to the needs of elites and disregard lower-class hotels. Therefore, the development of hotels is more of an individual effort, and it lacks regulatory oversight, which would ensure compliance with specifications. It is therefore important for the governments of these countries to strategically develop the tourism industry with the basic understanding that having high-quality hotel services that cut across the different classes of hotels will significantly affect the image of the country as a destination (Tsai, Song, & Wong, 2009). Regarding staff relational services, interpersonal relationships are essential to social cohesion in a high-context culture like Africa. Thus, friendliness, politeness, and courtesy are not only synonymous with the African social system but are also embedded in the corporate culture. In addition to promptness to customers' requests, staff can equally initiate discussions that promote interpersonal relationships and intimacy by asking polite questions, such as "How was your night?" and "Did you enjoy your breakfast?" Additionally, management should sponsor staff attendance at seminars that promote their interpersonal relationship skills. To further add to the quality of customers' experiences, hotels should be sited on ambient locations. Locating hotels close to historical and heritage sites could tie visitors' entire trip experiences to such locations. For instance, most of the positive reviews about the location of hotels in Egypt centered on the pleasurable feelings of having rooms overlooking the River Nile and the spa area. Understandably, price is an important criterion in evaluating a hotel service; high-quality hotel services positively correlate with high prices, and consumers usually express dissatisfaction when the price paid does not match the level of service. Consequently, managers, especially those in lower-class hotels, should continuously improve services to match the prices that customers pay. It is further recommended

that, while managers should continue to improve the quality of the Internet/Wifi in their hotels, African governments should create policies that will liberalize Internet availability if they hope to catch up with modern business practices. Finally, managers should continuously ensure that adequate security systems are in place. Even though hotels cannot control the national security system, guests will feel reassured if they know that there are adequate security systems in hotels. However, managers must carefully implement the appropriate security measures because, as Chan and Lam (2013) argued, some overt security measures can frighten guests instead of reassuring them.

5.3 Limitations and Recommendations for Future Research

Our selection of service quality attributes was based on the frequency of occurrence of those attributes, which was based on the content analysis. Although we painstakingly ensured that our inclusion was standardized, there may have been some culturally nuanced attributes that might have been excluded due to their infrequent occurrence. We therefore recommend a qualitative study with guests in selected hotels in Africa to gain a deeper understanding of those culturally nuanced attributes. Additionally, the African market is quite large, and the selection of five countries and only twenty hotels in each of those countries may have grossly affected the results of our study. Consequently, a study that embraces countries in other regions, such either as Europe, America, or Asia, and compares their service attributes to those in Africa is recommended. Finally, our inclusion criteria were limited to reviews with complete demographic profiles because reviews with no demographic profiles could have altered the results of our study.

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Branding Transformation Through Social Media and Co-creation: Lessons from Marriott International

Sharon Nyangwe^(✉) and Dimitrios Buhalis

Department of Tourism and Hospitality, Faculty of Management,
Bournemouth University, Poole, UK
ssnyangwe@yahoo.com, dbuhalis@bournemouth.ac.uk

Abstract. Branding has shifted from brand as a resource owned by the firm to brand as a collaborative activity co-created by the firm and its stakeholders. Using a single case study approach, this paper uses Marriott Hotels International, to explore how Web 2.0 has transformed the landscape of brand management. It aims to uncover how co-creation of brand value is being carried out between companies and consumers through social media. Wide-ranging secondary research data was reviewed and semi-structured interviews were conducted with Marriott managers. Findings suggest that past marketing and branding mantras of consistency and control are no longer relevant. Companies can co-create brand value by adopting a strategy that incorporates brand communities, brand stories and influencers in the co-creation of their brand narrative, in real time. This study contributes to furthering the understanding of branding theory and practice in the age of Web 2.0 and will be useful to managers in formulating future branding strategies and building their competitiveness.

Keywords: Branding · Value co-creation · Social media

1 Introduction

Brands are among the most valuable assets that a firm possesses. Branding research has expanded from consumer goods to services and include concepts such as relationships, services and the internet (Christodoulides, 2008). Establishing relationships with consumers has been accompanied by an evident shift in the approach to branding: from customer manipulation to customer involvement; from telling and selling to communicating and sharing knowledge; and from a short term transactional approach to a longer term relational approach (Dall’Olmo Riley & de Chertonay, 2000). The 1980s–2000s literature took a largely service-centred view of branding that was intrinsically customer oriented and relational. This shift in marketing and branding, towards a greater emphasis on services and the involvement of the consumer in the process is identified by Vargo and Lusch (2004b) as the service-dominant logic (S-D logic). A major underpinning premise of S-D logic is that customers are the centre of the brand value creation process. Branding is therefore no longer merely a resource owned and provided by the firm, but a collaborative activity that is co-created by the firm and its

stakeholders (Merz et al., 2009). Co-creation is ultimately based on joint creation of value between the firm and consumers. It allows customers to co-construct a personalised service experience to suit their own context (Prahalad & Ramaswamy, 2004). This age of openness and co-creation can be attributed to a large extent to the advent of Web 2.0 and social media (Leung, Law, van Hoof & Buhalis 2013).

The emergence of the internet provided new ways of communication between firms and consumers. The democratization of media production facilitated by Web 2.0 shifted the locus of power from the firm to the collective (Berthon et al., 2012). This has revolutionized how businesses operate and has facilitated a new era of two-way communication between brands and existing and potential consumers (Sigala, 2009). Communication also extends to consumer-consumer interaction and what customers hear or read about brands from consumers or communities on social media. This has a greater impact than what brands say about themselves (Christodoulides, 2008). This new age branding is abandoning the mind-set of command and control. It embraces the participatory culture of the era that has been powered by the advent of social media. The democratisation of branding places and the value co-creation process at the forefront. This paper revises theory and concepts that can be used to inform managers how they can practically co-create brand value with consumers in this new branding landscape.

2 Literature Review

2.1 Web 2.0 and Branding

Web 2.0 tools have changed the way people search, find, read, gather, share and consume information. They have given consumers platforms to produce and publish content that directly impacts the brand (Tiago & Verissimo, 2014). Social media has repositioned the balance of power and levelled the high degree of control that brand managers had in creating brand value and has made consumers equal players in the network (Peters et al., 2013). Social media has altered the conversation between brands and consumers from a broadcast media monologue into a social media dialogue. Customers are transformed from mere brand consumers into content producers and brand evaluators. The traditional system of top down control in branding has shifted and brand managers have realised that *a brand is no longer what they tell consumers it is, it is what consumers tell each other it is* (Gensler et al., 2013). Social-media based conversations have begun to occur outside the managers' direct influence.

Creative consumers can now renegotiate, alter and fragment the narrative of the brand with the influence of their personal experience and opinions (Kohli et al., 2015). They do this through discussions about the product or service offering, through reviews or evaluations and through consumer created advertising videos or images, all of which increasingly determines brand value and proposition. Social media hence has narrowed the gap between stakeholder brand perception and the brand promise made by the organization. It is increasingly apparent that brand managers cannot maintain control over every aspect of the brand (Balmer, 2012). The focus has shifted towards co-creation of brand value and how managers can guide, influence and inspire consumers to co-create brand meaning (Haarhoof and Kleyn, 2012).

2.2 Value Co-creation: The Shift of Value Production

This paper considers value creation from the service dominant logic perspective of value-in-use for consumers. It can be defined as the customer's experiential perception of the value-in-use that is derived from usage of resources or from a mental state (Gronroos, 2008). Traditionally the concept of value creation was based on a company centric view, where the firm played a unilateral role in creating value. As consumers have become more informed, connected and empowered, the roles of production and consumption of value have converged and the focus of value creation has shifted to consumer-company interaction (Prahalad & Ramaswamy, 2004). Quality interactions that allow consumers to co-create unique, personalised experiences with the company have been identified as the key factor in value co-creation and as sources of competitive advantage. Prahalad and Ramaswamy (2004) identified 4 building blocks that facilitate these quality interactions namely, dialogue, access, risk-benefits and transparency. Hatch and Schultz (2010) expand on these 4 building blocks and explain how they present opportunities for brand value co-creation. Dialogue creates multiple inputs to a brand and transparency gives companies more knowledge of their stakeholders.

Also in support of quality interactions as a building block of value co-creation, Gronroos (2011) explained that companies, when performing a service, gain opportunities to become co-creators of value with their customers. From an S-D logic perspective this is only possible if direct interaction between the service provider and the consumer exists. There are two components of value co-creation that emerge from the literature, namely: value-in-use and co-production. Value-in use is based on the premise that firms can only offer services as a value proposition but value realisation ultimately depends on the customer's participation and determination of value during the consumption process (Prahalad & Ramaswamy, 2004). This is in support of S-D logic which posits that value is uniquely determined by the beneficiary (Vargo & Lusch, 2004a). The second component of value co-creation is co-production. This refers to participation by consumers in the creation of the core offering through shared production, co-design and shared innovation. Lusch and Vargo (2006) argued that co-production goes beyond customer participation in production. Instead it places the customer at the same level of importance as the firm because ultimately no value exists without customers incorporating the firm's value proposition into their own lives (Payne et al., 2009).

2.3 The Co-created Brand: The Shift of Power

A recurring proposition in branding literature is that brand value is co-created through network relationships and social interactions among multiple stakeholders (Merz et al., 2009). Earliest research on brand value co-creation was presented by Van Durme et al. (2003) and integrated a 'three promises' value framework into a brand equity model that explains triadic brand relationships. His brand relationship pyramid illustrates how the brand, the company and the employees make, enable and keep promises with the consumer towards value co-creation. In support of the promise framework, Helm and Jones (2010) developed a value co-creation cyclic model which extends the value chain and makes recommendations on how the co-created brand should be governed. The

model draws attention to the value captured from delivering on a meaningful brand promise and asserts that in a co-creation context, resources only generate value if the consumer perceives the experience to be superior. Firms need to adopt an outward looking view that sets success criteria, incorporates customer expectations and places customers in the centre of the value co-creation process (Helm and Jones, 2010). There are other stakeholders besides consumers involved in the co-creation process. For instance, Brodie et al. (2006) developed the service brand-relationship-value (SBRV) triangle aiming to address the limitations by incorporating network relationships between the brand and other stakeholders. Igeslias et al. (2013) presented an organic view of the brand (OVV) from a service dominant logic, arguing that brands are organic entities because of stakeholder involvement in the value creation process. The concept of OVV challenges the traditional value propositions, supporting the argument of S-D logic, that value is co-created with the consumer in a fluid space. According to this logic, customer interaction with the brand and its employees and the value-in-use of the service rendered, plays an instrumental role in the overall experience and consequently the creation of brand value (Berry, 2000; Gronroos, 2011). Despite its significant contribution to brand value co-creation theory, the SBRV model focuses solely on the employee-stakeholder interaction as a source of creating brand meaning and experience, but does not expand on other sources of meaning and value creation (Dall'Olmo Riley & de Chertonay, 2000). Nevertheless, Payne et al. (2009) introduces a model that overcomes some of those limitations, integrating the processes of value co-creation, interactions, experiences and relationships whilst incorporating other sources of brand knowledge and value creation such as social trends and brand communities.

2.4 Mediums of Brand Value Co-creation

Storytelling is essential in communicating brand values and establishing an emotional connection (Woodside, 2010). Brand stories emerging between the firm and the consumer are vital in the co-creation of brand value. The advent of social media has resulted in brand managers losing presiding control as authors of their brand stories. Instead empowered consumers gain an important voice in the narrative of the brand (Gensler et al., 2013). Consumer-generated brand stories told on social media have a greater impact on the brand than offline stories. They optimize use of social networks, are digital, accessible, real-time, dynamic and more trusted as they are seen as authentic (Malthouse et al., 2010). Firms have to consider consumers as active co-creators of brand meaning and find a way to successfully co-ordinate brand narratives into one cohesive and compelling brand story. Firm generated brand stories create and strengthen relationships by providing a theme for conversations between firms and consumers. These conversations facilitate co-creation by allowing consumers to integrate their own brand-related experiences with the firm's brand narrative thereby co-constructing brand meaning and identity (Gensler et al., 2013). The evolution of branding towards a service dominant logic highlights the need to focus attention on integrating the role of consumers and other stakeholders in the process of brand value co-creation. Brand community researchers were among the first to focus on the role of the collective consumer in co-creating brand value, they perform several functions that

facilitate co-creation. They share information which increases brand transparency and provide social structures that provide access with lower entrance barriers, setting up dialogues between the brand and their consumers (Muniz & O'Guinn 2001). Schau et al., (2009) identified brand community practices that contribute to value creation such as community engagement and social networking; creating cultural capital for members, which the brand can capitalize on. Brand communities are arguably of more value to the brand. They have a strong sense of attachment and their membership is purposeful and stable, as opposed to individual consumers who interact with the brand more casually and are non-committal (Algesheimer, Dholakia & Herrmann, 2005).

3 Methodology

Despite the emerging role of social media, there is limited research on *how* brands can co-create value online. This research aims to explore how brand value can be co-created by the firm and their consumers through the vehicle of social media. This study is a qualitative inquiry, which utilized a combination of secondary and primary data, in a single case study approach of Marriott Hotels International. The study considers brand value co-creation from the firm's perspective. The secondary data was gathered from academic journals, textbooks and documentation from online sources including press releases and Marriott's website. Marriott's social media pages were also reviewed to determine the relevance of Marriott as a case firm. The social media pages used were Marriott's Instagram, Twitter and Snapchat during the period 2015–2017. The primary data was gathered from 9 semi-structured in-depth interviews of Marriott brand marketing and social media managers, as well as from observation of the Marriott MLive studio operations. Marriott International was selected because it is an inherently interesting case that is at the forefront of innovation in social media management and best practice in hospitality management. A study by Hospitality Net (2016) which ranked 50 hotel brands by value ranked Marriott at number 2. They named the company the world's most valuable hotel brand portfolio with a brand value of US\$5.3 billion. The company is also a pioneer in innovative practices. For example MLive social media content studios were created to monitor social media activity and generate social engagement. Marriott is unique in that it is the single largest hospitality brand and with the recent acquisition of Starwood in 2016 is now managing a portfolio of over 30 brands.

The study used a purposive sampling method and targeted 9 Marriott senior executives with brand marketing and/or social media expertise as well as exposure to the company's marketing and branding strategies and/or interaction with consumers on social media. The initial semi-structured interview questions were divided into two sections to explore *how* value is co-created and *who* co-creates value on Marriott's social media networks. The interviews were iterative in design, and the questions asked were progressively refined and adapted from one interview to the next to allow for new angles and emerging themes to be incorporated. The study also conducted informal direct observation of the Marriott MLive studio at the corporate headquarters which included a tour of the MLive studio and a detailed explanation of the social media monitoring tools in use. The data analysis was conducted manually because the

multiple methods of data collection captured the data in different formats and allowed the researcher to be able to conduct a more in depth manual analysis. Content analysis was conducted to explore the data in depth and to identify the recurring themes (Yin, 2014). This involved an initial descriptive coding process which assigned labels that summarized the topic of each passage of qualitative data under review. The labels were assigned from the data collected from the transcribed interviews, from field notes of the direct observations and from online documentation. These labels provided an inventory of recurring topics that were used to organize the data into the emergent themes. The findings from the different data sets were triangulated to identify the convergence and to synthesise the findings with reference to theoretical propositions identified in the literature review (Denzin & Lincoln, 2011).

4 Results

There were 4 themes that emerged from the content analysis, namely: brand communities, brand stories, influence and presence. The themes were categorised and data was synthesised to similar propositions (Ritchie et al., 2014).

4.1 Theme 1—Brand Communities

There is a general consensus in the literature that brand value emerges from stakeholder engagement with the company, and not just between the company and individual consumers (Merz et al., 2009). Brand value co-creation is not just based on consumer-brand interaction but also on consumer-stakeholder interaction and consumer-consumer interaction. All these interactions between stakeholders is what constitutes brand communities. Through documentation, interviews and direct observation, the brand community for Marriott was identified as the Marriott Insiders. The analysis supports the assertion by Gensler et al., (2013) that a brand is no longer what managers tell consumers it is; it is what the consumers tell each other it is.

... We have a community called the Marriott Insiders...we go to them and discuss products, discuss innovations and ask them for their feedback, and they interact with each other... about their own experiences...it's an opportunity for us to tell them, hey we are doing an enhancement on the loyalty program, here is what we are trying to do and get their feedback, directly from them. And this is how you stay connected... (Interviewee 2).

[The community] enables us to engage with people who are already interested in our brands, and target them...communities have helped us the most in being the 'voice' of our hotels and brands..., humanizing us and making it easy for communication to be two-way (Interviewee 8).

4.2 Theme 2—Influence

A recurring theme among the interviews was the brand value co-creation potential that came from leveraging social media influencers. Social media is about building meaningful relationships and enabling lasting conversations. Social media influencers provide a gateway to that engagement (Booth & Matic, 2011). Marriott is achieving this in two ways: by actively inviting influencers to co-create content and by

capitalising on content already created by influencers who are a ‘brand fit’. One way Marriott is actively engaging influencers is through the Snapchat campaign geared towards reaching younger audiences. Marriott invited four influencers to participate in a 3 month campaign entitled ‘Six Days, Seven Nights’ which allowed viewers to explore new destinations through the lenses of top social media influencers.

The majority of brands are using Snapchat to push out ads, we’re actually partnering with influencers to co-create content...Our overall strategy is first content, then community...But ultimately our goal is giving consumers what they want, and they will in turn give value back to us (Marriott 2017).

By equipping these influencers with the tools to engage in multiple way conversations, Marriott creates several touch points where they can co-create value; with their existing and potential customers, employees and other stakeholders. Marriott co-create brand value by initiating the conversations with different members of their network and capitalising on the social relationships that consumers have with each other, the influencers and the brand. Influencers are characterised by the number of friends and followers they have. What makes them truly valuable is how many extended or indirect connections they have and how relevant they are to the brand (Booth & Matic, 2011). Although the impact of utilising influencers is far reaching, interviewees pointed the cost of engaging with influencers out that expect to be financially compensated in kind and money. There was a consensus that engaging with these influencers in a more organic way had greater overall benefits. Influencers are a key player in the value co-creation as they attract existing and potential customers into the brand conversation. They also have influence in terms of shaping brand personality and identity in the minds of the consumers and other stakeholders.

4.3 Theme 3—Brand Stories

Storytelling is essential in communicating brand values and establishing an emotional connection with consumers (Woodside, 2010). There are different strategies that can be used in achieving this. Marriott has decided to play the consumers game and gain cultural resonance by fitting in their cultural environment seamlessly (Gensler et al., 2013). Throughout the interview process, one co-created brand story that was frequently mentioned was that of Nick Johnson, the Pokemon Go enthusiast who was on a mission to be the first person to collect all 151 Pokemons as part of a viral video game app craze. Marriott decided to sponsor the remainder of Nick’s journey around the world to catch the remaining 3 Pokemons to complete his quest to ‘catch em all’.

Partnering with Nick was such a natural fit for Marriott Rewards because it’s all about giving members the chance to pursue what they love through travel... We’re so excited to help Nick live out his dream as he travels from country to country and shares his story (Shorty Awards 2017).

As asserted by Lund et al., (2017), memorable and entertaining stories can break down the barriers to social networks and allow brands access to engage with their audience and influence the brand. Marriott achieved this by becoming part of the social conversation with their audience and aligning their brand with a relevant and entertaining story that resonated with their consumers. Marriott’s involvement in Nick’s ‘The

Pokemon Go' quest was such a success because they allowed him to authentically tell his own story.

"It's all about sharing stories people already have a connection to" (Interviewee 3) "Keeping Nick at the centre of the story and Marriott created a more organic, authentic, and relevant campaign for our audience, while connecting Marriott's Portfolio message of personal fulfilment through travel" (Shorty Awards 2017).

This supports the literature on value co-creation through the integration of firm provided resources with other private and public resources (Vargo & Lusch, 2004a). Marriott used their Marriott Rewards program to spearhead the campaign and Nick's story corroborated the narrative of the Marriott Rewards 'story'. This is that Marriott rewards enables its members to pursue their passions through travel. By keeping Nick at the centre of the story and focusing on his passions, Marriott maintained the authenticity of the story and gained more engagement and reach, than if they had inserted excessive brand related content. Branding literature emphasises that the authenticity of a brand's story allows it to trigger its persuasive power (Gensler et al., 2013). This sentiment was echoed during the interviews:

You know our generation or the generation we work with, they can see an ad from a mile away and they can see content that is fake but what they appreciate is real authentic content (Interviewee 1).

4.4 Theme 4—Presence

Kietzmann et al., (2011) identified presence as one of the 6 building blocks of social media used by firms to build relationships and engage with their consumers and this resonated strongly from the data collected. Many of the managers interviewed agree with the need to build strong relationships with their consumers to build value. The data collected revealed that an important aspect of that relationship is being present, visible and available to guests in real-time as expressed by Interviewee 2:

There is definitely a lot of benefit of interacting in real-time with the guests posts to really enhance their experience...and surprise and delight them...Through posting they are showing their intention of starting a conversation with the brand so we are there at this moment to engage with them and to be attentive to their needs and to make their experience even better (Interviewee 2).

This statement supports the assertion of S-D logic that value co-creation from a service perspective is determined not through value-in-exchange but rather through the customers' perceived value-in-use and hence a greater focus on the relationship between the firm and their customers (Merz et al., 2009). Therefore value gained from a service interaction with the brand in real time has a greater impact because the benefits are experienced during consumption of the service. The major tool that Marriott has been using to maintain a strong brand presence is their MLive real time content studios whose mission is to tap into real time trends that are relevant to the brand. During the direct observation of the MLive Hub, the manager demonstrated the social media monitoring tools used to track conversations, trends, global performance and brand reputation on the different social media platforms. Marriott have teamed with the HYP3R, a real-time location based engagement tool to target social media users who

are on the move using the HYP3R geo-fencing technology (Samuely, 2017). Multiple screens tracking real time activity were observed at the Mlive Hub and an explanation given of how the social media managers in the hub track activity on various platforms.

...We really have an always on approach across the globe...24-hour coverage of ...anything that is happening in the world, attacks, events, incidents...things to celebrate... (Interviewee 2).

This real-time presence and always-on strategy adds value for customers from both an engagement and a customer service perspective, as explained by Interviewee 9.

Customer service has always been about connecting businesses with customers, and social media facilitates these relationships in a natural manner that's conducive to timely assistance. Marriott is now better equipped to handle more customer issues with the help of social media, making the process faster and easier for everyone involved (Interviewee 9).

The way that customers perceive the responses they receive from Marriott social media teams has a major impact on the customers involved and the quality of the engagement. It also has far reaching implications, particularly if the interaction is considered to be a negative one, as most of the conversations are happening in the public and stay online forever. This highlights the role of employees in brand value co-creation and the need to have empathy and use personalization and contextualization in customer care (Buhalis and Foerste 2015; Neuhofer, Buhalis, Ladkin, 2015). Dall'Olmo Riley & de Chertonay, (2000) argued that the brand represents vision and culture of the company and that employees are responsible for shaping and representing that culture by reinforcing the brand image and brand promise at all points of contact with the customer thereby also making them co-creators of brand value. Employees are also responsible for managing the various social layers of customer-to-customer value co-creation (Rihova, Buhalis Moital, Gouthro, 2013). Social media equips these employees with the tools to change a potentially negative perception of the brand for a customer who has had a bad experience and seeks resolution from the firm online. Consequently, the consumer's perceptions of how well the service was performed is greatly influenced by the process of delivery. This includes the holistic interactions with the brand before, during and after the co-creation and consumption of the service and the extent to which the customer feels that the promises made have been fulfilled and value created (Dall'Olmo Riley & de Chertonay, 2000). This also influences the competitiveness and the profitability of organisations (Viglia, Minazzi, Buhalis, 2016).

The goal is about the quality of the experience of the guest (Interviewee 2).

The literature is in support of Marriott's approach to real-time service. Prahalad and Ramaswamy (2004) proposed that quality interactions that allow consumers to co-create unique, personalised experiences with the company have been identified as the key factor in value co-creation and acquiring new sources of competitive advantage. Marriott's 'always on' approach is not always a positive thing for all customers however. There are some social media monitoring tools that border on being intrusive and may have an adverse effect. An example is the MPlace app which uses beacons to provide location-based discounted offers. This tool adds limited brand value to customers and studies have shown that engagement with firm provided promotions is lower and can lead to negative perceptions of the brand (Gensler et al., 2013). During

the direct observation of the MLive hub it was apparent that Marriott was aware of this and had a strategy to ensure that they engaged with their consumers in a way that was organic with limited focus on promotional content.

5 Conclusion

The emergence of social media has shifted the locus of power from the firm to the collective. Managers increasingly appreciate that brands emerge organically from the conversations and user generated content that emerges in the marketplace. Brands are becoming extremely dynamic and no single actor can determine them but every actor can influence their co-creation. Brand managers need to become participatory and listen, observe and converse with their stakeholder's (Ind, 2014). Brand communities are a driving force in co-creating value through innovation and co-production and strengthening consumer-consumer relationships. Brand communities eventually become carriers of brand meaning, instead of followers of the brand proposition presented by the firm (Muniz and O'Guinn, 2001) as shown in the high level of interaction with Marriott's brand community and their commitment to supporting Marriott's social media campaigns. Brand communities revealed who co-creates brand value and the emergent theme of brand stories demonstrate how this brand value is co-created. Marriott has achieved this by getting involved in stories that people already have a connection with and aligning this with their brand objectives. Entertainment is a key motivator for consumers to engage with, contribute and create content (Gensler et al., 2013). Influencers clearly drive the co-creation of brand value and Booth and Matic (2011) stated that the increasing power of social media influencers means that brands need to ensure their social media strategies include analysing and evaluating the potential of engaging with influential contributors. Marriott has done this by leveraging the right social media influencers on the right platforms to engage the right kind of consumers. The final theme of presence revealed the extent of the impact that social media have on brand management. This is evidenced by Marriott's constant presence on social media, through tools like the MLive studios, which is instrumental in achieving their customer service strategy of 'surprise and delight' and their engagement strategy to be 'always on'. This study supports the stakeholder focus of branding which defines branding in the context of value creation as; organic entities built through social processes where value is conversationally co-created by multiple stakeholders in a fluid space (Iglesias, 2013).

In the new social media powered branding era managers need to accept the loss of control and be willing to share with consumers and other stakeholders. The democratisation of branding has repositioned consumers and brand managers as equal actors and co-authors of the brand narrative (Berthon et al., 2012). Social media must take on the dual task of creating brand stories that establish an emotional connection with consumers but also participate and share entertaining brand stories that are being told by their network. While managers need to direct the brand, they must also be willing to accept that brand meaning is constantly co-created and evolves with many other stakeholders (Gensler et al., 2013). Marketing managers must pay greater attention to developing a long-term customer orientation through mutual exchange and

fulfilment of promises (Gronroos, 1990). This mutual exchange can be achieved by a strategic mix of user generated content and firm brand stories. Managers also need to engage with influencers on social media and focus on how they can play a more active role either as a moderator or a participant in the content generated by these influencers. Ultimately managers will need to develop a new leadership style that is humble, open and participatory (Iglesias et al., 2013) and engage in bottom up brand co-creation.

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Linking Technological Frames to Social Media Implementation—An International Study of Hotels

Karin Högberg^(✉) and Anna Karin Olsson

University West, Trollhättan, Sweden
{karin.hogberg,anna-karin.olsson}@hv.se

Abstract. Social media have transformed the hospitality and tourism industry and affected how customers interact and take decisions, but have also affected organisations' business strategies and processes. Prior research has shown that a key understanding of IT implementation in organisations is how individuals adopt, use and make sense of technologies. Despite the increased use of social media in hotel organisations there is a research gap and little is known about how individuals' sense-making affects organisational use over time. The aim of the present study is to contribute to the research field by using Orlikowski and Gash's (ACM Trans Inf Syst 12(2):174–207, 1994) framework of Technological Frames. The interpretative case study follows social media use in 14 hotel organisations within an international hotel chain in seven European countries over four years. The study finds incongruence and lack of dominant frames and discusses the related organisational implications.

Keywords: Technological frames · Social media · Hotel organisations
Case study

1 Introduction

Social media have had a great impact on people's social lives and how they communicate, interact and consume online (Kaplan and Haenlein, 2010; Aral et al., 2013). Furthermore, social media have also changed how customers acquire and share information about firms (Minazzi, 2015), and therefore the way organizations communicate with customers and provide services (Aral et al., 2013; Sigala and Gretzel, 2017). The concept of social media refers to a large range of technologies such as social networks like Facebook or LinkedIn. Kaplan and Haenlein (2010: 61) define social media as 'a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content'. The challenge of implementing social media in organisational work-practices has been highlighted as an important research venue that needs further investigation (Aral et al., 2013). Social media were originally designed as online social networks for personal use and not to function in organizational settings as organizational tools (Friesen, 2010; Treem et al., 2015). Researchers argue that social media have come to blur boundaries between people's private and professional lives (Kreiner et al., 2009).

Also, there is a need for more knowledge on how organizations use social media and the impact social media use has on workplace practices and processes (Aral et al., 2013; van Osch and Coursaris, 2013). Social media have transformed industries (Aral et al., 2013) which is particularly evident in the hospitality and tourism industry (Sigala and Gretzel, 2017). For example, social media have changed how the industry handles marketing and delivers services (Minazzi, 2015). There has also been a shift in power from the industry to customers in that by sharing service experiences, and posting online reviews, the relationship between the industry and its customers has been made more transparent (Sigala and Gretzel, 2017; Qi and Ning, 2017). The empirical setting of hotel organisations was chosen due to these changes but also because even though social media implementation is rapidly increasing in hotel organisations, compared to other industries use of social media has been limited (Sigala and Gretzel, 2012; Leue et al., 2013), e.g. due to the hotels' fear of losing control over their brand reputation (Sigala and Gretzel, 2012). Researchers point out a research gap since much research in hospitality has focused on the customer, rather than the organisational perspective (Munar, 2012; Sigala and Gretzel, 2012). Research with an organisational perspective remains scarce (Garrido-Moreno and Lockett, 2016).

It is widely recognized that individuals' interpretation of Information Technology (IT) in workplace settings is relevant to study since how they use and make sense of technology is key to understanding organisational implementation and use of new technologies (Weick, 1990). As individuals interact with a new technology they create individual technological frames, which is, assumptions and anticipations of how the new technology can be used and what it can do (Orlikowski and Gash, 1994). The framework of technological frames has been applied in many studies to examine the usage of IT in organisations, yet little is known about the individual technological frames of social media in organisational settings (Treem et al., 2015). Against this background the present paper aims to respond to the identified research gaps by studying social media implementation within an international hotel chain and to identify the effect technological frames of employees have on the organisational use of social media. Furthermore, the purpose is to identify the role of technological frames held by hotel employees and to study what effects individual frames have on organisational use of social media over time. Orlikowski and Gash's (1994) framework of technological frames is used as a theoretical lens to understand how employees make sense of technology, here social media. The research questions are as follows: What are the technological frames of social media of managers and employees in hotel organisations? How do technological frames affect the organisational use of social media over time? The present study examines these questions through a longitudinal case study of social media implementation in 14 hotels in seven European countries in an international hotel chain.

2 Social Media in Hospitality

With the introduction of social media the hospitality industry faces new challenges that call for research. A large emphasis has been put on the increased use of online reviews and the importance of User Generated Content has been widely analysed. For example, McCarthy et al. (2010) explored the influence of social media on customer preferences

in the hotel industry. Silveira-Chaves et al. (2012) investigated how hotels respond to online reviews on sites like TripAdvisor, while Sparks and Browning (2011) discovered that customers determined what hotel to book depending on ratings in online reviews. Varkaris et al. (2017) explored how social media influence how customer search for select hotels. Crotts et al. (2009) studied the effects of negative online reviews, and how organizations respond to online reviews was investigated by Qi and Ning (2017). Ayeh et al. (2013), and Xie et al. (2011) investigated perceived credibility of online reviews. Researchers have also investigated how hotel organisations use social media. For example, Chan and Guillet (2011) examined the level to which social media was used in the Hong Kong hotel industry and concluded that Facebook and Twitter were the most used tools, and that the studied hotels poorly implemented social media to learn about customers' needs. Haro de Rosario et al. (2013) analysed the use of social media by the world's 50 largest hotel chains, and discovered that the size and age of the hotel chain influenced the use of social media. Escobar-Rodríguez and Carvajal-Trujillo (2013) observed Spanish hotel chains and explored the relationship between the size of the hotel and their social media strategy, and found that a majority of the hotels had a high social media presence and interaction with customers. Leue et al. (2013) evaluated the use of social networks as a marketing tool in luxury hotels in the UK.

3 Theoretical Framework: Technological Frames

The theoretical framework of Technological Frames was introduced by Orlikowski and Gash, referring to frames as social constructs that include 'assumptions, knowledge, and expectations, expressed symbolically through language, visual images, metaphors, and stories' (1994: 175). They suggested that frames exist on individual and group levels, are flexible in structure and content, and may shift over time. Different individuals can hold dissimilar views of the purpose of technology, and technology can be interpreted and used in different ways (Pinch and Bijker, 1984; Treem et al., 2015). Shared frames have been shown to stem from education, work experience, interactions within relevant social groups (Orlikowski and Gash, 1994), prior life experiences and knowledge, and the present context of an employee's job roles, responsibilities and work context, including firm and industry context. Orlikowski and Gash (1994) point out that individuals within social groups tend to create shared frames due to their use and interaction with technology within a given context, e.g. a workplace. Shared frames or shared understanding of how the information system will support the organisational strategy is crucial to how the implementation will turn out. When using new technology, individuals go through a sense-making process, developing frames that shape their continued use of the technology (Orlikowski and Gash, 1994). The sense-making process is not specific to technology, but also includes how technology is applied in a specific context (Orlikowski and Gash, 1994). Accordingly, technological frames of social media are related to individuals' professional and private contexts and the blurred border of overlapping contexts (Olesen, 2012; Kreiner et al., 2009), thus individuals may be 'bringing technological frames to work' (Treem et al., 2015: 396). Orlikowski and Gash (1994) view technological frames as covering three domains:

(1) the nature of technology refers to the individual's interpretation of technology and understanding of its functionality; (2) technology strategy refers to users' views of why the organisation needs to implement the technology; and (3) technology in use refers to the individual's understanding of how the technology can be used on a day-to-day basis and possible consequences related to such use.

Orlikowski and Gash (1994) use the term 'congruence' to describe when individuals and groups have the same technological frames. Incongruence suggests differences in expectations, knowledge, and assumptions. Earlier research suggests that incongruence can lead to conflicts among groups and that these groups can either negotiate or resolve these conflicts (Davidson, 2006). Incongruence among individuals and groups may create difficulties and conflicts in the process of adopting and using technologies in organisations. Frame inconsistency within groups can also affect the implementation process. Many studies have focused on the effects of congruence in relation to the implementation of new ICT in organisations: Managers' technological frames related to innovation of electronic market implementation (Mishra and Agarwal, 2010); how IT implementation affects organisational change (Davidson, 2006); how frames affect organisational changes and decisions (Ovaska et al., 2005); and employee participation in a design process (Menold, 2009). Furthermore, the technological frames have also been applied in several studies of group and individual usage and understanding of social media: The relationship between social networks and societal change with focus on informal knowledge sharing with social media in organisations (Hosein and Hosein, 2013); and the adoption of Enterprise Social Media (Figueroa and Cranefield, 2012; Treem et al., 2015).

4 Methodology

4.1 The Case Study and Data Collection

The study was conducted in an international hotel chain. The hotel chain started to use social media in 2013, hence all the hotels started using social media at the same time. Since individual technological frames are implicit, an interpretative qualitative method was used to uncover the essential beliefs and views regarding social media. Interpretative studies aim to understand a specific phenomenon through how individuals give it meaning (Bryman and Bell, 2015). Furthermore, the study is also designed as a longitudinal case study as data was collected over a period of four years. Also, the activity of making sense of new technology and understanding its usefulness changes over time (Davidson, 2006; Olesen, 2012). While four years is a relatively short period of time, the social media landscape changes quickly, and a longitudinal design was necessary in order to grasp the speed of development and usage of the new technology. In the present paper, the hotel chain represents a single case with embedded cases, represented by the different hotels in the study (Yin, 2003). A case study design is appropriate when investigating a 'contemporary phenomenon within its real-life context' (Yin, 2003: 13), a key strength when seeking to answer questions such as how and why (Yin, 2003). Semi-structured interviews with hotel employees was the main source of data. The interviews were all conducted by the first author and collected over a

four-year period (2013–2017) and a total of 31 interviews, including eight follow-up interviews (described below) at 14 hotels in seven European countries (Sweden, Norway, Denmark, Finland, France, the Netherlands and Italy) were conducted. The interviews lasted 60–90 min and a majority of them were performed face to face. The respondents are all employees in hotels within the hotel chain and responsible for social media use at their respective hotel and have different titles such as marketing manager or sales manager. Furthermore, interviews have also been conducted with the hotel chain's European social media manager and two e-commerce managers. The researchers followed a semi-structured interview procedure (Kvale, 1996) to ask questions about each respondent's use and perceptions of social media in the hotel organisations, but also about their private social media use. The questions were formulated to get insight into their work situation, use and perception of social media. The follow-up interviews were conducted approximately two years after the first interviews (cf. Treem et al., 2015; Olesen, 2012; Davidson, 2006).

Longitudinal studies often have problems with sample attrition, for example, employees change jobs or organisations go out of business (Bryman and Bell, 2015). This has also been an element that affected the design of this study, however the aim was not to do follow-up interviews with all 23 respondents but to focus on a smaller sample (cf. Blegind Jensen and Aanestad, 2007). It should be noted however that the sample of the follow-up interviews was highly affected by which respondents were still working at their positions at the hotels. The hotel industry has high employee turnover and as many as seven of the respondents interviewed in the first round had changed positions or workplace a year after the first interview. The follow-up interviews were carried out in order to understand and analyse how the hotels had used social media over time and how employees' and managers' frames affected the use. The follow-up interviews focused on the respondents' ongoing usage of organisational social media and reactions related to management's ongoing adjustments and changes in policy and control of social media within the hotel chain (cf. Davidson and Pai, 2004). The interview guide was developed based on the previous interviews and continuous online observations of the hotels' social media activities since the first round of interviews.

Furthermore, written material such as social media guidelines were a source of empirical data along with field notes from observations at the hotels and continuous following of social media content and websites during 2013–2017. Also, participatory observations (Bryman and Bell, 2015) were made during the interviews in order to get insights into the respondent's daily work practices related to social media. The notes taken before and after the interviews are full field notes, i.e., detailed notes with information about persons, events and surroundings (Lofland and Lofland, 2006), e.g. customer information at the hotels about what hashtags to use, posts on social media, both controlled by the hotels and others such as TripAdvisor. The field notes and social media content functioned as background information and a validation of data at the follow-up interviews in order to grasp social media use over time. The validity of the study was thus enhanced by using multiple data sources selected during a longitudinal period for studying the same phenomenon (Yin, 2003) in order to reveal the frames of the respondents through language, visual images, metaphors, and stories with focus on their knowledge, assumptions, and expectations of social media (cf. Orlikowski and Gash, 1994; Davidson and Pai, 2004).

4.2 Analysis of Data

The analysis mainly builds on the interview transcripts and also to some degree on the social media observations and field notes. Since the study is longitudinal, a timeline was made in order to emphasize the different phases and events that took place during the four years. An analysis of technological frames requires eliciting an individual's knowledge, assumptions, and expectations, and the semi-structured interviews aimed to reveal these frames through language, visual images, metaphors, and stories (Orlikowski and Gash, 1994). By focusing on the respondents' stories, metaphors and expressions, and sense-making related to social media, an interpretation of their frames was developed (Davidson and Pai, 2004). In order to understand the respondents' interpretations of social media and to identify their technological frames (Klein and Myers, 1999; Orlikowski and Gash, 1994) the hermeneutic circle was useful (Cole and Avison, 2007). The hermeneutic circle emphasizes a spiral understanding of the data by focusing on the meanings of the parts and then linking them with the whole in an integrative manner (Klein and Myers, 1999). In doing so, an understanding of the studied phenomena, in this case identifying the respondent's frames of social media, and linking them to actual use could be achieved. The first step in the hermeneutic analysis was to read the transcripts and to get insight into the context of the hotel organisations and hotel chain. Then, by going back and forth through the data, a sense-making of the data was created, using open coding processes (Cole and Avison, 2007). Also, a secondary thematisation was conducted by using the qualitative data analysis software NVivo (Bazeley, 2013). This step was also important when trying to understand where the respondents had created their frames, and find possible dominant frames (Orlikowski and Gash, 1994). Furthermore, by linking the frames to actual use (technology in use) of social media in the organisations the second research question could be answered. During the entire hermeneutic analytical circle the data sources from online observations, participatory observations, and notes were used in order to validate and create more understanding of the social media use and the respondent's frames.

5 Findings and Discussion

5.1 Hotel Chain Management Frames of Social Media

The hotel chain decided to use social media in 2013, which became the starting point for all hotels in the chain. A European social media manager was hired at the company headquarters to develop guidelines for the entire chain. Furthermore, an e-commerce manager was hired to offer training in social media activities. At the starting point the hotel chain's policy was that every single hotel was in charge of its own social media usage and activities, i.e., they chose what social media channels they wanted to be active in. However, the hotel chain had policies, does and don'ts, and sent out general information and marketing material about the chain that the hotels were expected to publish in social media channels along with the material they produced themselves. All of the hotels use Facebook and some use Twitter and Instagram. While free to choose what social media they wanted to be active in, they were encouraged by headquarters to

use Facebook and Instagram. The social media manager illustrates the hotel chain's social media vision as follows:

We should use social media to engage in a special way with our customers. [...] We have two levels, we have brand level, that's something we can control from here, then we have the hotels and that's a little bit more difficult [to control], we have almost 400 hotels, it is actually impossible to follow up. We have training and guidelines to help the hotels and we also have marketing campaigns that we share with the hotels. And that's something we can track. We also use a tool to make measurements on different levels.

Furthermore, the social media manager explains that since social media is widely used by individuals in their private lives, hotel chain management needs to be more open-minded and flexible when creating guidelines and manuals for the individual hotels. He also emphasizes that the hotel staff often are young, know how to use social media, and are aware of the boundaries between professional and personal. The social media manager and e-commerce managers were analysed as a social group with similar frames concerning social media. The essence of their frames of social media is focused on creating and maintaining relationships with customers but also as a way of marketing the hotel chain. This relates to Orlikowski and Gash's (1994) technology strategy and technology in use. The effort of creating guidelines and offering education was analysed as an effort to create similar assumptions and knowledge on social media, that is, create similar frames (Orlikowski and Gash, 1994).

5.2 The Employees' Frames of Social Media

At an overall level, the findings show that the employees were positive towards the hotel chain's decision to adopt social media but critical that, according to some, it took too long. It was the hotel chain head management that decided to adopt and implement social media. The individuals' perception of social media usage in the workplace indicated that first of all they see that the usefulness of social media is highly connected to marketing and that they interpret the adoption of social media on the chain level as a new way of marketing the brand, but also as being reactive towards customers' questions and online reviews. Several of the employees are frustrated and express that they think that competitors are ahead of them because the hotel chain was so restrained in its social media usage. The employees vary in their reaction towards the hotel chain's decision to implement social media. Some of them are very critical that the chain waited so long to take the decision to implement social media while others think it is quite alright. One of the individuals explains his interpretation of the restraint policy from the hotel chain:

As I understand it, they [hotel chain] were afraid that it would start to sprawl, that the brand would sprawl too much. And I think that because of that they were late, they had to create some kind of standard for how and where we should be seen. That's when they hired that guy who would be responsible [social media manager], then everything was controlled. Maybe too controlled. We went from nothing to having schedules for what we should post on Facebook and Twitter and stuff like that.

The employees express congruent interpretations (Orlikowski and Gash, 1994) of why the hotel chain should use social media. They all link social media presence to keeping

up with a trend, not falling behind and being competitive, hence there is a focus on the 'need' to use social media and less emphasis on qualitative aspects of using social media. One of the employees says: *'You have to follow the trend. Social media is something you can't avoid right now'*. The guidelines provided by the hotel chain are described by the employees as focused on marketing strategies, sales, do's and don'ts, and what type of tone and words should be used in social media channels. The hotel chain sends out marketing material that the hotels are expected to use and share. Several of the employees do not approve of the social media guidelines while others think they are acceptable. There is a clearly a discrepancy when it comes to the interpreted usage of social media since all the employees are aware of the potential benefits of interacting with customers, but many of them say that there is just not enough time, hence the technology strategy does not match the technology in use (Orlikowski and Gash, 1994). Furthermore, the employees express rather negative attitudes towards the hotel chain since they feel that they have been neglected in the adoption process, that is, they wanted the hotel chain to start using social media much earlier. They are also critical towards the high level of control that they perceive that the hotel chain practices. This relates to earlier research showing that IT implementation was interpreted by employees as a control mechanism (Davidson, 2006). Many of the employees expressed a limited usage of social media in their private life while others use social media heavily. The employee states that the fact that they do or do not use social media in their private life affects what social media channels they uses in their workplace. The employees also discuss the negative aspects of social media use, e.g. the lack of privacy which is described as the main reason for not using social media in their private lives. Overall, the employees describe that being responsible for social media presence and activities in their respective organisation is laid 'on top of everything else', and that they are not given more time to focus on social media activities. Hence, this was analysed as a 'more-workload-frame' that highly affected the employee's interpretation of social media. The employees also express that they do not prioritize social media activities since other work tasks are viewed as more important, which also makes their social media presence irregular with focus on solving 'emergencies' like negative online reviews or customer complaints. Hence, the data reveals that there were different assumptions between the managers' frames of social media and the employees', creating frame incongruence between the two groups (Orlikowski and Gash, 1994; Davidson, 2006). This was for example illustrated by the conflict that arose during those four years concerning the emphasis on using social media as a traditional marketing channel. This was analysed as an illustration of the employees' frames of social media and that the managers' emphasis on marketing was contradictory, or incongruent, concerning how the employees made sense of social media (Orlikowski and Gash, 1994).

The context in which social media is used is also relevant to take into consideration. The employees have a clear focus on their individual hotel's use while the hotel chain management is eager to market the entire chain and brand, hence the incongruence. The incongruence also affected the employee's technology-in-use (Orlikowski and Gash, 1994) since some of them refused to publish marketing material in their social media channels. Interestingly, even though the employees had all worked with sales and marketing, they did not emphasize that social media should be used for this purpose,

which indicated that they were strongly affected by private social media use and did not assume that social media makes sense as a marketing tool (Orlikowski and Gash, 1994; Treem et al., 2015). The large resistance towards using social media as a marketing channel was analysed as result of the employees' frames of social media being highly affected by the use of social media outside of the organisations, in more private settings (Treem et al., 2015). Although not all of them were keen on using social media in their private lives, due to lack of interest or concern about privacy issues, they expressed strong frames of the nature of social media and its usefulness. After a couple of years the management changed their emphasis on using social media as a marketing channel.

5.3 Linking Social Media Use to Frame Incongruence and Inconsistency

The data reveals that the lack of dominant frames within the organisations persisted during the study, as did frame incongruence and frame inconsistency. During the four years the study took place, the employees' expectations of social media were still mainly focused on marketing and sales, which also indicates that the incongruence between the frames of management and employees was sustained. During the four years that the implementation process was observed, the employees expressed that they used the policies and manuals very little or not at all, which was analysed as a failure to create shared frames (Orlikowski and Gash, 1994). Also, very few of the employees used the opportunity to learn about social media in the courses arranged by the e-commerce manager. Instead they looked outside the organisational boundaries, e.g. by using PR consultants or imitating competitors when looking for 'the right way' to use social media, that is, dominant frames to lean towards and emulate (Davidson, 2006). The dominant frames did not seem to be owned by members of the studied organisations, instead they were highly affected by stakeholders' and competitors' frames of social media, and had a bigger influence on social media use, or technology in use (Orlikowski and Gash, 1994), than the managers' frames. This was analysed as an illustration of the 'newness' of social media, that is, how social media differs from other IT and ICTs implemented in organisations. During 2015 the hotel chain started to use enterprise social media (ESM) as a channel where all employees, not just those in charge of social media, can post anything they want and other hotels within the chain can use the material, or be inspired. The employees have different interpretations of this newly implemented ESM channel. Some of them are not aware that it exists while others are very positive, or in contrast, sceptical about it. One of the employees describes that he is very positive towards the implementation of EMS, since he experiences that it gives him an opportunity to practice and see how other employees use social media. On the other hand, another employee is very sceptical about it and interprets the ESM as a way of controlling and centralizing social media use.

The lack of dominant frame is arguably related to the flexible nature of social media (Treem et al., 2015), that is, there is no technical manual showing right or wrong, or no IT expert to go to. Also the data revealed a high turnover of employees that can affect the lack of dominant frames. Also, evidently the employees did not interpret the hotel chain management's knowledge of social media as worthy of emulating, that is, their frames are not dominant frames that affect and change others' frames (Orlikowski and Gash, 1994). This relates to Orlikowski and Gash's (1994) discussion that individuals

can discard knowledge that does not fit into their interpretation of what is meaningful. The follow-up interviews reveal that the employees do not prioritize social media activities since other work tasks are viewed as more important, which also makes their social media presence irregular with focus on solving ‘emergencies’ like negative online reviews or customer complaints. This was also verified by an interview with a new E-commerce manager who argued that due to an inconsistency in quality and use in the individual hotels, the hotel chain management decided to centralize social media use. In 2017, a decision was made to close down all social media channels except Facebook at each individual hotel, take away the social media responsibility from individuals at each hotel and instead have centrally placed social media managers that published social media content. The employees also describe several major managerial changes in social media directions and strategy during those four years such as implementation of enterprise social media and step-by-step increased centralization of social media. These changes are analysed as a response to both the frame incongruence between groups and frame inconsistency within groups and an effort to create congruence and a holistic technology strategy (Orlikowski and Gash, 1994). The employees also express rather negative attitudes towards the hotel chain since they feel that they were neglected in the adoption process, and are critical of the high level of control that they experience that the hotel chain now practices. One employee, a heavy user of social media in her private life, is sceptical about the decision and illustrates the change by saying: *“The hotel chain has decided that we should not have anyone responsible for social media at our hotels and that we are only allowed to use Facebook and Instagram.”* The process described above illustrates how the incongruence of frames (Orlikowski and Gash, 1994) between management and employees enhanced a need for centralization of social media in order to control and manage the social media outcome. It can be argued that the consistent frames of social media that the employees had created outside the organisational context were strong and difficult to change, and therefore the employees were unable to, or did not want to, change their perspectives on the usefulness of social media. As a result, the hotels’ use of social media was inconsistent, irregular and extremely dependent on individual employees’ interpretation of the usefulness of social media, which also can be argued to reflect the nature of social media as flexible and not designed for organisational use (Treem et al., 2015).

6 Conclusions

The present study contributes to the literature by identifying the technological frames of individuals and groups within hotel organisations in a hotel chain. The data was analysed to uncover the technological frames of groups and individuals, linking them to their actual use and sense-making (Orlikowski and Gash, 1994; Davidson, 2006). The first research question was addressed by investigating the technological frames of the hotel chain managers and employees at the different hotels over a four-year period. The employees’ interpretations of social media use in the workplace was framed as ‘more work-load’. Furthermore, the analysis revealed both frame incongruence between the groups and frame inconsistency between the groups grounded in different views of

technology strategy and technology use (Orlikowski and Gash, 1994). By uncovering and analysing the frames and answering research question one, research question two concerning organisational consequences and use of social media could be answered. The result shows that the incongruence and inconsistency of frames led to a centralization of social media use, in practice taking away the individual hotel's responsibility for social media use. The findings underpin earlier frame research by identifying incongruence between groups but also inconsistency within groups (Davidson, 2006). The empirical findings in this paper may be limited due to the case study of one hotel chain. The dynamics and employee turnover that characterize this industry furthermore limited the longitudinal study, hence it focuses on a rather small sample and we therefore encourage more research in this field.

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Technology Empowered Real-Time Service

Yeyen Sinarta^(✉) and Dimitrios Buhalis

Department of Tourism and Hospitality, Bournemouth University, Poole, UK
{i7431637, dbuhalis}@bournemouth.ac.uk

Abstract. Real-time service has gained higher importance as part of the digital competitiveness of brands. This has followed the establishment of social media as an engagement mechanism that supports consumer experience by bridging consumer expectations and brand performance in real time. The ubiquity of social media's constant connectivity has led to the increasing demand of instant gratification. Consumers not only demand brands to provide a personalised response, but also expect them to reply instantly 'now'. This exploratory research aims to identify how brands leverage social media and technology to enhance consumer experience in real-time. Data collection was conducted in two research stages. First an in-depth case study of Marriott MLive and then multiple case studies of four best-practice companies. Real-time data monitoring and engagement can support organisations to eliminate problems before they escalate, enhance customer experience and also take advantage of upselling opportunities. This study concludes with a real-time service competitive advantage conceptual framework. The findings suggest that the integration of real-time listening and monitoring in conjunction with highly contextual delivery become crucial tools for enhancing brands competitiveness.

Keywords: Real-time · Real-time service · Social media · ICTs · Technology Competitive advantage

1 Introduction

Technology has revolutionised the way brands communicate with consumers and how they engage (Del Rowe, 2016). The use of technology to enhance consumer experience may include interactive websites, social media channels or mobile applications that are monitored in real-time (Neuhofer, 2014). The emergence of social media and the proliferation of mobile technologies have sparked an increasing demand from well-informed consumers to interact in real time and to engage dynamically before, during and after the trip experience (Buhalis & Law, 2008). Consumer preferences can change in real-time depending on contextual factors such as weather or traffic conditions. Brands are increasingly expected to be able to understand these constant changes in order to be prepared to convey relevant actions to consumers in a timely manner (Del Rowe, 2016).

The dynamic and experiential nature of the travel, tourism and hospitality industries (Fotis, Buhalis, & Rossides, 2012) demand real time services more than other sectors.

There is a growing requirement to dynamically focus the service and engagement to targeted consumers, through contextualised and personalised service offerings based on the real-time intelligence. Contextual information is based both on consumer personal preferences and external factors (such as traffic, season, weather, etc.) (Buhalis & Foerste, 2015; Prahalad & Ramaswamy, 2004a).

In the highly competitive environment, only brands that can co-create exceptional consumer experiences can set themselves apart from competitors (McKinsey, 2016). However, only a few studies have attempted to examine how real-time data and agile action, based on contextual information, can create distinct value for all stakeholders and how technology, time and contextual relevancy can assist organisations to cocreate higher value experiences for the digitally savvy consumers in the marketplace (Buhalis & Foerste, 2015; Neuhofer, Buhalis, & Ladkin, 2012). This exploratory study aims to bridge the gap in the literature by exploring how social media and technology can be optimised to enhance consumer experience in real-time. The objectives of this paper are to analyse how brands perform real-time service, using social media and technology; to explore the value of real-time service for all stakeholders; and to conceptualise a comprehensive real-time service competitive advantage framework.

2 Literature Review: Real-Time Marketing

Lieb (2014) defined real-time marketing as “*the strategy and practice of responding with immediacy to external events and triggers. It’s arguably the most relevant form of marketing, achieved by listening to and/or anticipating consumer interests and needs*”. Real-time marketing as a concept has been coined in the literature over two decades ago. It has been expanded over a period of time with the basic argument that dynamic timing and flexible service offerings can lead to competitiveness (McKenna, 1995; Oliver, Roland & Sajeev, 1998; Reid, 2014; Rust & Oliver, 2000). Real-time marketing and its close relation with social media as a medium of engagement are widely discussed from a business practice perspective (Del Rowe, 2016; Econsultancy, 2015; Lieb, 2014; Scott, 2012). Real-time marketing extends both mass customisation or personalisation (e.g. conquering consumer space by focusing on the uniqueness of individual needs) and relationship marketing (e.g. conquering consumer time by fulfilling those needs as they evolve) (Rust & Oliver, 2000). Oliver, Roland, & Sajeev (1998) argued that brands should provide each consumer with products or services that are customised to their current needs, yet still hold the flexibility to adapt to the changing preferences, as well as continuously engage with each consumer and improve offerings (McKenna, 1997). However, it was not until the proliferation of social media, with Twitter and Facebook in particular, that real-time marketing was practically possible (Fotis, Buhalis, & Rossides, 2011; Hays, Page, & Buhalis, 2012). The use of social media to perform real-time marketing should be based on the understanding that the mere presence and one-way communication (pure marketing message) are not sufficient to gain success (Hamill, Stevenson, & Attard, 2012). It requires dynamic conversation with the right audience, trust from consumers as well as continuous engagement with influential consumers (Yoo & Gretzel, 2010).

2.1 Real-Time Motivation and Expectation

Real time marketing is a result of the customer expectation for real time engagement. From a travel and tourism perspective, consumers use social media to be inspired, obtain and compare information, express themselves, look for products or services features, articulate their travel-related experiences or provide inputs/outputs on their decision-making process (Buhalis & Foerste, 2015; Leung, Law, van Hoof, & Buhalis, 2013; Fotis, 2015; Xiang & Gretzel, 2010). Some examples related to these motives in the context of real-time service are shown in Table 1. Consumers have various expectations in order to improve their travel experience in different travel stages (Fotis, 2015; Neuhofer, 2014). As a result of the ubiquity of digital devices and the interactive nature of social media, consumers want their needs to be recognised and instantly gratified by brands; fulfilling these needs ‘now’ (Patel, 2014). They also expect effortless access to real-time information, personalised suggestions; alternatives on travel consumptions and instant customer service (Buhalis & Amaranggana, 2015). Social media offer a strong tool to deliver or receive messages and facilitate interaction towards instant gratification. They are therefore used by consumers to reach brands, especially during unexpected events and crisis, such as missing a flight when rearrangements are required or when contextual conditions create disruptions. Consumers expect a timely response or quick service recovery from brands shortly after contacting them through their social channels; often in contrast to overloaded call centres that are nearly impossible to reach.

Table 1. Real-time social media motives and examples (adapted from Fotis, 2015)

Social media motivations	Example of real-time service (consumer-brand) motivation	Travel stage
Search for information, look for price and availabilities, product/service features	Instead of browsing through complex information online, or waiting in the line for hours on call centres, consumer may reach brand’s social media channels directly to get specific information instantly	Before, during
Self-expression	When feeling satisfied or disappointed (variety of emotions, both positive and negative), consumers may share their feeling via social media right away, even when the activity is still happening	Before, during, after
Consumption and post-consumption evaluation	During or after the consumption of experience, consumers may share a review about their (positive/negative) experience; whether to seek acknowledgement or solution from brands, or to notify other consumers (peer-to-peer) in real-time	During, after

Consumers increasingly demand brands to have personalities just as people, and they expect brands to be able to connect with consumers authentically, whether by personalising products or services, or by engaging with them in real-time across social platforms at the right moment (Lieb, 2014). They expect that their favourite airline or hotel chain care for them, particular at a time of distress, or acknowledge back a complimentary remark. This is where brands are expected to have a good sense, show empathy and adopt an adaptive response to a rapid change of consumer needs, in order to be successful (Buhalis, 2003). The rising expectations of consumers, who increasingly participate in the experience co-creation process, rather than the consumption of a service, provide valuable insights for brands (Neuhofer, Buhalis, & Ladkin, 2013). It also gives them an opportunity to create or develop service offerings based on consumer's specific needs in real-time, as well as to deliver higher value for consumers (Sashi, 2012).

2.2 Real-Time Co-creation

Through service dominant logic the process of value creation is evolving from a product-centric approach to a consumer-centric one. This aims to provide a more personalised consumer experience, where "informed, networked, empowered consumers increasingly co-create value" with brands (Prahalad & Ramaswamy, 2004a, p. 5). Co-creation, defined as the "joint creation of value by the company and the customer" (Prahalad & Ramaswamy, 2004a, p. 8) has become a central notion in experience consumption. In the context of co-creation, it's critical to have direct interactions with consumers. Social media empower brands to co-create directly with, and among, active networked consumers through collective, collaborative and dynamic process of consumer-brand interactions; allowing role unification of both parties (Gensler, Volckner, Liu-Thompkins, & Wiertz, 2013; Neuhofer, Buhalis, & Ladkin, 2013). By understanding why, how and where consumers are actively communicating and making a decision to purchase, brands have the ability to produce greater value for consumers and to foster positive engagement with them (Court, Elzinga, Mulder, & Vetvik, 2009). While many brands measure consumer engagement as their performance indicator for value (Evergage, 2014); Harrigan, Evers, Miles, Daly (2017) argued that it is crucial for brands to vision consumer engagement as a process, instead of treating it as an outcome. This can lead to a more measurable result, namely: higher value be co-created for all stakeholders, consumer loyalty and satisfaction. Furthermore, brands which are able to implement real-time data-driven strategy may improve their competitive advantage and achieve better outcomes (Forrester, 2017; Lieb, 2014).

2.3 Real-Time Competitive Advantage

By having better understanding of expectations and real-time engagement, brands can develop their competitiveness. Brand competitiveness can be achieved by implementing either price strategy (selling at low-cost) or differentiation strategy (selling differentiated products or services at premium prices) (Porter, 1989). In addition to this traditional strategy approach, Hunt (2012) proposed that following resource-advantage

theory, sustainable competitive advantage can only be produced by intangible attributes, namely being responsive to consumer's preferences and needs, innovativeness, and service quality. In 2014, Evergage conducted a survey of 114 digital marketers in 18 countries in order to discover the industry perceptions of real-time marketing and its benefit. The result revealed that the highest value of real-time marketing is increasing consumer engagement (81%), followed with enhancing consumer experience (73%) and increasing conversion rates (59%). By leveraging real-time data monitoring, brands can ensure their relevancy from producing and co-creating content or service that are meaningful to consumers when they are most interested, via medium or platform which suits their behaviour best (Buhalis & Foerste, 2015). Competitiveness lies in a brand's ability to co-create distinctive value with consumers (Christopher, Payne, & Ballantyne, 2002) based on their real-time needs. This supersedes the solely price or differentiation competitive advantage, as these empowered consumers are striving for higher value and they are willing to pay higher price in order to obtain that expected value (Darmer & Sundbo, 2008; Pine & Gilmore, 1999). Consumers demand highly personalised products or services and are only receptive to information which is related to them at the time they require it. Contextual-based offerings are arguably the most relevant way to address these dynamics and ever-changing needs of consumers. Time is a very critical element of context and hence increasingly instant gratification of essence. This strategy provides consumers with service offerings which are highly relevant based on their real-time context or situation. They are also benefitting brands in strengthening their competitiveness (against competitors who do not) and maximising revenue, namely through real-time yield management or dynamic pricing (Buhalis & Foerste, 2015).

3 Methodology

To explore the performance of brands in utilising social media and technology to enhance consumer experience in real-time, an exploratory qualitative approach was employed, using an inductive enquiry as the research begins from observation to theory development (Farquhar, 2012). The study started with the pre-research stage, where secondary data, in the form of journal articles, books and best-practice coverage stories from best-practice industry websites and reports, were systematically collected and analysed. This was followed by a twofold data collection process, through a case study approach, in order to enhance the credibility of research findings. Firstly, primary data were collected by conducting an in-depth case study of Marriott's real time social media monitor MLive, through a semi-structured interview and direct observation. Secondly, a multiple case study was conducted using a variety of secondary data sources.

3.1 Research Stage 1: In-Depth Case Study of Marriott MLive

Case study is a strong method when the scope of study is under-researched or lacks theory, and the research goal is to understand 'why' and 'how' a certain phenomenon

occurs. The unique advantage of case study as a methodology is in its capability to deal with a heterogeneity of evidence, namely: interviews, documents, artefacts and observations (Yin, 2014). A single case approach was chosen for the first research stage to gain in-depth knowledge about Marriott's real time social media monitor MLive. This approach benefited from depth, revelatory, insight and unique understanding (Eisenhardt & Graebner, 2007).

Marriott MLive was chosen by employing a purposive sampling method (Farquhar, 2012). This is because it is a best-practice company that embrace and successfully execute real-time service for consumer experience enhancement. Four main considerations were applied for selecting Marriott's MLive as an appropriate unit of analysis, including: (1) Marriott is one of the leading innovators of real-time service implementation, (2) has a dedicated real-time command centre (MLive) in four countries to actively interact with its global consumers 24/7 in various languages, (3) uses real-time data with a main focus on 'Return of Engagement' and experience enhancement (co-creation), (4) recently won the Gold and Silver Creative Data Lions at the Cannes International Festival of Creativity in the categories of Social Data and Use of Real-time Data, respectively (Marriott, 2017).

A semi-structured, open-ended interview was conducted in August 2017 with two of the most senior Marriott executives, followed by direct observation of the MLive operations at the Marriott Headquarters in London. Direct observation was essential to explore how Marriott is dealing with real events in real-time. The interview transcription process was carried out manually from the iPhone recording application to Microsoft Word document. Preliminary analysis, during the transcription process, helped researchers to highlight important narratives (Farquhar, 2012). Furthermore, an initial analysis of the interview data was conducted once the transcription was completed, in order to highlight emerging subjects before employing an in-depth content analysis (Gribich, 2007). Data analysis was conducted by developing a codebook using Microsoft Excel, where textual data from the interview and the direct observation were examined and filtered. The most prominent patterns from both data collection methods were drawn and analysed further to address research objectives. However, the main weaknesses of single case studies are their credibility and contribution of findings (Yin, 2014). Hence, additional secondary multiple case studies were conducted in research stage 2 to obtain a stronger argument.

3.2 Research Stage 2: Multiple Case Study

Multiple case studies were employed in addition to the in-depth single case study to gain more credible findings from best-practice companies. This enabled to compare and contrast cases and to discover real time service as a phenomenon (Farquhar, 2012). Selecting best-practice companies in tourism and hospitality industry was appropriate as very few brands employ real-time service. A purposive sampling method was chosen, to ensure that the population represent eligible attributes based on the study objectives (Berg, 2004). In order to meet such attributes, selected companies were required to have these characteristics: (1) employ social media and technology as part of brand's service offerings, (2) actively engage with consumers in real-time using social media, (3) have implemented the immediacy or real-time factor in their service

offerings. Four cases were considered sufficient for a cross-case analysis to produce broad understanding of the context (Miles, Huberman, & Saldana, 2014). The selected companies represent different industry sectors, namely: one airline, one hospitality and one gastronomic business. One destination was also analysed to explore the macro level. Table 2 shows the best-practice companies selected, the industry each of them represent and their best-practice application. These criteria were considered sufficient to enable a variety of cases and best possible case variation for the cross-case analysis purpose.

Secondary data was collected from online publications, company websites, annual reports, social media channels and public interviews. In addition, online observation of the social media of these organisations examined the real-time service performance for each company. With multiple sources of secondary data, the researchers took advantage of the *naturally occurring* notion of the data, indicating that there is no interference from the researchers (Silverman, 2014). Data analysis was conducted in two phases: first, the individual analysis of the four case studies and second, through integrating data from the cross-case synthesis to highlight commonalities and similarities of the cases (Yin, 2014), as well as drawing a holistic understanding of real-time service performance for each brand from a best-practice perspective.

Table 2. Selection of case study companies

Company/brands	Industry	Real-time best-practice implementation
KLM Dutch Airlines	Airlines	Crisis management, Social media customer service tool
Visit Philadelphia	Destination	Real-time surprise and delight, combination of virtual and physical approach to enhance experience in real-time
Red Roof Inn	Hospitality	Crisis management in real-time, highly contextual and personalised advertisement
Pretzel Crisps	Gastronomic	Real-time listening, surprise and delight using keyword analysis

4 Findings: Data-Driven Real-Time Value Co-creation

The findings reveal that personalisation of service goes beyond delivering relevant content for targeted consumers. Brands need to ensure that service delivery fits consumer-specific needs and preferences at that particular moment (Buhalis & Foerste, 2015). Time is a critical element of the contextual information, both internal and external, for all stakeholders. Real-time insights are used to identify what are the current trends or interests and to capture those opportunities that can be facilitated within a time frame. It was evident from the case studies that flexibility and an adaptive approach, to a constantly changing consumer population, are paramount to establish an

authentic connection, in which consumers do not perceive the gesture as merely advertising. Maintaining one-to-one interaction is still the key in dynamic social interaction with consumers (McKenna, 1997). However, brands are also required to explore the context of opportunities holistically by combining different aspects that consumers expect to co-create with the brand, so they can provide higher value for them (Neuhofer, Buhalis, & Ladkin, 2012; Prahalad & Ramaswamy, 2004b). The findings also indicate that the instant gratification value of social media benefit consumers with timely reaction from brands which support cocreation. They also give brands the ability to recognise needs, communicate and interact with consumers in real-time (Yoo & Gretzel, 2010). The following quote demonstrates both benefits and opportunities for brands to interact in real-time with consumers:

Social media give you that instant recognition, instant communication, instant interaction with your customers at the time when they posted something or they wanted to tell you something, so you don't have to wait till someone sends you something. We can just interact in real time with our customers. (Jon)

The findings from the second research stage show that all four brands (KLM, Visit Philly, Red Roof Inn and Pretzel Crisps) identify consumer needs proactively and co-create value dynamically. They establish online engagement with their consumers and are in a position to respond in near real time. KLM for example makes a commitment to respond to all consumer social media requests within one hour, 24 h a day. The main commonalities between the four cases are that they aim to enhance consumer experience by actively engaging as well as by personalising and contextualising service offerings. Brands are actively reaching out to targeted or relevantly influential consumers, often in an unexpected manner, to enhance their experience.

Visit Philadelphia and Pretzel Crisps use a *surprise and delight* strategy to improve consumers' experience by combining virtual and physical interaction. It is evident from the case studies that real time strategies enable brands to add distinct value in consumer-brand engagement. Real time requires a more human (less corporate) interaction, the act of spontaneity and the brand interest in the individual preferences and circumstances (Lieb, 2014). By integrating the critical knowledge of consumer real-time needs, geo-data, contextual factors as well as mobile search behaviour and targeted queries brands have an excellent understanding of customer needs. Therefore they can manage individual needs and experiences and are able to add more value throughout the traveller journey. They can even convert an external crisis or negative context into a profitable transaction, as evident from the Red Roof Inn case. Although they may not need to establish direct engagement with consumers, real time strategies provide a real-time solution to consumer's demand at the exact time they are looking for it. During crisis situation, consumers also expect brands to be responsive in various channels, either public or private, offline or online, virtual or physical. It was evident from the case of KLM that consumers choose social media channels to reach brands, due to the unsatisfactory reach or response via other channels. Given the fact that call centres are often impossible to reach, communicating reliable and relevant information

across social media platforms in real-time can significantly ameliorate crisis situations. Highly contextualised and personalised offerings can be delivered in real-time to precise consumer targets not only via social channels but also via different platforms, such as localised search advertising. Moreover, the research demonstrated that consumers use social media as they appreciate its instant gratification value. Brands are expected to optimise relationship with consumers using their most preferred channels. Flexibility and adaptive behaviour towards consumer demand and online empathy are crucial to maintain engagement with high spending consumers. Value for all stakeholders are drawn based on the evidence from two research stages. Stakeholders are divided into several categories, which consist of brands, consumers and potential consumers (Table 3).

Table 3. Value for each stakeholder

Stakeholders	Value
Brands	<ul style="list-style-type: none"> – Positive advocacy/e-WOM/referrals – Product and service improvement – Increase sales/sales growth – Organic engagement – Authentic user-Generated content – Real-time complaint management/service recovery – Proximity/location-based offerings – Yield management or dynamic pricing based on real-time data
Consumers	<ul style="list-style-type: none"> – Instant gratification – Consumer satisfaction and loyalty – Enhanced experience – Real-time information and recommendation – Dynamic and interactive communications – Brand awareness – Surprise and delight
Potential consumers	<ul style="list-style-type: none"> – Trustful information source/recommendation – Improved brand perception

It is evident that the ability to co-create higher value in real time is increasingly the most significant source of competitive advantage. The findings show that the ‘now’ factor is becoming paramount for brand competitiveness. It can be developed on consumer’s internal and external context and provide high relevancy of service actions (proactive and reactive) that support service value co-creation. Based on data integration from the two research stages, Fig. 1 provides a conceptual framework of real-time service competitive advantage that demonstrates how newness contributes to competitiveness.

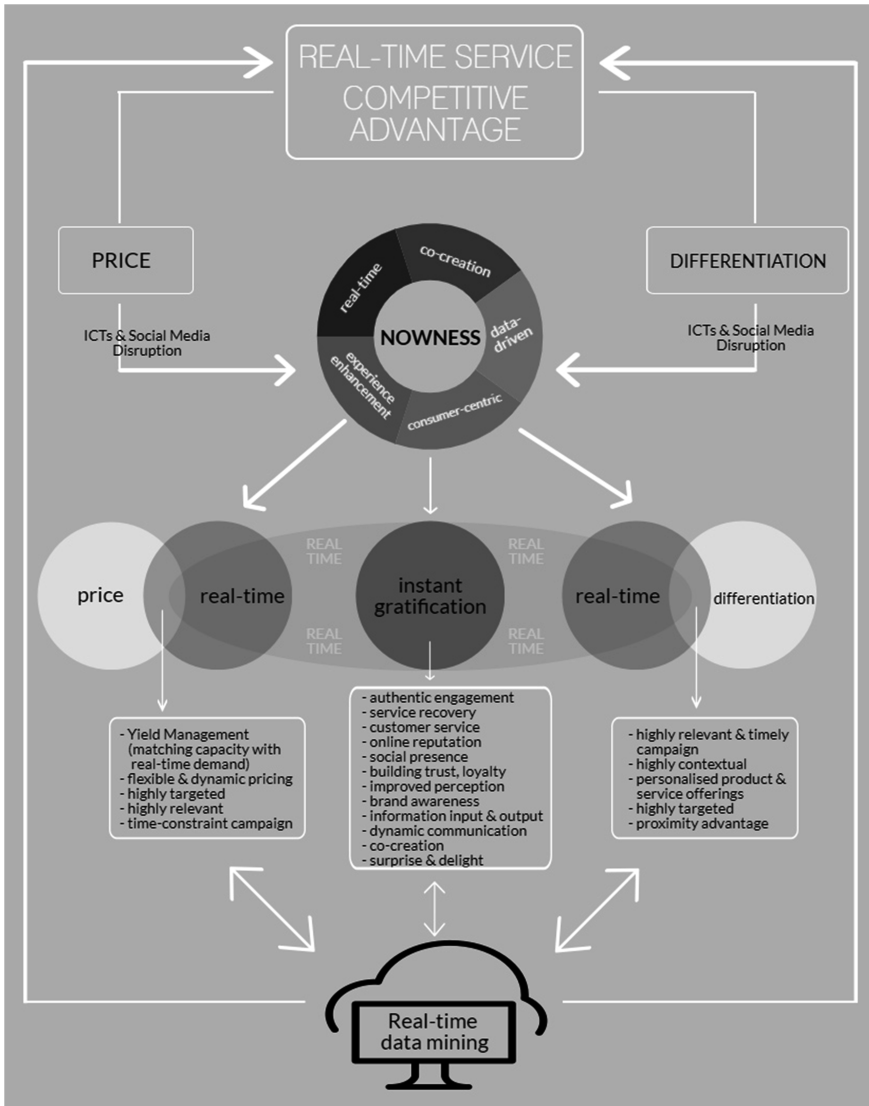


Fig. 1. Real-time service competitive advantage conceptual framework

The framework shows that the components of real-time service characteristics, namely: contextually relevant *real-time*, *co-creation*, *data-driven*, *consumer-centric*, and *consumer experience enhancement* are catalysts for dynamic, flexible, and responsive performance for both brands and consumers. Beyond the two sources of competitive advantage (price and differentiation), ‘real-time’ plays a critical role in the experience enhancement process. This is due to its high relevancy with consumer ever-changing needs and expectation of instant gratification. This disruptive behaviour

can be catered with the right utilisation of ICTs, where brands are able to analyse and recognise unique needs of each individual dynamically, and tailor their service through real-time data mining to gain mutually beneficial value.

5 Conclusions and Future Research

This exploratory research shows that real-time service offers a cutting-edge approach to co-create value with consumers, as engagement often happens in real-time, right when consumers are already interacting with brands in their physical space. This study reveals that real-time service adds considerable value to brand's competitiveness by utilising real-time data from consumers, supplemented with contextual information which is relevant for both parties.

Using timely engagement via social media and other technology channels and media, brands can support consumer experience. This ever-increasing capability to dynamically interact and take immediate actions towards triggered data help brands to achieve more effective performance. By having consumers as the centre of the strategy and operations, brands are able to build trust-based relationships as a source of value (Christopher, Payne, & Ballantyne, 2002). Dynamic communications and meaningful exchange of real-time information can be used by brands to personalise service offerings based on contextual data (Buhalis & Foerste, 2015).

This study underlines best-practice examples from companies, which are successful in implementing real-time service in order to co-create value for all stakeholders. Future research may look into benchmarking real-time service best-practice performance, as well as analyse weaknesses or failure examples. Additionally, further study can be conducted to empirically analyse real-time service motivations and expectations from a consumer's perspective.

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Factors Influencing Customers' Intention to Use Instant Messaging to Communicate with Hotels

Soey Sut Ieng Lei^(✉), Ksenia Kirillova, and Dan Wang

School of Hotel and Tourism Management, The Hong Kong Polytechnic University, Kowloon, Hong Kong SAR
soey.lei@connect.polyu.hk, {ksenia.kirillova,d.wang}@polyu.edu.hk

Abstract. The means of computer-mediated communications continue to evolve along with the rapid development of IT. Realizing the importance of maintaining a close relationship with customers, hospitality organizations have started adopting new media such as Instant Messaging (IM) applications to communicate with customers. Customers' intention to adopt IM to communicate with hotels are remained unknown. This study explores factors influencing customers' intention to use IM to communicate with hotels based on the technology acceptance model and computer-mediated communication theories. Using an experimental design, online survey and nested logistic regression analysis, the findings reveal that age and perceived usefulness of IM exert substantial influence on customers' intention to use IM for hotel-customer communication. This study provides several theoretical and practical implications.

Keywords: Computer-mediated communication · Media theory · Instant messaging · Hotel guests

1 Introduction

In the hotel industry, the communication between the hotel and customers is ubiquitous as customers may have different needs at different stages throughout the entire travel journey (i.e., before, during, and after the stay). For example, customers may want to enquire about hotel facilities before the stay, or hotels may also want to influence customers' decision making processes by sending them relevant marketing information during the stay. As Information and Communication Technologies (ICT) continue to advance, specifically with the increasing penetration of smartphone and social networks in human's personal life and work related issues, people's communication style and habits are changing. Many businesses have started adopting new media such as instant messenger apps (e.g. WhatsApp, WeChat, Facebook Messenger) to better connect with customers. For example, leading hotel companies such as Marriott launched the "Anything Else" mobile request service which allows customers to chat with hotel associates instantly anytime anywhere. Hyatt Hotels have also started testing Facebook

Messenger as a customer service channel (Hertzfeld, 2016; InterContinental Hotels Group, 2015; Wilkinson, 2015).

The industry practice leads to questions regarding consumers' psychology and behaviour in adopting and using IM as a communication media in customer-hotel interaction scenarios. This study is interested in investigating a research question in this area: What are the factors that influence customers' intention to use instant messaging to communicate with hotels? Combining Technology Acceptance Model (TAM) and Computer-Mediated Communication theories (CMC) as the theoretical foundation, this study adopts an experimental design using cross-sectional data and a scenario-based approach to examine the factors influencing customers' intention to IM to communicate with hotels during their stay. This study contributes to the literature regarding IT innovation and consumers' adoption in hospitality industry by framing the IM adoption for customer-hotel interaction on the basis of TAM and communication theories.

2 Theoretical Background and Conceptual Framework

2.1 Technology Acceptance Model

The technology acceptance model (TAM) suggests that user's adoption of a technology is predicted by two major factors—perceived usefulness and perceived ease-of-use (Davis, 1989). According to TAM, the greater a user perceives using a technology would be free from effort and useful to improve job performance, the more likely the user would adopt the technology. TAM has been extensively applied in studies about usage behaviour of different types of technologies across a wide range of disciplines including the field of tourism and hospitality. The model has also been applied in IM studies in which researchers found that users' perceived usefulness and perceived ease-of-use of IM significantly influence their acceptance and use experience of IM (Lou, Chau, & Li, 2005; Lu, Zhou, & Wang, 2009; Wang, Hsieh, & Song, 2012). Thus, based on extant literature, it is hypothesized that:

- H1. Customers' perceived usefulness of IM positively affects their intention to use IM to communicate with hotels.
- H2. Customers' perceived social presence of IM positively affects their intention to use IM to communicate with hotels.

2.2 CMC Theories

It is important to incorporate Computer Mediated Communication (CMC) theories into TAM to understand users' adoption of IM as IM is a type of computer-mediated communication medium. CMC is a collective term for network-based communication tools. Originally, researchers argue that because CMC lacks the nonverbal cues and social context cues which can be transmitted through traditional channels (e.g. face-to-face and telephone communications), the communication experience is constrained under such an environment (e.g. the interlocutors can no longer observe each other's facial expressions and receive immediate feedback). Thus, CMC is considered

as “lean” media and is not preferred for “rich” communication (Culnan & Markus, 1987; Daft & Lengel, 1983; Rice & Love, 1987).

Gradually, more and more research findings seem to mitigate or contradict the argument of these original cues-filtered-out theories (Carlson & Davis, 1998). For example, some researchers found there are times where face-to-face (FtF) is not always superior to CMC communication (Dubrovsky, 1985; Jonassen & Kwon, 2001; Light & Light, 1999; Phillips & Santoro, 1989; Rhoads, 2010). Some research also suggests that the differences between CMC and FtF diminish as people adapt to the CMC environment overtime (Rice & Love, 1987). There are times where CMC can even exceed FtF interactions (Walther & Burgoon, 1992). As previous CMC studies found mixed and contradictive results, the knowledge and understanding about communication media choice and media effectiveness is still limited and unclear.

The traditional CMC theories propose three major media traits that distinguish CMC from FtF communications. First, the *Media Richness* theory suggests that users’ perceived capability of a communication medium to deliver rich contents that matches the equivocality of the communication situation affects their media choice (Daft & Lengel, 1986). Based on the media richness theory, rich information is more capable than lean information in reducing uncertainty, and FtF communication is the richest mode because of its capacity to support multiple verbal and nonverbal cue systems (Walther, 2011). Second, the *Social Presence* theory proposes that the degree to which a medium can transmit human elements to deliver a sense of personalness affects users’ choice of selecting such media (Short, Williams, & Christie, 1976). As CMC media eliminates nonverbal cues such as facial expressions and body gestures, the interlocutors are less aware of each other’s personal characteristics such as personality traits and demographics. This may affect the communicators’ impression toward each other and make them feel less warm and involved. Based on prior research studies in IM that supported these propositions (Ogara, Koh, & Prybutok, 2014; Wang et al., 2012), it is hypothesized that:

H3. Customers’ perceived media richness of IM positively affects their intention to use IM to communicate with hotels.

H4. Customers’ perceived social presence of IM positively affects their intention to use IM to communicate with hotels.

2.3 User and Task Characteristics

The mixed and contradictive findings from prior research shows the need to consider extra factors other than individuals’ perceptions when examining media choice. External factors sometimes may override personal or dispositional factors when task demands are strong or when the situational press (e.g. time pressure, geographical distance) is powerful (Fulk, Steinfield, Schmitz, & Power, 1987; Trevino, Lengel, Bodensteiner, Gerloff, & Muir, 1990). Previous studies found that under urgent situations that require rapid feedback and timely information processing, rich media such as telephone is more appropriate than lean media (Dennis & Kinney, 1998; Koo, Wati & Jung, 2011; Trevino et al., 1987). Furthermore, when the task complexity is high and requires a medium that is capable of transmitting multiple cues to achieve mutual

understanding, rich media should prevail over lean media which is more appropriate for simple tasks (Koo et al., 2011; Sheer & Chen, 2004). As instant messaging is considered as a lean media based on traditional CMC theories, one may not prefer to use IM in situations where the task nature is urgent and complex. Last, prior research suggests that it is also important to take into account users' characteristics such as their prior experience of using IM and their frequency of use of IM (Carlson & Zmud, 1994). A number of research has supported the positive relationship between users' self-efficacy of using a technology and their intention to adopt a technology (e.g. Mun & Hwang, 2003). Thus, to take into account these important external factors, it is hypothesized that:

- H5. Customers' perceived self-efficacy of using IM positively affects their intention to use IM to communicate with hotels.
- H6. Customers' frequency of using IM positively affects their intention to use IM to communicate with hotels.
- H7. Task urgency negatively affects customers' intention to use IM to communicate with hotels.
- H8. Task complexity negatively affects customers' intention to use IM to communicate with hotels.

Figure 1 summarizes the hypotheses and presents the conceptual model.

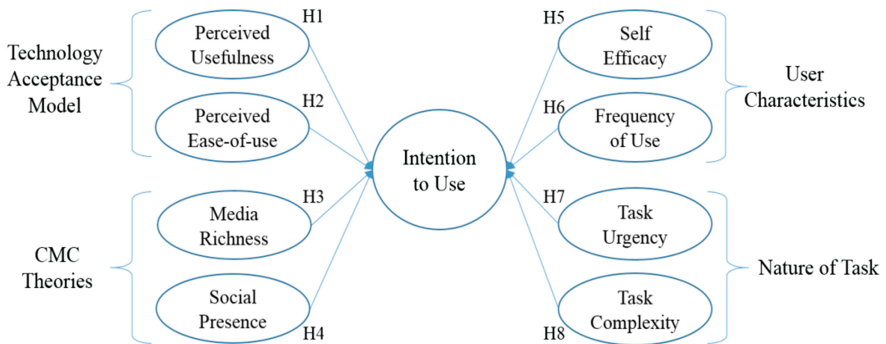


Fig. 1. Conceptual model

3 Method

This study adopted a randomized between-subject block experimental design, using cross-sectional data and a scenario-based approach. The randomized block experimental design is typically utilized when a researcher is interested in the effects of treatments yet also wants to control for the effect of other subject-specific variables (Montgomery, 2009). Therefore, the research design in this study combined the elements of a cross-sectional survey with features of 2 (low vs. high task urgency) × 2 (low vs. high task complexity) randomized between-subject experiment. The survey first asked all respondents for their general perceptions on IM perceived usefulness, IM

perceived ease of use, IM social presence, IM media richness, and IM self-efficacy. Then, respondents were randomly exposed to one of the four scenarios, and their willingness to use IM to communicate with a hotel for a particular situation was measured. The survey concluded with socio-demographic questions, as well as the questions about frequency of IM use in everyday life.

3.1 Stimuli

Task complexity and task urgency were manipulated by the means of a scenario. The scenarios were designed to ensure that respondents engage in a situation during a hotel stay that would require immediate communication with hotel staff. Four types of scenarios were designed: low urgency-low complexity, low urgency-high complexity, high urgency-low complexity, and high urgency-high complexity.

To ensure face validity of the scenarios, ten individuals representing the target population were consulted, and the research instrument was modified according to the feedback solicited. Next, a pilot-test was carried out with 50 respondents on Amazon MTurk, to make sure that respondents perceive the scenario to be realistic [3-item scale by Feick and Higie (1992)] and that they recognize the differences in scenarios accordingly (by one question on each condition). Manipulation checks on both experimental conditions and reality of scenarios were successful ($p < 0.001$), and therefore the manipulations were perceived as intended. Manipulation checks performed on the full dataset confirmed the pilot findings.

3.2 Sampling and Data Collection

Powered by Qualtrics, online survey was distributed to US Amazon MTurks' members in July 2017. Amazon MTurk is the website that recruits human intelligence workers to complete various tasks such as sorting data or answering surveys. MTurk participants tend to be demographically more diverse than conventional Internet samples and are generally as reliable as information collected via traditional methods (Buhrmester, Kwang, & Gosling, 2011). Two screening questions were in place (Have you ever used IM? Have you stayed in a hotel within the last 12 months?). To ensure data quality, two attention check questions were included in the survey. The data collection process resulted in 479 completed questionnaires. After responses with failed attention checks were excluded, the sample consisted of 339 valid responses. Additional 28 responses were excluded as not having a definite "yes" or "no" response on the dependent variable, leaving a final sample of 311.

3.3 Variables and Measures

In addition to gender, age, and educational background, the variables measured, along with corresponding reliability coefficients and descriptive statistics, are presented in Table 1. It should be noted that although intention to use IM to communicate with hotel staff was originally measured by three statements from Noone and Mattila (2009) on a 5-point Likert scale, it was later transformed to a "yes"/"no" variable due to binominal (rather than normal) nature of distribution in the variable. Frequency of IM everyday

use was measured on a 5-point scale, ranging from “never” to “all the time.” The continuous variables were standardized for the analysis.

Table 1. Variables and measurements scales

Variable	Source	Cronbach alpha	Mean (s.d.)	Range
IM social presence	Short et al., (1976)	0.88	5.46 (1.17)	1–7
IM media richness	Carlson & Zmud, (1999)	0.77	5.67 (0.94)	1–7
IM perceived usefulness	Venkatesh & Davis, (2000)	0.89	5.74 (1.02)	1–7
IM ease of use	Venkatesh & Davis, (2000)	0.83	6.00 (0.89)	1–7
IM self-efficacy	Mun & Hwang, (2003)	0.89	5.64 (1.06)	1–7
IM frequency of everyday use	5-Point Likert scale (1 = never; 5 = all the time)	N/A	3.57 (1.13)	2–5

3.4 Data Analysis

Data were analyzed with the help of STATA, by means of hierarchical, or nested, logistic regression. Hierarchical regression modeling assesses the influence of several predictor variables in a sequential way. Generally, socio-demographic information and control variables are entered first, followed by groups of variables based on their conceptual significance and research relevance (Cohen & Cohen, 1983). Following these guidelines, we first introduced the socio-demographic characteristic (Model 1). Then, we entered the variables related to user characteristics (Model 2), the TAM theory (Model 3), CMC theories (Model 4). Finally, we introduced situation-specific variables (task urgency and task complexity) coded as categorical (Model 5). A likelihood ratio test in a form of the X^2 test was utilized to compare hierarchically nested models. The Hosmer-Lemeshow test showed that the data appropriately fits the final model ($X^2 = 11.75$, $p = 0.163$).

4 Results

The final sample was prevalently male (55%), ranging from 19 to 70 years in age ($M = 36.00$, $SD = 10.17$), with at least a Bachelor degree (64%).

As seen from Table 2, Model 1 with socio-demographic variables was only marginally significant ($p < 0.1$), with age exerting a significant negative effect on the dependent variable. The interpretation is that with each additional year of age, the likelihood of IM use to communicate with hotels decreases by 3%, while controlling for respondents' gender and education. Adding user characteristics in Model 2 significantly improves the model fit ($X^2 = 14.16$, $p < 0.01$), and frequency of everyday IM use is the only significant variable. In Model 3, which accounts for the TAM variables significantly adds to the model fit ($X^2 = 26.00$, $p < 0.001$), the effects of age

and frequency of everyday use disappear, as they are perhaps captured by self-efficacy (with a negative effect) and perceived usefulness. As evident from Models 4 and 5, neither CMC variables ($X^2 = 5.73, p = 0.6$) nor task features ($X^2 = 0.28, p = 0.87$) contribute to the likelihood of IM usage to communicate with the hotel. In the final model, the effects of age, perceived usefulness, and self-efficacy remain. Specifically, the model shows that a unit increase in perceived usefulness increases the odds of using IM in hotels by 2 times. Interestingly, a forward movement on the self-efficacy scale brings out a 39% decrease in the dependent variable. Based on this, only Hypothesis 1 was supported whereas Hypotheses 2, 3, 4, 5, 6, 7, and 8 were not supported. In other words, neither user characteristics nor CMC theories nor the nature of task fully account for the consumer’s decision to use IM for hotel-related communication. However, the TAM model and self-efficacy can partially explain this choice.

Table 2. Results of nested logistic regression

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	β (s.e)	Exp (β)	β (s.e)	Exp (β)	β (s.e)	Exp (β)	β (s.e)	Exp (β)	β (s.e)	Exp (β)
Constant	1.44 (0.51)	N/A	-0.91 (1.17)	N/A	-0.31 (1.26)	N/A	-0.84 (1.30)	N/A	-0.88 (1.30)	N/A
Female	-0.10 (0.24)	0.91	-0.12 (0.25)	0.88	-0.02 (0.26)	1.03	0.00 (0.26)	1.00	0.00 (0.26)	1.00
Age	-0.03* (0.01)	0.97	-0.02 (0.01)	0.98	-0.01 (0.01)	0.98	-0.03* (0.01)	0.97	-0.03* (0.01)	0.97
Education										
Some college	-0.50 (0.39)	0.61	-0.54 (0.40)	0.58	-0.49 (0.42)	0.62	-0.49 (0.42)	0.61	-0.49 (0.43)	0.61
Bachelor degree	-0.49 (0.31)	0.61	-0.64 (0.32)	0.53	0.63 (0.34)	0.53	-0.62 (0.34)	0.54	-0.63 (0.34)	0.53
Graduate degree	-0.13 (0.40)	0.88	-0.37 (0.41)	0.69	-0.44 (0.43)	0.65	-0.42 (0.43)	0.66	-0.43 (0.43)	0.65
IM frequency of use			0.42*** (0.11)	1.52	0.18 (0.13)	1.20	0.14 (0.13)	1.15	0.13 (0.13)	1.14
IM self-efficacy			-0.20 (0.18)	0.82	-0.51* (0.24)	0.60	-0.50* (0.25)	0.60	-0.49* (0.25)	0.61
IM perceived usefulness					0.88*** (0.19)	2.40	0.70 (0.21)***	2.00	0.70** (0.21)	2.02
IM ease of use					-0.16 (0.22)	0.86	-0.21 (0.22)	0.81	-0.21 (0.22)	0.81
IM Social presence							0.27 (0.15)	1.31	0.26 (0.15)	1.30
IM media richness							0.12 (0.21)	1.12	0.12 (0.21)	1.12
Task urgency									0.13 (0.25)	1.13
Task complexity									-0.04 (0.26)	0.96
-2Log-likelihood	-210.50		-203.41		-190.41		-187.55		-187.41	
Chi-square	10.15		24.31**		50.30***		56.03***		56.31***	

*Significant at $p < 0.05$, **significant at $p < 0.01$, *** significant at $p < 0.001$

5 Discussion and Conclusion

This study investigates the factors influencing customers' intention to adopt IM to communicate with the service provider in a hospitality context. Based on prior research, this study develops a conceptual model based on TAM and CMC theories. However, the results of the data analyses show unexpected results. Age and perceived usefulness were the only variables that have significant relationships with the dependent variable. Furthermore, it was found that customers' self-efficacy of using IM has a negative relationship with their intention to adopt IM in this study context. The following discussion helps to interpret and reflect upon the unexpected results based on existing theory and literature.

While TAM can partially explain the research question of this study, CMC theories show weak support to the conceptual model. This might not be too surprising as previous studies have indeed found inconsistent and mixed results when studying communication media choice and adoption based on CMC theories. In this study, the relatively high means of perceived media richness and social presence of IM may explain the fact that as IM has penetrated into our daily lives, IM is no longer perceived as a lean communication medium as originally proposed by traditional CMC literature (Daft, Lengel, & Trevino, 1987) in which FtF communication was regarded as the benchmark of rich communications. With advanced functions such as emoji and voice messaging, IM has actually become a multi-functional communication tool that can no longer be entirely explained by traditional CMC theories but requires more complicated and integrative theories to explain and understand. This study confirms that as IM has become most people's daily communication tool, it is highly believable that people has adapted to an IM communication environment overtime which reduces the difference between CMC and normal FtF interactions (Rice & Love, 1987).

Compared with previous IM adoption studies which mainly focus on the use of IM in organizational settings, IM is perceived as much richer by the hotel customers in this study than employees in organizations who perceived IM as symbolizing informality and much less rich than FtF communications (Cameron & Webster, 2005). Customers in this study in general perceive IM as fairly rich in terms of both media richness and social presence. This may explain the non-significant variables, task complexity and task urgency. In other words, customers perceive IM as rich enough to allow them to deliver and receive efficient and meaningful responses no matter in which situation. Prior studies suggest that when the communicated need requires immediate attention or more detailed explanations, individuals would prefer richer communication media channels (Koo et al., 2011). The results of this study show that as people adapt to the IM communication environment and perceive IM as rich enough, the degree of task complexity and urgency would not affect the degree to which they would want to communicate through IM.

The unexpected negative relationship found between self-efficacy and intention to use also needs further investigation in future research. Previous studies mostly support the positive relationship between self-efficacy and the adoption of technology specifically IM (To, Liao, Chiang, Shih, & Chang, 2008). Theoretically, higher self-efficacy means that an individual is more confident to manage and control the use of a

technology to perform a task, in this case, the communication of needs and wants. The opposite relationship found in this study might be explained by the main difference between this study and prior studies—the study context. This study is the first research attempt to understand customers' adoption of new media to communicate with hotels. Although the manipulation check questions indicate that respondents perceive the communication scenarios as realistic, the phenomenon of using IM to communicate with hotels is still new. Some respondents commented that they have never heard of the availability of and IM service in hotels. The findings of this study reveal that understanding the nature of consumer-company communications within a hospitality context is paramount. Why would customers perceive IM as much richer than employees in organizations? Do customers perceive communications with hotels as formal or informal communication? Are customers seeking simply efficiency or are they seeking something else when communicating with hospitality companies? This study found that customers who are expert in using IM tend to have lower intention to adopt IM for hotel-customer communications. Is that because they perceive that IM is suitable for efficient communication but not for situations where they expect to receive a good hospitality service? What are the situational factors that override the need of matching IM capacity and task characteristics? These are all important questions to be explored in future research.

This study focuses on a recent industry-led phenomenon which has potential in changing the communication between hotels and customers. The results are unexpected but interesting enough to provide insights for future studies. Future studies that are interested in understanding customers' media choice or adoption in hospitality settings need to go beyond TAM and CMC theories. The context of this study, that is, using IM in hotel settings to communicate with hotel employees needs further investigation. According to literature, the effectiveness of a communication medium is dependent upon the nature and context of the communication (Walther, 1996). The effectiveness of a medium is not "implicitly" or "objectively" dependent on the medium characteristics but instead is determined by users' perceptions and the context of use (Trevino et al., 1990). What media people use to communicate for certain purposes is directly influenced by the varieties of available media choices and the conditions of the usage context (Watson-Manheim & Bélanger, 2007). Therefore, other factors such as the symbolic meaning of CMC tools (e.g. email is more official than texting) or the personal cognitive style (e.g. introvert may prefer IM to FtF interactions) which have been recognized in previous studies should also be considered in future studies.

6 Limitations

This study is restricted by its limitations in acquiring a larger sample size and in recruiting respondents from more diverse sources. Future studies may consider to enlarge the sample size and acquire the data from different sources that represent a different set of participants to triangulate the research findings. It would also be interesting for future studies to compare the adoption behaviour of IM among consumers with different cultural backgrounds. This study is also limited due to the number of media choices respondents could consider which is typically not the case in

real world situations. Future studies may incorporate a greater variety of media choices (i.e. phone, email, face-to-face) when studying customers' media selection to compare and explain why customers would prefer one to another under what type of situation. The interpretation of "task" in this study is also limited in the sense that a "task" could be considered as a much more complicated process when human-to-human communication is the issue under investigation. Future studies may consider to understand task from different perspectives and concepts such as task analysability and media synchronicity.

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Consumer Evaluation of Hotel Service Robots

Iis P. Tussyadiah^{1(✉)} and Sangwon Park²

¹ School of Hospitality and Tourism Management, University of Surrey,
Guildford, UK

i.tussyadiah@surrey.ac.uk

² School of Hotel and Tourism Management, The Hong Kong Polytechnic
University, Kowloon, Hong Kong
sangwon.park@polyu.edu.hk

Abstract. In light of the trend in integrating artificial intelligence and robotics into tourism and hospitality operations, it is important to understand consumer responses to hotel service robots. Two studies were conducted to achieve this objective: an online survey and a laboratory experiment using measurements of automatic emotional reactions via biosensors. Responses to two types of robots, NAO for check-in and Relay for room delivery, were tested. Study 1 demonstrates that consumer intention to adopt hotel service robots is influenced by human-robot interaction dimensions of anthropomorphism, perceived intelligence, and perceived security. Differences were found between NAO and Relay: NAO's adoption depends on anthropomorphism and perceived security, while Relay's on perceived intelligence and importance of service operation in hotel experiences. Study 2 revealed support for the importance of anthropomorphism and perceived security in NAO, as reflected in Galvanic Skin Response (GSR) peaks during sequences of interactions and fixation on NAO's face. Support for perceived intelligence in Relay was also identified. Implications for the hospitality industry are provided.

Keywords: Service robot · Human-robot interaction · Godspeed scale
Hotel management · Emotional response · Biometric research

1 Introduction

The topic of Artificial Intelligence (AI) and robotics seems to dominate recent debates in academic literature and popular media around the next technology applications to proliferate and greatly impact the service sector, including tourism and hospitality (e.g., Murphy, Hofacker, & Gretzel, 2017; Osawa et al., 2017). Automation has been implemented in service settings for some time (e.g., self-service kiosks) and the development of robots for the service sector has started decades ago (Borsenik, 1993; Collier, 1983). However, with recent technological advancements in AI and robotics, we see more and more service robots entering the realms of tourism and hospitality operations, including consumer-facing ones (Ivanov, Webster, & Berezina, 2017). Hilton Worldwide, in collaboration with IBM, piloted the world's first robot concierge (using Softbank's NAO robot) that draws knowledge from Watson and WayBlazer (AI systems) to inform guests on local attractions, restaurants, hotel amenities, etc.

(Hilton, 2016). Starwood introduced robotic butlers (using Savioke's Relay robot) at their Aloft Hotel, mainly to deliver amenities to guestrooms in lieu of an actual human staff (Crook, 2014). In the name of efficiency, Henn-na Hotel was the first hotel to employ robots throughout its entire operations, from check-in at the front desk to automated luggage delivery and in-room companion (Guardian, 2015). The implementation of hotel robotics is often integrated with other enabling technologies such as facial recognition, automatic payment, drone delivery, and self-driving cars.

For hotels, efficiency of activities performed by staff is measured by the time needed to execute them; the less time, the less expensive labour cost would be. Hence, investment in robot labour is often less expensive than paying humans (Osawa et al., 2017). However, the adoption of service robots changes the nature of service experience as some service encounters are redefined by Human-Robot Interaction (HRI). Different from industrial robots whose performance metrics solely depend on efficiency, the success of service robots depends on the satisfaction of the users (Bartneck et al., 2009a, b). Therefore, it is important to understand the characteristics of robots that induce positive reactions from consumers in service settings such as hotels. The aims of this research are: (1) to understand consumer evaluation of hotel service robots and its effects on adoption intention, and (2) to identify if consumers react differently to different types of hotel service robots (i.e., NAO vs. Relay) in light of their operational capabilities (i.e., check-in vs. room delivery). In order to achieve these goals, two studies were conducted: (1) self-report measures of robot evaluation collected via a large-scale online survey and (2) psychophysiological measurements of automatic emotional reactions to robots collected using biosensor equipment. These two studies followed a concurrent nested (embedded) design, where the latter is used to complement and corroborate the findings of the former.

2 Human-Robot Interaction in Service

In light of the substantial impact potentials of autonomous robots on society, researchers have paid more attention to HRI. Compared to automated machines, robots are mobile and of a greater degree of embodiment, in order to fulfil their social and operational functions (Salem et al., 2015). The autonomy of a robot, which is its ability to accommodate variations of its environment (Stubbs, Hinds, & Wettergreen, 2007), intensifies its interactions with people (Thrun, 2004). This implies that robots get more empowerment, enabling them to make their own decisions in a wide range of circumstances. Thrun (2004) distinguished two types of HRI: direct and indirect interactions. The nature of HRI is closely associated with information flow (e.g., Duncan & Moriarty, 1998). Direct interaction exposes the bidirectional flow of information, which shows an equal footing between people and robots. Indirect interaction assumes a unidirectional communication whereby a robot acts on the basis of a command by an operator and responds back to its user.

Researchers have attempted to conceptualize and operationalize the different dimensions of HRI to explain user satisfaction with service robots (e.g., Bartnek et al., 2009a, b). Humanoid robots have gained substantial attention due to the advantage of their appearance. In general, previous studies indicated that human appearance is more

likely to induce positive perceptions and attitudes. That is, anthropomorphism (i.e., attribution of human characteristics to nonhuman objects) enhances a sense of efficacy with nonhuman objects as well as amplifies emotional attachment with them. Scholars in cognitive psychology suggested that perceived similarity between human behaviour and nonhuman movement of objects enhances accessibility of human schema (Morwedge, Preston, & Wegner, 2007). Anthropomorphizing products and brands, thus, can facilitate consumers to feel a congruency between human schema and the product features due to the human metaphor arising from the human-like objects (Aggarwal & McGill, 2007). Therefore, a humanoid form of robots has traditionally been seen as the obvious strategy for successfully integrating robots into service/social environments (Duffy, 2003).

Animacy is another characteristic that robotics researchers aim for when designing robots. Robots that are lifelike can deeply involve users emotionally, which, in turn, will influence their behaviour (Scholl & Tremoulet, 2000). As robots can demonstrate physical behaviour, reactions to stimuli, and language skills (Bartneck et al., 2009b), they can be perceived as lifelike to a certain degree. More importantly, robots designed to interact with people in socially meaningful ways (such as service robots) are suggested to demonstrate a certain extent of personality (Lee et al., 2006). Moreover, people typically form first impressions when encountering others and positive first impressions often lead to positive evaluation. Therefore, the degree to which a service/social robot is liked by consumers (i.e., likeability) influences consumer judgment toward the robot (Bartneck et al., 2009b). Finally, perceived intelligence of robots (referring to the perceived ability of the robots to acquire and apply knowledge and skills in various service environments) and perceived safety (referring to the user's perception of the level of danger/hazard and of comfort) when interacting with service robots have been suggested to be critical with regards to acceptance of robots (Bartneck et al., 2009a, b).

3 Study 1: Evaluation of Hotel Service Robots

3.1 Methodology

In order to achieve the research goals, a questionnaire was developed to gauge consumer evaluation of two different hotel service robots: NAO and Relay. Respondents were randomly assigned to two stimuli and presented with an image of the robot and a video depicting the robot at work: NAO serving a female guest to check-in at the front desk (using the first scenario in EARS video; EARS, 2015) and Relay delivering snacks to a guestroom (Engadget, 2014). Respondents were then asked to complete the Godspeed Questionnaire (Bartneck et al., 2009a, b), which consists of five parts: Anthropomorphism, animacy, likeability, perceived intelligence, and perceived security. All scales were measured by 5-point semantic differentials; for example, *Fake–Natural*, *Machinelike–Humanlike*, and *Artificial–Lifelike*. Then, they were asked to indicate how important check-in or room delivery is for their hotel experience and state

their intention to use the robot in the future. The questionnaire was distributed via a global market research company targeting consumers in the United Kingdom (UK) and United States (US) in August 2017. A total of 841 responses were collected, comprising of 51.8% US and 48.2% UK consumers. Of them, 53% are male and 65% are between 25 and 54 years old. Over 70% of respondents had a 2-year college degree or above. About 55% of them have a combined annual household income below \$60,000.

A Partial Least Square (PLS) analysis was used to analyse the data. PLS is a proper method to address the purposes of this research. Given the limited extant studies that investigate the influences of robots on guest experiences in tourism and hospitality, the philosophical goal of this research is exploratory (or an extension of existing structural theory) rather than theory testing or confirmation (Hair, Ringle, & Sarstedt, 2011). In this vein, PLS allows identifying exogenous factors related to evaluation of robots to better understand an endogenous construct, adoption intention. Next, a multi-group analysis was conducted to reveal differences between responses of NAO and Relay robots.

3.2 Results

First, confirmatory factor analysis was run using SmartPLS 3.0. It was observed that item loadings of all latent constructs are over 0.60. Table 1 presents the result of the latent correlation analysis to test construct validity. It reveals that the square roots of Average Variance Extracted (AVEs) of individual reflective constructs are higher than inter-correlations to other constructs, which confirms discriminant validity. The square roots of AVEs of individual constructs are also over or close to 0.80. It implies that each of the latent variables explains its indicators more than the error variances, supporting a notion of convergent validity. Then, two types of reliability estimations (Cronbach’s alpha and composite reliability) consistently show reasonable levels (over 0.75) (see Table 1).

Table 1. Discriminant validity

Measurement items	CA	CR	AVE	Fornell-Larcker criterion					
				AT	AN	LK	PI	PS	IM
AT: anthropomorphism	0.835	0.881	0.598	0.773					
AN: animacy	0.851	0.895	0.632	0.707	0.795				
LK: likeability	0.943	0.944	0.815	0.517	0.726	0.903			
PI: perceived intelligence	0.907	0.908	0.729	0.473	0.672	0.710	0.854		
PS: perceived security	0.779	0.822	0.702	0.447	0.562	0.681	0.640	0.838	
IM: importance	1	1	1	0.247	0.297	0.241	0.213	0.215	1
IN: intention	1	1	1	0.403	0.414	0.422	0.447	0.440	0.112

Note: CA Cronbach’s Alpha; CR composite reliability; AVE average variance extracted

Next, the structural model was tested to estimate the proposed relationships by applying a bootstrapping random sampling approach (2000 sample). As shown in Fig. 1, anthropomorphism ($b = 0.205, p < 0.001$), perceived intelligence ($b = 0.196, p < 0.001$), and perceived security ($b = 0.194, p < 0.001$) have a statistically positive influence on adoption intention. These estimated factors explained approximately 27% of variances of the adoption intention.

In order to address the second objective, a multi-group analysis comparing path coefficients between those respondents who have been exposed to two different robots: NAO ($n = 421$) or Relay ($n = 420$), was conducted. Specifically, respondents exposed to NAO considered anthropomorphism ($b = 0.235, p < 0.001$) and perceived safety ($b = 0.259, p < 0.001$) as important elements of affecting intention. On the contrary, those exposed to Relay indicate that the two elements of anthropomorphism ($b = 0.094, p > 0.05$) and security ($b = 0.055, p > 0.05$) are not significant to induce the adoption intention. More interestingly, importance of operations ($b = 0.113, p < 0.05$) and perceived intelligence ($b = 0.192, p < 0.05$) appear to be vital factors affecting intention, in respect to a Relay robot. It is important to note that check-in was considered more critical than room delivery, with mean values of 3.64 and 2.66, respectively ($p < 0.001$). Adoption intention of Relay is higher than that of NAO (NAO = 2.98, Relay = 3.28; $t = -3.59, p < 0.001$).

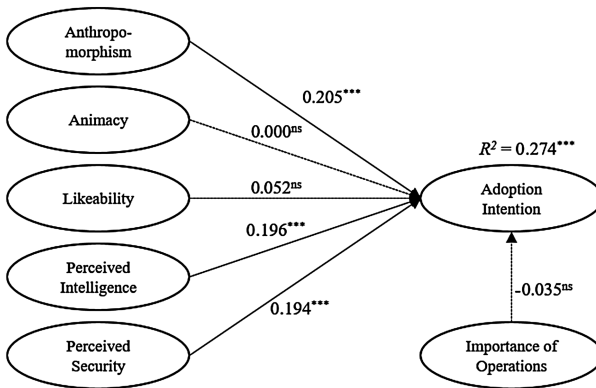


Fig. 1. Robot evaluation on adoption intention

Lastly, a series of approaches to assessing confounding effects in the estimated results were taken into account. First, Harman’s single-factor test was conducted by deriving single factors from exploratory factor analysis. The unrotated principal components analysis with seven factors counts for 40.795% of the total variance, below the cut-off value of 50%. Second, it was observed that no correlation shows an extreme value ($r > 0.90$). The collinearity test also reveals that the variance inflation factor values of all exogenous constructs are below 10, which suggests a limited concern of multicollinearity in the model.

4 Study 2: Automatic Emotional Responses to Hotel Service Robots

4.1 Methodology

To obtain better insights into consumers' inner states while viewing hotel service robots, Study 2 was conducted in a laboratory utilizing biosensor equipment: Tobii X2-30 eye tracker, Shimmer3 GSR+, and Affectiva AFFDEX facial coding system. Eye tracker measures gaze locations, time length of fixations, and pupil dilation, which are useful to assess attention and emotional state of respondents. GSR is a measure of skin conductance, which indicates the level of sweating at the skin's surface, signalling emotional arousal (e.g., stress, excitement, cognitive loads). The specific goal of GSR measurement is to identify Skin Conductance Responses (SCR) that can be attributed to the stimuli. Heart rate (HR) and art rate variation (HRV) were also measured, as accelerated heart rate can indicate emotional arousal. AFFDEX is an automated facial coding system consisting of face and facial landmark detection, face texture feature extraction, facial action classification, and emotion expression modelling (McDuff et al., 2016). The emotion expressions (joy, anger, surprise, fear, contempt, sadness, and disgust), valence, and emotional engagement were detected using EMFACS system (Brave & Nass, 2003) and given scores from 0 (absent) to 100 (present). The threshold for this research was set to 50. Together, these sensors provide a picture of the two dimensions in human emotions according to the circumplex model: valence and arousal (Russell, 1980; Russell & Feldman Barrett, 1999).

Respondents were invited to participate in the study through personal communication in a professional network setting. Fitted with biosensors, respondents went through a short calibration process before being exposed to the stimuli. This study uses the same stimuli and randomization procedure as in Study 1; respondents viewed the images for 8 s, the NAO check-in video for 77 s, and the Relay room delivery video for 98 s. The data collection and analysis were facilitated by iMotions biometric research platform for real-time synchronization of all complementary sensors. A total of 32 respondents participated in this study; 15 of them are male, 27 are in their 20s, and all reside in the UK.

4.2 Results

First, to better understand the objects that caught respondents' attention, eye tracking results were consulted. Figure 2 presents gaze distribution for NAO and Relay robots. The heatmaps show the intensity of gaze, which is concentrated on the "face" of both robots (tablet-like screen in Relay) (A). Respondents also fixated on the "chest" area (text in Relay, to the right of chest) (B), and lower body (C). On average, respondents took 1.3 s (secs) to fixate on NAO's face (A) and spent 1.8 s. In comparison, TTFF for the chest area (B) is 2.1 s and time spent is 0.9 s (C: TTFF = 3.4 s, time spent = 0.3 s).

For Relay, the TTFF for A is 1.1 s and time spent is 2.3 s (B: TTFF = 1.4 s, time spent = 1.1 s; C: TTFF = 4.3 s, time spent = 0.4 s). These results indicate that humans are naturally drawn to “faces” first, indicating the importance of anthropomorphism in robot design, confirming results in Study 1 and in previous studies (Bartneck et al., 2009b). Also, respondents were drawn to text, as evident in longer time spent fixating on Relay’s face and right chest. This may indicate higher cognitive load as respondents read the text.

The same patterns were also found in the videos; respondents’ gaze was concentrated on the face of one who was speaking during the conversation (examples of the video sequences with gaze distribution can be found in Fig. 5). NAO’s hands move during a conversation so as to indicate animacy, mimicking natural human behaviour during a conversation. This, however, did not receive significant attention by respondents when compared to the face.

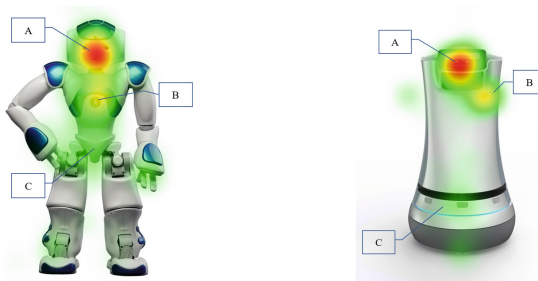


Fig. 2. Gaze distribution and area of interest: NAO versus relay (images)

Second, GSR, HR, and HRV were consulted to gauge emotional arousal levels. Figure 3 illustrates the normalized GSR for NAO and Relay images (colours represent respondents). With the exception of a few with GSR following a downward trend without any peaks, respondents experienced GSR peaks during viewing NAO or Relay images. The share of respondents who had at least one GSR peak during viewing NAO was 73%, while Relay was 71%. The highest number of GSR peaks for NAO was five, while Relay was two. On average, NAO induced 8 peaks per minute (ppm) (net: 10.8 ppm), while Relay 6.3 ppm (net: 8.6 ppm). It is important to note that given the TTFF of 1.3 s for NAO’s face, it appears that most respondents experience an onset of GSR after fixating on the robot’s face. GSR peaks on Relay are more spread out throughout the 8-s duration.

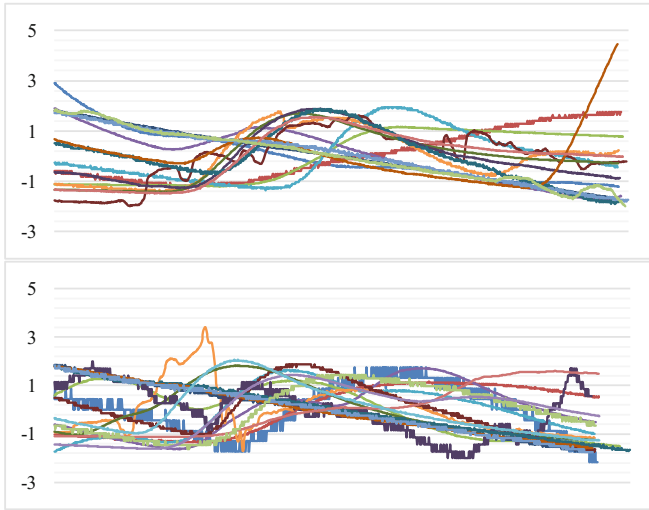


Fig. 3. Skin conductance (normalized GSR): NAO (top) versus relay (bottom)

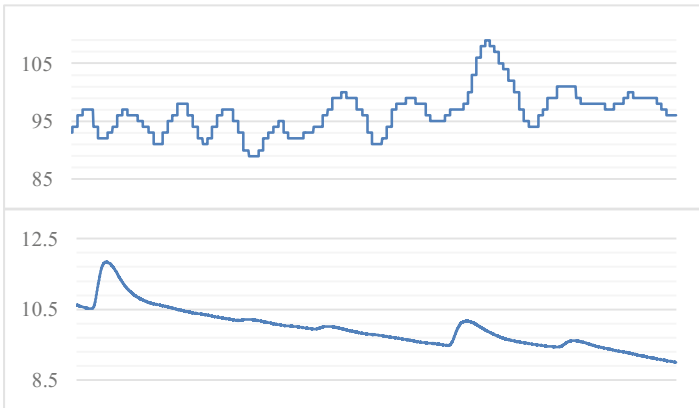


Fig. 4. Heart rate (top) versus skin conductance (bottom): respondent #031

In some instances, HR and HRV are consistent with GSR. However, as suggested in previous research, the impact of emotion on HR is less apparent than on GSR, as HR variability can be caused by sympathetic and parasympathetic nervous system and other mechanisms (Shimmer, 2015). Figure 4 compares the HR and GSR from

Respondent #031 who watched the NAO check-in video. While the HR is highly variable, a significant jump in HR at about two-third of the video is consistent with the peak in GSR. Due to high variability in respondents' HR, HR and HRV were consulted in this study only to complement the explanation for GSR peaks.

While watching the NAO check-in video, 87% respondents had at least one GSR peak; the highest number of GSR peaks was 12. All respondents (100%) had GSR peaks while watching the Relay video; the highest was 15. The NAO video induced 4.6 ppm on average (net: 5 ppm) and Relay 4 ppm, both higher than the typical rate of 1–3 ppm of non-specific skin conductance response (NS-SCR). As illustrated in Fig. 6, GSR peaks can be attributed to several scenes in the videos. NAO is stationary; it stands on the desk and converses with the guest. Most peaks were detected at the beginning of the video, where NAO started greeting the guest. Other moments with significant peaks are when (a) NAO verifies guest's reservation and payment, and (b) asks guest to process the room key (i.e., to take a key from a dispenser and deposit it on a device located by NAO's side) (see Fig. 5). On the other hand, Relay is a mobile robot. In addition to the beginning of the video, significant peaks were detected along Relay's journey: Taking the elevator, finding the room, serving the guest, being rated, and going back to the lobby.

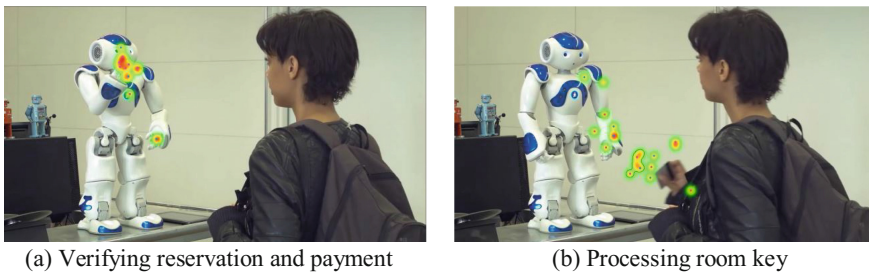


Fig. 5. NAO video sequences with most GSR peaks (shown with gaze data) (*video credit EARS 2015*)

Lastly, to better understand the valence of respondents' emotions, results from facial expression analysis were consulted. While most respondents maintained neutral expressions throughout the study, some occurrences of positive and negative expression were detected (i.e., when the probability exceeds the threshold). Figure 7 presents the share of respondents expressing valence, emotional engagement, and basic emotions while watching the videos. No indication of sadness or fear was detected. From the occurrences alone, it can be observed that more NAO respondents expressed positive emotions (including joy), while more emotional engagement was detected from Relay respondents. The share of respondents who expressed positive emotion is slightly higher in NAO than in Relay (20 and 18%, respectively), but lower in terms of negative emotion (Relay = 35% and NAO = 33%). However, in terms of time percent,

on average Relay respondents had longer expressions of positive emotions (23.7% of the duration) than negative emotions (8.2%).

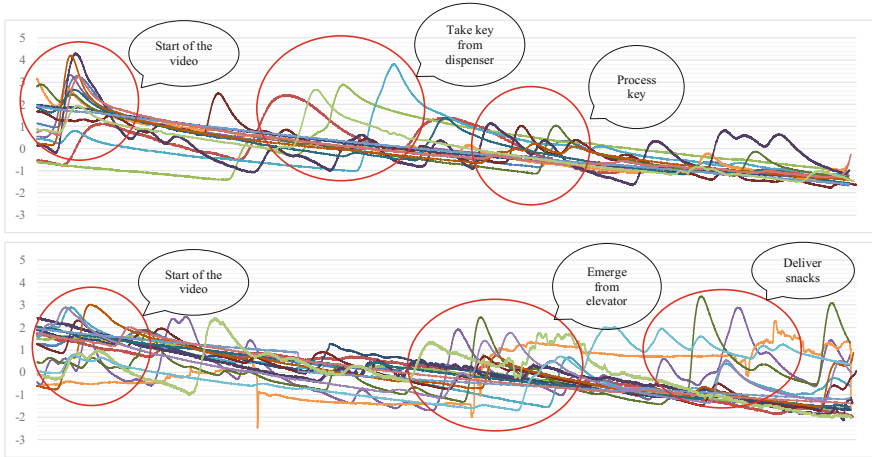


Fig. 6. Skin conductance (normalized GSR): NAO (top) versus relay (bottom)

On the other hand, the positive expression among NAO respondents lasted for 5.2% of the duration and the negative for 6%. When linked to other metrics (GSR peaks, HR, and eye tracking), it was identified that intense positive emotions (positive valence and joy) happened when Relay was navigating from the elevator and expressing happiness after being rated high for its service (making child-like, semi-circle movements and sounds). While this may be interpreted as indications of

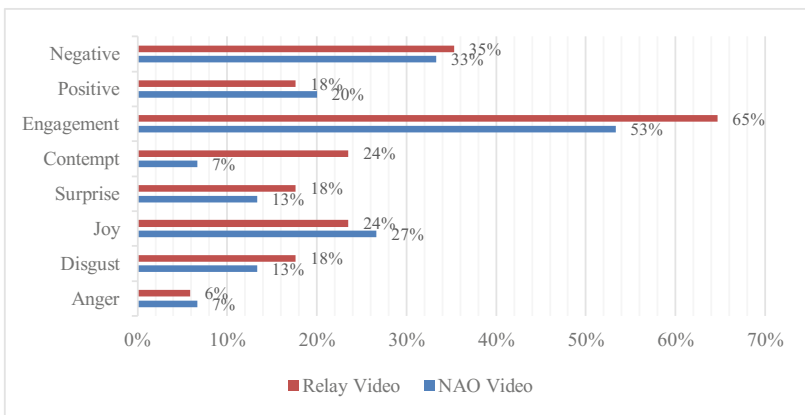


Fig. 7. Percent occurrence of emotional expression: NAO versus relay

animacy, being able to navigate the hotel on its own signals its intelligence (Bartneck et al., 2009b), supporting Study 1.

5 Conclusion and Implications

Study 1 found that adoption of hotel service robots is significantly influenced by dimensions of HRI: anthropomorphism, perceived intelligence, and perceived safety. Considering the functions of these robots, manning the front desk and delivering items to guestrooms, they are to replace human staff and interact with guests in a social setting (i.e., direct interaction during check-in and combination of direct and indirect interactions during room delivery). Therefore, the attribution of human characteristics and behaviour to robots that take the most human function is important. Indeed, anthropomorphism was significant in inducing use intention of NAO robot for check-in. This is supported by the findings in Study 2 where respondents' attention is focused on the face, with limited fixation on other body parts. Secondly, perceived safety was significant in affecting NAO's adoption. Based on GSR peaks and HR, it was identified that respondents experienced emotional arousals during the stages when NAO verifies reservation and payment and when it instructs the guest to process a room key. It can be suggested that consumers have a certain level of concerns over the safety of the check-in process as they anticipate its outcome.

On the other hand, Relay's adoption intention was significantly predicted by perceived intelligence and importance of operations. While the latter cannot be explained by Study 2, several emotional indicators hinted at perception of intelligence. For example, GSR peaks and attention were identified during critical moments when Relay is finding its way around, especially when it emerges from the elevator to navigate to the guestroom. This autonomous behaviour may be interpreted as intelligent behaviour by respondents (Bartneck et al., 2009b). It is critical to note that most respondents perceived that room delivery is not essential to hotel experience, when compared to check-in. As evident in lack of significance of perceived safety, people may feel more at ease about using robots for room delivery, as supported by the longer time share of positive emotional expressions for the duration of the Relay video.

By conducting two complementary studies, this research provides a better understanding of consumer evaluation of hotel service robots and its effects on adoption intention. Importantly, it provides empirical evidence supporting the critical factors that drive consumer adoption intention. For hotel managers, this research provides implications on the design requirements for employing robots. Firstly, for essential consumer-facing functions where consumers might be nervous about the outcomes of the interactions, it is important to enhance the feeling of safety. In addition, infusing the robots with humanlike characteristics (e.g., by programming humanlike expressions) will also contribute to inducing positive attitude from consumers. On the other hand, for non-essential services, it is important to pay more attention to functionality (e.g., robot delivery to find its way around, robot concierge to give relevant recommendations); one that will be interpreted by consumers as intelligence.

Due to limited access to hotel facilities employing actual robots, this study uses a second-hand interaction (i.e., respondents watch a video of a robot serving others).

Therefore, HRI evaluation was not based on personal experience. However, the results are still significant to understand consumer openness to the emerging trends in hotel experience. Future studies should be conducted in actual service settings, using mobile eye tracker and other biosensors. Along with relatively low variance explained for behavioural intention, other factors related to adoption of new technology (e.g., trust, attitude, etc.) are suggested to be considered in future research. Additionally, the videos used in this study are from two different sources: Researchers (NAO) and marketers (Relay). Lastly, it is important to note that this study was not designed for experimentation with perfectly comparable situations. As robots are designed to fulfil certain functions (e.g., NAO cannot serve room delivery), comparing adoption intention between different types of robots and settings independent of the inherent design is not possible.

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Part VI
Mobile Tourism

The Mechanism that Links the Implicit Theories of Intelligence and Continuance of Information Technology: Evidence from the Use of Mobile Apps to Make Hotel Reservations

Lawrence Hoc Nang Fong^{1(✉)}, Irene Cheng Chu Chan², Rob Law²,
and Tuan Phong Ly³

¹ Faculty of Business Administration, University of Macau, Macau S.A.R.,
China

lawrencefong@umac.mo

² School of Hotel & Tourism Management, The Hong Kong Polytechnic
University, Hong Kong S.A.R., China

irene.cc.chan@connect.polyu.hk, rob.law@polyu.edu.hk

³ Institute for Tourism Studies, Macau S.A.R., China

jack@ift.edu.mo

Abstract. Consumers are increasingly adopting mobile apps to make hotel reservations. Apart from attracting new users, hoteliers and Online Travel Agents (OTAs) devote great efforts to motivate customers' continuous use of the apps. This study introduces Implicit Theories of Intelligence (ITI) as an antecedent of the intention to continue the use of apps and explores the underlying mechanism. This study draws from an online survey administered to 459 Chinese respondents to link ITI with continuance intention (CI). The findings show that incremental theorists of intelligence exhibited higher hedonic motivation (HM) and lower perceived risk (PR) in the use of apps than entity theorists of intelligence. HM positively predicted CI, whereas PR negatively predicted CI. Contrary to our expectation, the mediating role of effort expectancy was not supported. These findings offer meaningful implications to hoteliers and OTAs.

Keywords: Lay theory · Essentialism · Tourism · Hotel · Smartphone Technology adoption

1 Introduction

Mobile apps (called apps hereafter) are increasingly adopted by businesses along with the growing penetration rate of smartphones to reach, interact, and transact with consumers. Many hoteliers and Online Travel Agents (OTAs) use apps to allow consumers to make hotel reservations. An increasing number of consumers adopted these reservation apps in recent years. To stand out from competitors, hoteliers and OTAs need to develop apps that provide customers with a pleasant hotel reservation experience to convince customers to use the apps again. Literature indicates that perception and

emotion that arouse from usage experience are key determinants of adoption and continuance of information technology (Martins, Oliveira, & Popovič, 2014; Venkatesh, Thong, & Xu, 2012; Zhou, Lu, & Wang, 2010). However, these studies did not delve into the upstream variables, such as belief. Belief is recognized as a dispositional variable, but it can be temporarily changed (Franiuk, Pomerantz, & Cohen, 2004). By shaping people's belief to a desirable type, hoteliers and OTAs will be able to manipulate customers' perception and emotion aroused from the experience of using apps and convert them to repeated users. The current study connects a belief notion called Implicit Theories of Intelligence (ITI) (Sternberg, 1985) and customers' continuance intention on the use of apps to make hotel reservations. This study also examines the intervening perceptual and emotional variables.

ITI categorizes a person according to his or her belief about intelligence. Some people believe that intelligence is alterable, whereas others believe that intelligence is static (Dweck, Chiu, & Hong, 1995; Wilson & English, 2017). These two opposing beliefs affect people's views of goal achievement, motivation to achieve the goal, and goal performance. Findings on the effects of ITI were primarily drawn from empirical examinations pertinent to academic achievement. Scholarly attempts to extend the predictive power of ITI to responses in other domains were scarce (King, 2012). The present study introduces ITI as an antecedent of continuance intention to use apps to make hotel reservations. Potential intervening perceptual and emotional variables, which include effort expectancy, perceived risk, and hedonic motivation, are identified from literature (Gao, Waechter, & Bai, 2015; Venkatesh et al., 2012) and empirically examined. The findings contribute to literature in ITI and technology use. To our best knowledge, ITI has not been used to explain tourism and hospitality phenomena. As such, findings would add knowledge to the tourism and hospitality literature, especially on how ITI shapes repeated use of apps for making hotel reservation.

This study aims to examine the mediating roles of effort expectancy, perceived risk, and hedonic motivation between ITI and continuance intention to use apps to make hotel reservations. Our empirical examination was limited to a certain ethnicity because cultural differences are a significant factor that affects technology use (Im, Hong, & Kang, 2011). Chinese were chosen for this study given that Chinese are currently considered the most lucrative tourism market by a majority of global hoteliers (Fong, Lam, & Law, 2017).

2 Theory

2.1 Implicit Theories of Intelligence (ITI)

ITI grounds in essentialist lay theories which explain "people's beliefs about human attributes" (Haslam, 2017, p. 5). ITI distinguishes people according to two opposing beliefs. Incremental theorists are individuals who believe that human attributes are alterable, whereas entity theorists are those who believe that human attributes are static. Intelligence is one of the earliest examined and most extensively researched attributes (Sternberg, 1985; Tamir, John, Srivastava, & Gross, 2007); other attributes include personality (Chiu, Hong, & Dweck, 1997), culture (Chao, Takeuchi, & Farh, 2017),

emotion (Tamir et al., 2007), and willpower (Job, Dweck, & Walton, 2010). According to ITI, incremental theorists of intelligence are the people who believe intelligence is flexible and improvable, whereas entity theorists of intelligence believe intelligence is fixed, regardless of how much effort has been devoted (Wilson & English, 2017). ITI is consistently shown as a strong predictor of academic performance (Ayoub & Aljughaiman, 2016; Blackwell, Trzesniewski, & Dweck, 2007; Yeager & Dweck, 2012). However, the predicting effects of ITI in other domains have been largely overlooked (King, 2012), including information technology continuance.

Literature indicates that incremental theorists of intelligence view difficulties more positively than entity theorists of intelligence (Blackwell et al., 2007). Difficulties are considered as an opportunity to learn from incremental theorists' perspective, whereas entity theorists tend to avoid pursuing an activity because they are afraid that they will encounter difficulties again. Thus, compared with entity theorists, incremental theorists exhibit more favourable response towards new and complex products (Sharifi & Palmeira, 2017), have stronger motivation to improve through repeated attempts (Mangels, Butterfield, Lamb, Good, & Dweck, 2006) and are more likely to persist an activity (Kasimatis, Miller, & Marcussen, 1996). By extending these rationales to the current study, incremental theorists of intelligence may be more likely to continue the use of apps to make hotel reservations (an activity). Intervening variables (i.e., mediators) should be identified to validate this argument.

2.2 Intervening Variables Between ITI and Continuance Intention

Theories suggest that perception and emotion are equally important in predicting information technology continuance (Kim, Chan, & Chan, 2007). Perception and emotion can be shaped by implicit beliefs of intelligence of individuals (Dweck & Leggett, 1988). These evidence lend credence to the mediating roles of perception and emotion in the ITI–continuance link in our study.

Incremental theorists of intelligence generally believe that outcome follows personal effort and focus on mastery goal (i.e., improvement gained in the process of attaining success); by contrast, entity theorists believe that outcome is independent from effort and focus on performance goal (i.e., success) (Blackwell et al., 2007; Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Molden & Dweck, 2006; Yeager & Dweck, 2012). Incremental theorists of intelligence seek learning opportunities to improve their skill and ability, which is something that entity theorists do not consider or value (Blackwell et al., 2007). These characteristics of incremental theorists of intelligence echo effort expectancy, which is a major factor that affects the adoption and continuance of information technology (Venkatesh et al., 2012). Effort expectancy refers to the degree of ease of using technology. Effort expectancy captures both ease of learning and skill development (Venkatesh et al., 2012). Drawing from their experience of the use of apps to make hotel reservations, incremental theorists may perceive that the apps are easier to use (i.e., higher effort expectancy) than entity theorists who do not concern about learning and skill development. We then hypothesize that:

H1: Effort expectancy mediates the relationship between ITI and continuance intention to use apps to make hotel reservations; thus, incremental theorists (versus entity theorists) exhibit higher effort expectancy, which is positively related to continuance intention.

Literature indicates that incremental theorists of intelligence prefer challenges that involve risk, whereas entity theorists of intelligence strive to avoid challenges (Baird, Scott, Dearing, & Hamill, 2009; Dweck & Leggett, 1988). This finding suggests that incremental theorists of intelligence are risk-tolerant. Given their exposure to the same stimulus, incremental theorists' perception of risk may be lower than that of their entity counterparts. Consumers' perceived risk in mobile commerce, which has been shown as a major factor that affects their reuse of mobile commerce, is mainly constituted by financial and privacy concerns (Gao et al., 2015; Lu, Yu, Liu, & Wei, 2017). Incremental theorists may have higher continuance intention to use apps to make hotel reservations because their perceived risk is lower than that of entity theorists. We hypothesize that:

H2: Perceived risk mediates the relationship between ITI and continuance intention to use apps to make hotel reservations; thus, incremental theorists (versus entity theorists) exhibit lower perceived risk, which is negatively related to continuance intention.

In addition to shaping perception, ITI influences emotional responses (Dweck & Leggett, 1988). Recent research reported that the emotional responses of incremental theorists were primarily rooted in the positive aspects of experience, whereas the emotional responses of entity theorists mainly aroused from negative aspects (Ommundsen, 2001; Tempelaar, Niculescu, Rienties, Gijsselaers, & Giesbers, 2012). Incremental theorists can regulate their emotions better than entity theorists even under negative circumstances (Ayoub & Aljughaiman, 2016). Incremental theorists find goal achievement more enjoyable (Biddle, Wang, Chatzisarantis, & Spray, 2003). These observations lead us to posit that incremental theorists feel their experience of using apps to make hotel reservations more positively than entity theorists. Emotional responses derived from the use of technology (coined as hedonic motivation by Venkatesh et al., 2012) is a major driver of continuance intention; in particular, positive emotion enhances continuance intention for information technology. Therefore, we hypothesize that:

H3: Hedonic motivation mediates the relationship between ITI and continuance intention to use apps to make hotel reservations; thus, incremental theorists (versus entity theorists) exhibit higher hedonic motivation, which is positively related to continuance intention.

The following conceptual framework (Fig. 1) illustrates the hypotheses in this study.

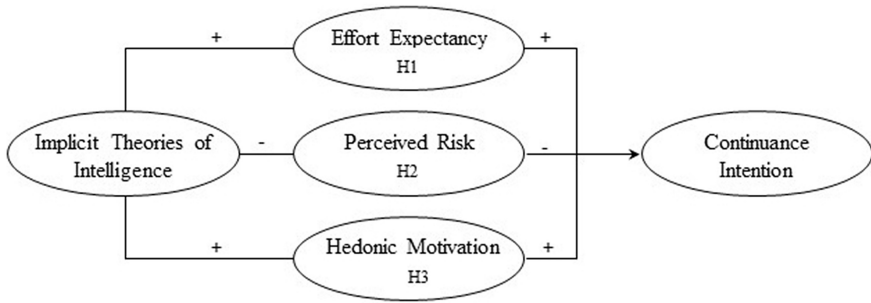


Fig. 1. The conceptual framework

3 Methods

3.1 Data Collection and Respondents

An online survey was administered to collect data. Respondents were chosen based on three criteria. First, they need to have experience in using apps to make hotel reservations because their continuance intention was considered. Second, they should be Chinese because this study was limited to the Chinese ethnicity (please refer to the last paragraph in the Introduction). Third, they should be at least 18 years old because this is the legal adult age in China. Given these criteria, three screening questions were asked at the beginning of the survey. In addition, attention check items were added to minimize the inattentiveness of respondents. For example, the respondents were asked to choose a specific answer (e.g., please choose “strongly disagree”).

Data collection was conducted on a Chinese online survey platform called Sojump (www.sojump.com). This survey platform has been consistently used to collect Chinese samples regarding their online purchase behaviour (Fong et al., 2017; Wang, Law, Guillet, Hung, & Fong, 2015). The data collection period lasted for four days. Among the 897 received responses, 431 were filtered out by either the screening questions or the attention check items. A total of 466 usable responses were retained for analysis.

3.2 Measures

The measure of ITI was borrowed from Dweck (2000). The scale consists of eight items, which was rated on a six-point Likert scale, where 1 denotes “strongly disagree” and 6 denotes “strongly agree”. Four items are reversely coded. A high ITI score denotes incremental theories of intelligence and the opposite denotes entity theories of intelligence. The other constructs are context-specific (using apps to make hotel reservations) and were adapted from previous studies. Effort expectancy, hedonic motivation, and continuance intention were adapted from Venkatesh et al. (2012). Perceived risk was adapted from Slade, Dwivedi, Piercy, and Williams (2015). These items were measured on a seven-point Likert scale, where 1 denotes “strongly disagree” and 7 denotes “strongly agree.” Their gender and age were identified because

these two variables are significant predictors of technology use (Venkatesh et al., 2012); their effects on continuance intention were also studied.

A Chinese questionnaire was developed through translation and back-translation procedures because the respondents were Chinese. A postgraduate student majoring in translation studies translated the items into Chinese. The Chinese version was then translated into English by another postgraduate student majoring in translation studies. The English version was semantically consistent with the original version. Thus, we concluded that the Chinese instrument was adequate. A pilot test was conducted to further evaluate the validity of our instrument. Respondents were recruited on Sojump.com. Among the 108 received responses, 105 were considered usable. No respondent indicated problems on the readability of instrument.

4 Results

4.1 Data Cleaning and Characteristics of Respondents

Among the 466 usable responses, seven outliers were found because their standardized values in certain variables were beyond the range of -4 to 4 . By removing these outliers, 459 responses were retained for subsequent analysis.

Gender distribution was almost even among the participants (male: $n = 234$, proportion = 51.0%). They were relatively young, given that 223 participants were 18–29 years old (proportion = 48.6%), followed by 179 participants aged 30–39 (proportion = 39.0%), and 57 participants aged 40 or above (proportion = 12.4%).

4.2 Measurement Model

Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to examine the data. The recommended sample size for PLS-SEM is at least 10 times the greatest number of structural paths that point to a construct (i.e., 60 samples in this study). Therefore, the sample size (i.e., 459) was adequate. Data normality was not an issue because bootstrapping technique was applied (bootstrapping samples = 10,000).

The reliability of measures was demonstrated by the fact that outer loadings (see Table 1), Cronbach's alpha, ρ_A , and composite reliability of all constructs were greater than 0.7 (see Table 2). Convergent validity was achieved because the Average Variance Extracted (AVE) values exceed 0.5. Discriminant validity was also achieved given that outer loadings were greater than cross loadings of the items (see Table 1) and the AVE values of constructs were greater than their squared correlations with other constructs (see Table 2). Further supporting evidence of discriminant validity was obtained using the Heterotrait-Monotrait Ratio (HTMT) approach (Henseler, Ringle, & Sarstedt, 2015). Results show that both $HTMT_{0.90}$ criterion and $HTMT_{inference}$ were met.

Table 1. Outer loadings and cross loadings

Items		ITI	EE	PR	HM	CI
ITI1	You have a certain amount of intelligence, and you can't really do much to change it ^a	0.766	0.069	-0.201	0.122	0.105
ITI2	Your intelligence is something about you that you can't change very much ^a	0.816	0.072	-0.146	0.065	0.053
ITI3	No matter who you are, you can significantly change your intelligence level	0.744	0.034	-0.042	0.126	0.012
ITI4	To be honest, you can't really change how intelligent you are ^a	0.792	0.155	-0.133	0.092	0.103
ITI5	You can always substantially change how intelligent you are	0.742	-0.012	-0.102	0.191	0.025
ITI6	You can learn new things, but you can't really change your basic intelligence ^a	0.685	0.023	-0.106	0.058	0.048
ITI7	No matter how much intelligence you have, you can always change it quite a bit	0.760	-0.018	-0.048	0.154	-0.001
ITI8	You can change even your basic intelligence level considerably	0.776	0.044	-0.096	0.195	0.048
EE1	Learning how to make hotel reservations using mobile apps is easy for me	0.014	0.819	-0.006	0.278	0.445
EE2	My interaction with mobile apps for hotel reservations is clear and understandable	0.098	0.781	-0.054	0.324	0.444
EE3	I find making hotel reservations using mobile apps easy	0.028	0.837	0.046	0.299	0.524
EE4	It is easy for me to become skilful at making hotel reservations using mobile apps	0.081	0.785	-0.084	0.367	0.526
PR1	I do not feel totally safe providing personal private information over mobile apps for hotel reservations	-0.152	-0.014	0.832	-0.095	-0.135

(continued)

Table 1. (continued)

Items		ITI	EE	PR	HM	CI
PR2	I am worried about making hotel reservations using mobile apps because other people may be able to access my account	-0.138	-0.031	0.909	-0.179	-0.157
PR3	I do not feel secure sending sensitive information across mobile apps for hotel reservations	-0.128	-0.035	0.924	-0.198	-0.189
HM1	Making hotel reservations using mobile apps is fun	0.112	0.342	-0.170	0.901	0.441
HM2	Making hotel reservations using mobile apps is enjoyable	0.152	0.398	-0.168	0.911	0.528
HM3	Making hotel reservations using mobile apps is very entertaining	0.190	0.318	-0.143	0.885	0.422
CI1	I intend to make hotel reservations using mobile apps in the future	0.034	0.544	-0.090	0.359	0.843
CI2	I will always try to make hotel reservations using mobile apps	0.043	0.553	-0.177	0.472	0.888
CI3	I plan to make hotel reservations using mobile apps frequently	0.115	0.420	-0.189	0.476	0.781

Notes Values in boldface are outer loadings, whereas others are cross-loadings

^aReverse-scored

ITI implicit theories of intelligence; EE effort expectancy; PR perceived risk; HM hedonic motivation; CI continuance intention of the use of apps for making hotel reservations

Table 2. Assessment of reliability and validity of constructs

Squared correlation between constructs	ITI	EE	PR	HM	CI
ITI	1.000				
EE	0.005	1.000			
PR	0.024	0.001	1.000		
HM	0.028	0.156	0.032	1.000	
CI	0.005	0.367	0.033	0.270	1.000
Average variance extracted	0.579	0.649	0.790	0.808	0.703
Composite reliability	0.917	0.881	0.919	0.927	0.876
rho_A	0.915	0.824	0.871	0.892	0.797
Cronbach's Alpha	0.897	0.820	0.866	0.882	0.788

Notes: ITI implicit theories of intelligence; EE effort expectancy; PR perceived risk; HM hedonic motivation; CI continuance intention of the use of apps for making hotel reservations

Common method bias was also assessed. Harman’s single-factor test showed that more than one factor was identified, and the first factor accounted for 25.928% of variance. Common method bias was not present because variance was below 50% (Zhou, Su, Zhou, & Zhang, 2016). Further supporting evidence was obtained using the Unmeasured Latent Marker Construct (ULMC) approach. Results showed that most method factor loadings were not statistically significant and the substantive variances of indicators were much larger than their method variances (ratio of 225:1) (Liang, Saraf, Hu, & Xue, 2007).

4.3 Structural Model and Testing of Hypotheses

A valid structural model should be free from multicollinearity. Given that the largest variance inflation factor was less than 5 (Hedonic motivation → Continuance intention: 1.276), multicollinearity was not a concern. Structural model testing results are shown in Fig. 2. Effort expectancy was not a significant mediator between ITI and continuance intention (coefficient = 0.033, $t = 1.349$, $p = 0.089$). Effort expectancy was significantly associated with continuance intention (coefficient = 0.480, $t = 12.104$, $p = 0.000$), but the relationship between ITI and effort expectancy was not significant (coefficient = 0.069, $t = 1.367$, $p = 0.086$). Thus, H1 was not supported. However, perceived risk (coefficient = 0.018, $t = 1.966$, $p = 0.025$) and hedonic motivation (coefficient = 0.052, $t = 2.819$, $p = 0.003$) were revealed as significant mediators. ITI had a negative relationship with perceived risk (coefficient = -0.156, $t = 2.648$, $p = 0.004$), which was negatively related to continuance intention (coefficient = -0.113, $t = 3.230$, $p = 0.001$). ITI had a positive relationship with hedonic motivation (coefficient = 0.168, $t = 3.139$, $p = 0.001$), which was positively associated with continuance intention (coefficient = 0.311, $t = 6.972$, $p = 0.000$). Therefore, H2 and H3 were supported. Moreover, hedonic motivation had a stronger effect size than the perceived risk (variance accounted for values = 0.679 and 0.229 respectively). The control variables gender (coefficient = 0.026, $t = 0.725$, $p = 0.234$) and age (coefficient = 0.044, $t = 1.279$, $p = 0.100$) did not affect continuance intention.

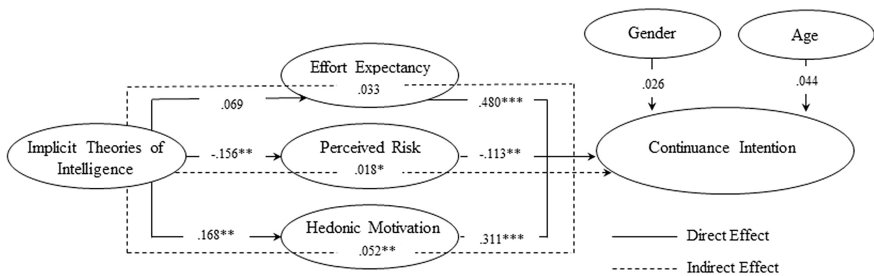


Fig. 2. Structural model testing results, Note *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; no asterisk —non-significant

5 Conclusions

The growing use of smartphones led to the growth of app users and the necessity of businesses to develop apps to cater to consumers. To increase their competitiveness, hoteliers and OTAs should develop apps that provide pleasant hotel reservation experiences to users to encourage them to use the apps again. The achievement of this objective requires an understanding of personal belief and the resulting perception and emotion that drive continuance intention to use these apps. This study examined the perceptual and emotional mechanism that connects ITI (a belief) and continuance intention.

This study revealed that ITI predicts continuance intention to use apps to make hotel reservations through perceived risk and hedonic motivation. Compared with entity theorists of intelligence, incremental theorists of intelligence perceived lower risk and felt more positively about their hotel reservation experience using apps. Hence, incremental theorists were more likely to use the apps again. The findings were coherent with our conjectures. The challenge-seeking characteristic of incremental theorists of intelligence denotes that they were more risk-tolerant (Baird et al., 2009; Dweck & Leggett, 1988). Apps were an innovative tool for hotel reservation compared with alternative means, such as travel agents and hotel reservation websites. The use of apps was generally considered more susceptible to financial and privacy risk. The belief of intelligence of incremental theorists buffered the perceived risk. Thus, their continuance intention was higher. Consistent with the previous findings that incremental theorists of intelligence felt more positively about the experience of goal achievement than entity theorists of intelligence (Ommundsen, 2001; Tempelaar et al., 2012), we found that incremental theorists of intelligence enjoyed the use of apps more than their entity counterparts. This positive experience becomes a strong motivator (even more significant than perceived risk) for them to reuse the apps to make hotel reservations.

Contrary to our expectation, effort expectancy did not mediate the ITI–continuance link because ITI was not related to effort expectancy. One possible explanation is that the mastery goal in the use of apps for making hotel reservations was not important to incremental theorists of intelligence. The reservation process with apps may be extremely simple and user-friendly that the learning opportunity was minimal and the ability to use the apps had little or even no value from the perspective of incremental theorists of intelligence. Mastery goal became meaningless to them, such as entity theorists. Incremental theorists of intelligence might even stress on performance goal, which is the concern of entity theorists (Biddle et al., 2003). However, this explanation about the relationship between ITI and effort expectancy has yet to be empirically confirmed.

The findings of this study contributed to literature in two major aspects. First, the robustness of the predicting power of ITI was demonstrated by applying it to predict information technology continuance, specifically on the use of apps to make hotel reservations. The literature on technology use has been extended by introducing ITI as an antecedent. Second, the mechanism that connects ITI and information technology continuance was clarified by showing that perceived risk and hedonic motivation were

mediators, whereas effort expectancy was not. The findings support the theoretical contention that perceptual and emotional responses to a stimulus are connectors of individual belief and behaviour (Mischel & Shoda, 1995).

Based on our findings, we recommend that hoteliers and OTAs ensure that their apps are easy to use and can render their customers an enjoyable experience (higher hedonic motivation). The risk of using apps should be minimized and customers should be aware of hoteliers and OTAs' risk minimization initiatives. Compared with entity theorists of intelligence, incremental theorists of intelligence exhibited higher hedonic motivation, lower perceived risk, and were thus more likely to use the apps again. Thus, hoteliers and OTAs should devote effort to accommodate entity theorists. In this regard, a temporary conversion of entity theorists to incremental theorists is vital. People's belief of intelligence can be shaped by reading text featuring a certain type of belief (i.e., incremental or entity beliefs)—semantic priming (Burns & Isbell, 2007). For example, "everyone has high intellectual potential" was used to trigger incremental belief of intelligence in the mind of entity theorists. In their advertisements that encourage customers to use apps to make hotel reservations, hoteliers and OTAs may highlight that everyone has high intellectual potential and intellectual enhancement follows every trip, so that incremental belief will be triggered in entity theorists' mind, and reinforced in incremental theorists' mind. Given the salience of incremental belief in their mind, customers would perceive a lower risk and anticipate a more enjoyable experience upon their decisions of using the apps for making hotel reservation again.

The current study has several limitations. First, all respondents were Chinese. Generalizing the implications to other ethnic consumers should be cautious. Replications of this study in other cultures are recommended. Further works may consider an examination of the moderating role of culture in the proposed mediation effects in this study. Second, this study only examined two perceptual mediators, which include effort expectancy and perceived risk, by considering their relevance to ITI in literature. Future research may identify and examine other perceptual mediators. Third, intention is not perfectly correlated with behaviour (Sheeran, 2002). Future research may capture the actual behaviour using longitudinal approach.

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An Exploratory Study of the Dependence on Mobile Payment Among Chinese Travelers

Rob Law¹(✉), Sunny Sun¹, Markus Schuckert¹,
and Dimitrios Buhalis²

¹ School of Hotel and Tourism Management, The Hong Kong Polytechnic University, Kowloon, Hong Kong

15901578r@connect.polyu.hk, {rob.law,
markus.schuckert}@polyu.edu.hk

² Bournemouth University, Poole, UK
dbuhalis@bournemouth.ac.uk

Abstract. Information and communication technology has evolved over the past two decades, particularly in the recent five years. Along with the extensive use of smartphones, mobile payment has emerged as an innovation of the age. At present, Chinese people heavily rely on mobile payment in their daily lives and their travels. Nevertheless, what if mobile payment breaks down during their use? To address this issue, this study focuses on the pre-crisis management stage (i.e., awareness and flexibility) of the crisis management framework to detect the potential breakdown of mobile payment systems. Findings indicate that during their travel, travelers tend to use bank cards or mobile payment more than they use cash. Moreover, attributes for measuring awareness and flexibility are identified through principal component analysis. Results of this study could assist tourism practitioners in understanding the current situation of adopting mobile payment among Chinese travelers and preparing for the potential breakdown of mobile payment.

Keywords: Mobile payment · Usage · Chinese travelers

1 Introduction

The rapid development of Information and Communication Technology (ICT) and the increasing use of mobile devices have resulted in the revolution of a new commercial format, that is, mobile payment (Liébana-Cabanillas et al., 2017). Although mobile payment has not reached the usage levels of other players, such as financial institutions, within the Western context, “cash-free” and mobile payments in China have become notable worldwide. In 2016, mobile payment occupied 71% of the total money transfer (CCTV, 2017). The present study defines mobile payment as third-party mobile payment via smartphones through mobile networks or wireless technologies under financial regulations. Alipay (53.70%) and WeChat Pay (39.51%) are two major third-party

mobile payment methods that dominate the Chinese mobile payment market (Liébana-Cabanillas et al., 2017; Xinhua, 2017). In 2016, Alipay and WeChat Pay occupied 92% of the market share (Guo, 2017). By April 2017, Alipay had already covered over 26 countries/regions and supported transactions in 18 currencies. By May 2017, WeChat Pay had entered 15 countries/regions and supported transactions in over 12 currencies (Souhu, 2017). In addition, mobile payment transactions in China are voluminous. For example, in the first quarter of 2017, China's third-party mobile payment transactions reached 820 billion US dollars (China Internet Watch, 2017). Statista (2016) indicated that the volume of mobile payment transactions may reach 2724 billion US dollars by 2018. At present, the "cash-free" payment in China is becoming increasingly common, particularly among many Chinese travelers who generally bring their smartphones during their domestic travels (Xinhua, 2017). Zhongchoujia (2017) explained that one customer depends on mobile payment so much that she did not realize that she had left her bank card in the automated teller machine (ATM) three weeks ago. The evidence shows that Chinese travelers heavily depend on mobile payment. This dependence may become problematic when mobile payment fails during the transaction process.

Stafford, Yu, and Armoo (2002) determined that a crisis can be divided into two types, namely, self-inflicted and external crises. The breakdown of mobile payment systems, as a technology failure, is an external crisis. Brown, Rovins, Feldmann-Jensen, Orchiston, and Johnston (2017) reviewed the crisis literature and determined that tourism crisis, such as natural disasters or incidents have been increasing over the past 20 years, and emphasized the importance of crisis preparation to limit the severity of the impact of crises on the tourism industry. Wang and Ritchie (2010) and Santana (2004) explained that crises should be addressed with regards to effective crisis planning because the hotel and tourism industry is vulnerable to crises. Crisis management is typically categorized in three stages: pre-crisis, crisis, and post-crisis (Richardson, 1994). Ritchie (2004) reviewed crisis management in the tourism field and found that although the impacts of crises cannot be stopped, they can be limited through public/private sector managers. Nevertheless, crises can be prevented by focusing closely on the pre-crisis stage for effective preparation.

Previous studies discussed natural disasters or incidents that have affected the tourism industry and investigated the crisis management from the perspective of suppliers (Brown et al., 2017; Ritchie, 2004). Although ICT is expanding substantially, only a few studies have addressed technology crisis in tourism. In addition, studies on tourism crisis management mainly deal with how to respond to and recover from crises; such limited studies rarely discuss how to reduce and prepare for crises (Ritchie, 2008). The current study used the evidence that Chinese travelers rely heavily on mobile payment during their travels as basis to investigate the technology crisis from the perspective of consumers, thereby filling in the aforementioned research gaps. In particular, the present study intends to identify the degree of dependence on mobile payment of Chinese travelers, analyze the awareness of Chinese travelers toward the breakdown of mobile payment systems, and investigate the flexibility of Chinese travelers when mobile payment breaks down.

2 Literature Review

2.1 Mobile Payment

Along with the emergence of mobile payment, an increasing number of studies have investigated the user acceptance of mobile payment and its associated risks (Khalilzadeh, Ozturk, & Bilgihan, 2017; Liébana-Cabanillas et al., 2017; Lu & Law, 2007). Liébana-Cabanillas et al. (2017) analyzed the user acceptance of mobile payment and identified the benefits of mobile payment that determine the user intention to adopt it. Peng, Xiong, and Yang (2012) adopted the Technology Acceptance Model (TAM) and explored the factors that affect the acceptance of mobile payment among tourists during their travel. The results showed that perceived compatibility, the applicability of mobile payment in the destination, and perceived security affect the mobile payment adoption of consumers.

Khalilzadeh et al. (2017) applied the Unified Theory of Acceptance and Use of Technology (UTAUT) and TAM models and investigated the acceptance of near-field communication (NFC)-based mobile payment of 412 restaurant customers. These researchers determined that attitude, security, and risk significantly affect the intention of consumers to use mobile payment. Khalilzadeh et al. (2017) revealed that although mobile payment brings convenience to consumers, risks may be inevitable during the transaction process. That is, the perceived risk negatively affects the intention of consumers to adopt mobile payment. For example, quick response code (QR code) considerably improves transaction efficiency. However, mobile payment becomes risky for consumers if attackers intend to replace the QR codes that comprise the beneficiary information of merchants. Thus, Lu, Yang, Li, Yuan, Li, and Chang (2017) proposed a novel mechanism to authenticate QR codes, thereby ensuring the safety of mobile payment transactions.

In summary, mobile payment brings immense convenience to tourists during their travel. Nevertheless, as emphasized by previous studies it also involves risks (Khalilzadeh et al., 2017; Lu et al., 2017). In addition, risks are reflected in technology failure. Lu and Law (2007) used a hotel in Hangzhou as an example and emphasized the high risk of technology failure along with the extensive adoption of Information Technology (IT) in tourism. The findings disclosed that IT problems could have a long-standing effect on the tourism industry. On the basis of the over reliance of Chinese travelers on mobile payment, one can infer that they will be largely affected if mobile payment breaks down. Given that this issue was generally disregarded by previous studies, the present study intends to explore the dependence of Chinese travelers on mobile payment during their travels. Moreover, this study will deal with the pre-crisis stage as a means to prepare for failures in mobile payment.

2.2 Crisis Management

An increasing number of crises, including natural disasters and human-influenced incidents, have affected the tourism industry since the 2000s (Faulkner, 2001). Ritchie (2004) discussed the emerging importance of crisis management in the tourism industry and proposed a strategic approach to pre-crisis preparation for natural disasters. Mikulić, Sprčić, Holiček, and Prebežac (2016) also mentioned that crises in the tourism

industry have intensified after 9/11 and the event involving the Bardo National Museum in Tunisia in 2015, and integrated risk management principles to deal with Croatian tourism. Four types of frameworks have been proposed to deal with crisis management (Fink, 1986; Mitroff & Pearson, 1993; Richardson, 1994; Smith, 1990). In the 1980s, Fink (1986) advocated a four-stage framework that covers the “prodromal crisis,” “acute crisis,” “chronic crisis,” and “crisis resolution” stages. Smith (1990) proposed a simplified framework with three stages, namely, “crisis of management,” “operational crisis,” and “crisis of legitimation.” Mitroff and Pearson (1993) proposed a complicated five-stage framework comprising “signal detection,” “preparation,” “damage containment,” “recovery,” and “learning.” Richardson (1994) further suggested a three-stage framework that involves “pre-crisis,” “crisis,” and “post-crisis.”

In the mid-2000s, Lu and Law (2007) discovered an IT crisis in the tourism industry. Lerbinger (1997) explained that technology failure is considered a failure caused by external factors. Lu and Law (2007) revealed that IT-associated failures are a potential problem in the tourism industry in Mainland China because of the long-standing effects of such failures. Also, Campo, Díaz, and Yagüe (2014) conducted an online survey of managers in Spanish hotels and determined that technology turbulence can influence the long-term willingness of hotels to innovate. To achieve crisis preparation, Wang and Ritchie (2010) developed the Onion Model of Strategic Crisis Planning framework by considering psychological, organizational, and environmental contextual factors. Racherla and Hu (2009) proposed a knowledge-based crisis management framework to achieve the sustainability of a destination. This study incorporated an IT-enabled management system as well.

Although four types of crisis management frameworks have been proposed, given that the three-stage crisis management framework is the most commonly adopted framework in previous studies (Azadian, Shirali, & Saki, 2014; Racherla & Hu, 2009; Santana, 2004), the present study adopts the three-stage framework from Richardson (1994). The present study only focuses on the pre-crisis stage because of its significance in minimizing the possible occurrence of unfortunate events and in effectively preparing for crises (Azadian et al., 2014). That is, mitigation and preparedness can guarantee the resources that are needed for recovery and determine in advance the tasks that should be completed by whom and under what circumstances (United Nations Environmental Programme, 2008). Awareness and flexibility are the two most important elements that determine how to prepare for a pre-crisis. The awareness identified can assist different parties in mitigating the breakdown of mobile payment. The flexibility analyzed can support different parties in preparing for the corresponding measures to deal with the breakdown of mobile payment. Figure 1 shows the Effective Crisis Management framework that the present study uses.

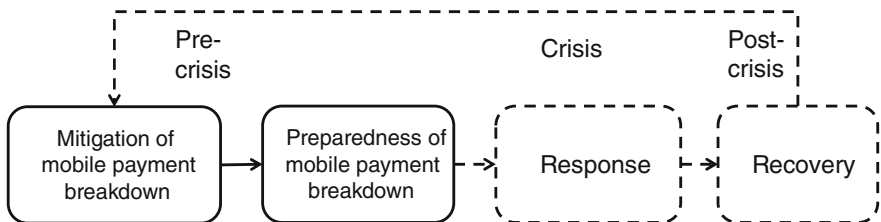


Fig. 1. Effective crisis management

In summary, most previous crisis management studies discussed natural disasters or incidents (Brown et al., 2017; Ritchie, 2004; Wang & Ritchie, 2010), applied IT concepts to mitigate crises, or generally introduced three different stages of crisis management in tourism from the perspective of suppliers (Mikulić et al., 2016; Racherla & Hu, 2009; Santana, 2004). Only a few studies have investigated IT-related crises in tourism along with its rapid development. In addition, Chinese travelers heavily depend on mobile payment during their travels. Thus, the present study focuses on the pre-crisis stage to mitigate and prepare for the breakdown of mobile payment from the perspective of consumers on the basis of the adjustment of an existing crisis management framework (Richardson, 1994; Santana, 2004).

3 Method

3.1 Questionnaire Design

The present study adopted a quantitative research method. A questionnaire was designed to analyze the failure of mobile payment systems faced by Chinese travelers. A pilot test was conducted in June 2017 prior to the actual data collection. The respondents provided a few comments on numbering, formatting, and wordings or expressions. An experienced researcher provided constructive comments on the expressions in the questionnaire. Thereafter, the researcher addressed the comments and finalized the questionnaire.

The questionnaire includes five sections. The first section centers on user experience. The questions include mobile payment methods that travelers have used for their recent trip(s). The travel types of travelers include domestic travel (i.e., own city), domestic travel (anywhere except own city), and outbound travel. This section also asks for the amount of mobile payment transactions made by travelers during their recent travel. The second section explores the dependence of travelers on mobile payment. The items include “I will bring my bank card for my domestic travel (i.e., own city).” and are rated using a Likert scale that ranges from 5 (strongly agree) to 1 (strongly disagree). The third section includes two items for measuring awareness that were modified from Azadian et al. (2014). Awareness is measured as follows when applying these items to the breakdown of mobile payments: “I know how to deal with mobile payment breakdown.” and “I know the channel(s) to communicate with the mobile payment company if mobile payment breaks down.” The fourth section contains three items for measuring flexibility. Two of these items were modified from Azadian et al. (2014) and one item was added after the pilot test. In summary, the three items are aimed at measuring awareness. That is, “I will give up mobile payment for this transaction if it fails,” “I have prepared other payment methods if mobile payment breaks down,” and “I am confident in solving mobile payment breakdown by myself.”

The items in the third and fourth sections are rated on a Likert scale that ranges from 5 (strongly agree) to 1 (strongly disagree). The final section comprises the basic socio-demographic information such as gender, age, and education level.

The actual data collection was performed by a third-party company (i.e., Sojump company) on June 17–25, 2017. The sample requirements are the Chinese respondents who have used mobile payment (e.g., Alipay, WeChat Pay) in the past one year during their travel. Sojump company was selected because it was established in 2006 and is currently the biggest third-party data collection company in China (Sojump, 2017). In addition, this company uses a set of criteria to ensure the quality of the data collected. The criteria include the screening questions and duration of the completion of the questionnaire. Lastly, the company distributed the questionnaire to the respondents in different parts of China who met the requirements, and 547 questionnaires were collected. After excluding the invalid questionnaires, 538 valid ones were used for further analysis. Descriptive data analysis was performed to obtain the experience and socio-demographic information of users. Thereafter, an overview of their dependence on mobile payment was provided. Paired sample t-tests were conducted further to analyze the differences between domestic and outbound travelers. Furthermore, principal component analysis was considered an appropriate method to identify the measurements of awareness of mobile payment breakdown and the flexibility of travelers when they face mobile payment failure.

4 Findings and Discussion

4.1 Descriptive Statistics

Table 1 presents the recent travel experience and socio-demographic information of the 538 respondents. Among them, 358 respondents used Alipay during their recent travel, 178 respondents used WeChat Pay during their travel, whereas only 1 respondent used Apple Pay and 1 respondent used Android pay. In terms of travel types, 273 respondents traveled in their own cities, 405 respondents traveled domestically in China (excluding their own cities), and 86 respondents traveled outbound. During their recent travels, 161 respondents (29.9%) spent RMB 500 to RMB 1000 in mobile payment transactions, and 122 respondents (22.9%) spent RMB 1001 to RMB 1500. In terms of socio-demographic information, 45.2% of the respondents are male and 54.8% are female. The respondents tend to be young because 68.6% are 28–37 years old. In terms of education level, 79.6% of the respondents hold undergraduate degrees. Most of the respondents reported a monthly household income of RMB 10,001–RMB 20,000. In particular, 37.2% of the respondents reported a monthly household income of RMB 10,000–RMB 15,000 while 30.3% reported a monthly household income of RMB 15,001–RMB 20,000.

Table 1. User experience and socio-demographic information

n = 538	Frequency	Percentage
<i>User experience of mobile payment during travel</i>		
Mobile payment method		
Alipay	358	66.5
WeChat pay	178	33.1
Apple pay	1	0.2
Android pay	1	0.2
Travel type^a		
Domestic travel (own city)	273	50.7
Domestic travel (elsewhere except own city)	405	75.3
Outbound travel	86	16.0
Transaction amount of mobile payment (RMB)		
<500	61	11.3
500–1000	161	29.9
1001–1500	123	22.9
1501–2000	99	18.4
≥ 2001	94	17.5
Social-demographic information		
Gender		
Male	243	45.2
Female	295	54.8
Age		
18–27	83	15.4
28–37	369	68.6
38–47	62	11.5
48–57	20	3.7
58 or above	4	0.7
Education level		
High school or below	10	1.8
College degree	57	10.6
Undergraduate degree	428	79.6
Graduate degree or above	43	8.0
Monthly household income (RMB)		
10,000 or below	44	8.2
10,001–15,000	200	37.2
15,001–20,000	163	30.3
20,001–25,000	77	14.3
25,001 or above	54	10.0

^aDuring one trip, the respondents can travel to more than one destination. Hence, the sum of the frequency of each travel type exceeds 538, while the sum of percentage exceeds 100%

4.2 Dependence on Mobile Payment

Table 2 illustrates the dependence on mobile payment of the respondents during their travels. Regardless of travel type, Chinese travelers tend not to bring cash, as reflected in their response to “I will bring cash during my travel.” The mean values of the domestic travel (i.e., own city), domestic travel (i.e., anywhere except own city), and outbound travel are 2.81, 2.69, and 2.85, respectively. By contrast, travelers tend to bring their bank cards during their travel, as reflected in the mean values of the statement “I will bring my bank cards during my travel.” The mean values of the domestic travel (i.e., own city), domestic travel (i.e., anywhere except own city), and outbound travel are 3.93, 4.07, and 4.40, respectively. The mean value of this statement is relatively high ($m = 4.40$) when travelers travel outbound. The finding matches the study of Chen and Chen (2017) that ATMs are not available everywhere or sometimes tourists do not feel that ATMs are safe in unfamiliar destinations.

Table 2. Dependence on mobile payment

	Min	Max	Mean	Std. deviation
<i>Domestic travel (own city) (n = 273)</i>				
Bring bank card	1	5	3.93	1.05
Bring cash	1	5	2.81	1.18
<i>Domestic travel (elsewhere except own city) (n = 405)</i>				
Bring bank card	1	5	4.07	1.08
Bring cash	1	5	2.69	1.16
<i>Outbound travel (n = 86)</i>				
Bring bank card	1	5	4.40	0.74
Bring cash	1	5	2.85	1.20

Note 1 = strongly disagree, 5 = strongly agree

Paired sample t-tests were conducted to analyze the differences between each pair in terms of the “bring bank card” and “bring cash” during the travel of Chinese travelers (Table 3). The findings revealed the significant differences in the “bring bank card” statement for both types of domestic travel (i.e., own city and anywhere except own city). The difference was significant at the 0.1 level. That is, travelers are more likely to bring bank cards when traveling elsewhere except their own cities than when traveling in their own cities. No significant differences were determined in other pairs. Furthermore, no significant differences were determined in reference to the “bring cash” statement between any of pair (i.e., pair 1, pair 2, and pair 3). Thus, travelers are unlikely to bring cash during their travels regardless of travel type.

Table 3. Paired sample t-tests

	Mean	Mean difference	Std. deviation	Std. error mean	t	df	Sig. (2-tailed)
<i>Bank card</i>							
Pair 1	3.82	-0.157	1.105	0.088	-1.794	158	0.075
	3.97						
Pair 2	4.18	-0.059	1.099	0.189	-0.312	33	0.757
	4.24						
Pair 3	4.34	-0.097	0.918	0.117	-0.830	61	0.410
	4.44						
<i>Cash</i>							
Pair 1	2.89	0.000	0.907	0.072	0.000	158	1.000
	2.89						
Pair 2	2.91	0.118	1.297	0.222	0.529	33	0.600
	2.79						
Pair 3	2.97	0.032	1.228	0.156	0.207	61	0.837
	2.94						

Note

- Pair 1: comparison between domestic travel to own city and to anywhere except own city
- Pair 2: comparison between domestic travel to own city and outbound travel
- Pair 3: comparison between domestic travel to anywhere except own city and outbound travel

4.3 Awareness and Flexibility

Table 4 describes the measurements of “awareness” and “flexibility” that match “mitigation of mobile payment breakdown” and “preparedness of mobile payment breakdown” in the proposed framework. “Prepare for other payment methods” ranks the highest (m = 4.41), whereas “Give up mobile payment for this transaction” ranks the lowest (m = 3.86). The findings indicated that although travelers are prepared to use other payment methods, they will not easily relinquish mobile payment transactions even though they encounter mobile payment breakdown. The findings indicate the important roles of “awareness” and “flexibility” (Azadian et al., 2014; Ritchie, 2004) within the mobile payment breakdown context.

Table 4. Attributes of awareness and flexibility

n = 538	Min	Max	Mean	Std. deviation
1. Deal with the MP problem	1	5	3.72	1.013
2. Know the communication channels	1	5	3.93	1.015
3. Give up MP for this transaction	1	5	3.86	1.074
4. Prepare other payment methods	1	5	4.41	0.755
5. Confident in dealing with the MP problem	1	5	4.09	0.855

Note: *MP* mobile payment

Principal component analysis was further conducted. The Kaiser–Meyer–Olkin (KMO) and Bartlett’s tests revealed that the value of the KMO measure of sampling adequacy equaled 0.660. In terms of Bartlett’s test of sphericity, chi-square = 625.238, $df = 28$, and $p = 0.000$. Table 5 reflects the communality of each attribute. The communalities of all the five attributes were over 0.6. Table 6 presents the two factors extracted and the total variance explained is 67.648 after extraction with the principal component analysis using a fixed number of two and rotation with varimax with Kaiser normalization. Three attributes represented the dimension “awareness” and the Cronbach’s alpha value was 0.735. Another two attributes represented the dimension “flexibility” and the Cronbach’s alpha value was 0.488. Although Cronbach’s alpha should be above 0.7, the value varies based on the number of attributes involved in the construct. Perry, Charlotte, Isabella, and Bob (2004, p. 363) explained that if the value of Cronbach’s alpha is between 0.5 and 0.7, then such scale is still considered moderately reliable. In addition, the value 0.488 was considered acceptable because only two attributes are used to measure flexibility in the current study. The first two attributes identified to measure awareness confirmed the findings of Azadian et al. (2014), although the third attribute (i.e., “confident in dealing with X problem”) was typically considered a measurement of flexibility in previous studies. In the context of mobile payment breakdown, “I am confident in dealing with a mobile payment breakdown.” was considered a good measurement for awareness. Moreover, two attributes used to measure flexibility showed good agreement with those from Azadian et al. (2014).

Table 5. Communalities of five attributes

	Initial	Communalities
1. Deal with the MP problem	1.000	0.678
2. Know the communication channels	1.000	0.663
3. Give up MP for this transaction	1.000	0.695
4. Prepare other payment methods	1.000	0.724
5. Confident in dealing with the MP problem	1.000	0.613

Extraction method: principal component analysis

Table 6. Principal component analysis

	Factor	
	1	2
<i>Awareness</i>		
1. Deal with the MP problem	0.818	
2. Know the communication channels	0.813	
3. Confident in dealing with the MP problem	0.780	
<i>Flexibility</i>		
1. Prepare other payment methods		0.832
2. Give up MP for this transaction		0.802

(continued)

Table 6. (continued)

	Factor	
Variance explained	40.441	27.036
Total variance explained	67.648	
Cronbach's alpha	0.735	0.488

Note

Extraction method: principal component analysis

Rotation method: varimax with Kaiser Normalization

Rotation converged in four iterations

5 Implications

At present, Chinese travelers depend heavily on mobile payment during their travels (Xinhua, 2017; Zhongchoujia, 2017). On the basis of the three-stage crisis management framework, the present study focuses on the pre-crisis stage to detect potential failures, mitigate the breakdown, and prepare for future breakdowns of mobile payment. Three attributes are identified to measure awareness and two attributes are identified to measure flexibility. The present study extends the crisis management framework to the mobile payment context and proves its applicability.

The findings also provide a few practical implications to tourism practitioners. The findings indicate that if travelers face a mobile payment breakdown, they do not clearly know how to deal with this issue. Thus, tourism practitioners can communicate with different parties, such as mobile payment companies, for travelers to be informed of the platform that can solve their problems in case of mobile payment breakdown. Furthermore, the attributes that are identified to measure the awareness and flexibility of consumers can be used by tourism practitioners to prepare consumers for possible breakdowns of mobile payment.

6 Conclusions and Future Research

Along with the rapid development of mobile payment, Chinese travelers solely depend on their smartphones during their travels. Nonetheless, the potential breakdown of mobile payment cannot be ignored. Most previous studies investigated natural disasters or incidents that affect the tourism industry. However, only a few studies have analyzed IT crises in tourism. To fill in this research gap, the present study explores the dependence on mobile payment of Chinese travelers and focuses on the pre-crisis stage by adopting a three-stage crisis management framework (Richardson, 1994).

The findings show that travelers tend not to bring cash during their travels regardless of travel type. They mainly depend on their bank cards or mobile payment. In addition, the present study identifies three attributes to measure awareness and two attributes to measure flexibility to effectively identify and prepare for possible

breakdowns of mobile payment. Several limitations are presented given that this research is still an exploratory study. First, only a few studies have investigated technology crises in tourism in recent years. Second, only two attributes are identified for measuring flexibility. Third, although “Knowing the communication channels of mobile payment breakdown.” is one of the attributes to measure awareness, the types of communication channels are not clear in this stage. Similarly, “prepare for other payment methods” is an attribute to measure flexibility, but the types of payment methods that consumers should prepare for are unknown. Thus, future studies can analyze in detail the communication channels for addressing breakdowns of mobile payment and investigate other payment methods that consumers can use in cases of such failure.

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Tangible Tourism with the Internet of Things

Dario Cavada¹, Mehdi Elahi², David Massimo², Stefano Maule¹,
Elena Not³(✉), Francesco Ricci², and Adriano Venturini¹

¹ Ectrl Solutions, Trento, Italy

{cavada, maule, venturini}@ectrlsolutions.com

² Free University of Bozen-Bolzano, Bolzano, Italy

{meelahi, damassimo, fricci}@unibz.it

³ Fondazione Bruno Kessler, Trento, Italy

not@fbk.eu

Abstract. The Internet of Things (IoT) enables new ways for exploiting the synergy between the physical and the digital world and therefore promises a more direct and active interaction between tourists and local products and places. In this article we show how, by distributing sensors/actuators in the environment or attaching them to objects, one can sense, trace and respond to users' actions onsite. Our research method analysis specific scenarios (case studies) of tangible interaction. We first discuss important issues, which were identified in these scenarios, and are related to log analysis, system usability, and extended models for learning user preferences. Then, the lessons learned in these specific cases have informed the constructive design of a wider scope infrastructure, which is here described and motivated. We envisage the tight integration of localized IoT solutions into a comprehensive mobile information system for tourism.

Keywords: Internet of things · Tangible interaction · Mobile tourism services

1 Introduction

Fast-paced advances in the field of the Internet of Things (IoT) make the exploitation of responsive networks of sensors and actuators to enable new ubiquitous information services possible. Nowadays, end-users of tourism information services can take advantage of different modes for acquiring information and satisfying their visiting goals: both through online services (e.g., mobile information guides) as well as through the interaction with physical objects (e.g., smart cards that activate services) and digitally augmented places (e.g. through public displays activated by presence). However, in the tourism domain all these different forms of interaction have hardly been integrated in a holistic system that offers a seamless and personalized user experience across several touch points with tourism products and services. For this to happen, there is the need of a system infrastructure that entails the reasoning over users' requests and actions monitored by heterogeneous applications, sensors and devices. In such an infrastructure, tourists should be able to seamlessly search for information about points of interest and local purchase opportunities through their personal device. Moreover, they should be advised about the presence of nearby interesting places

(recommendations) and related special offers on their smartphones or public displays. Finally, in order to inform their decisions, they should be offered the possibility to manipulate products to purchase while getting detailed descriptions about their unique features.

However, the complexity of dealing with a large application scenario that integrates IoT and ubiquitous information services of several types calls for a multi-step approach. In this paper, we follow a bottom up approach. We first report on a few replicable application scenarios at progressive levels of complexity, which we have implemented. We then illustrate the lessons learned in their analyses and the future work directions that we are now following in order to scale to a full IoT enhanced destination information system. Section 3 of the paper describes the initial simplified standalone IoT installations that were evaluated with end-users to develop and test a light-weight IoT platform that is robust, and easy to update and monitor from remote. Results from the pilot studies are reported in Sect. 4. We then turn to consider how smart things can be integrated into a wide area information infrastructure involving a network of IoT onsite installations interconnected with mobile personalized services accessible from personal devices and with web-based services accessible from personal computers or info points (Sect. 5). This infrastructure includes a centralized, cloud-based management of users' activity logs and recommendation services which support optimal information selection. The lessons learned, which are summarized in Sect. 6, suggest that a proper design of the interaction with the smart things is fundamental in encouraging the correct usage of the system. In fact, we observed that not all the recorded interactions with IoT installations correspond to a meaningful user behavior, and therefore caution must be exercised when automatically analyzing the collected data. When this is done, learning preferences from low-level behavior data is possible, as our initial study shows, and developing recommendation services for suggesting what to do next is a feasible task. Some reflections are collected at the end of the paper on issues related to scaling-up to a comprehensive scenario of interconnected physical and digital information services.

2 Background

Mobile information services have rapidly become indispensable helpers for tourists with a basic familiarity with technology (Grün et al., 2008; Rasinger et al., 2007; Ricci, 2011). But new forms of data exchange are revolutionizing the way information is distributed. A prime example is the new paradigm of the IoT, which refers to the networks of interconnected devices and objects embedded with electronics that exchange data and cooperate towards a common goal (Atzori et al., 2010). IoT enables new and effective ways for getting situation-aware information and a more direct dialogue between tourists and local products and places, thus providing innovative instantiations of the Smart Tourism concept (Buhalis & Amaranggana, 2014; Gretzel et al., 2015). By distributing sensors/actuators in the environment or attaching them to objects, it is now possible to sense, trace and respond to users' actions onsite or to cope with the evolving state of the environment (Kubitza et al., 2016; Neuhofer et al., 2015; Guo et al., 2014). Therefore, we are not only able to monitor the information tourists

search for, their bookings and preferred topics, but also the places they stop by, the products they get engaged with, and which actions they perform (observe, evaluate, compare, purchase, etc.). This offers the possibility to use a wide range of means for involving tourists in more captivating physical interactions, for personalising the information services more effectively and for better understanding the market needs and preferences.

IoT technology supports, for example, the augmentation of relevant points of interest distributed in the environment (outdoors or indoors) with beacons, i.e., small devices broadcasting low-energy Bluetooth messages encoded with standard transmission protocols (e.g. Eddystone¹). These messages can be sensed by the Bluetooth receiver available in most of the personal devices (tablets and smartphones) and, with the aid of background processes running on the devices, can fire the generation of location-based notifications or feed information to a user model in order to support further personalization of the system generated information (Ng et al., 2017). The possibility to augment physical objects with sensors, detecting when they are moved and manipulated, enables scenarios where descriptive information about objects is presented to users at the very exact time they are inspecting them, hence, stimulating enjoyment and sharing (Shaer & Hornecker, 2010). We have, for example, public displays showing a description when a product is taken out of its display position and is manipulated, with object movement detected via beacons. Or, as it will be illustrated below, one can build an interactive plinth (smart showcase) that provides information about objects that are put on top of it—with NFC tags attached to the objects and recognized by a reader integrated in the plinth. The information offered to the user, while interacting with the objects, can be adapted by explicitly selecting the output language and the type of information (theme) through buttons or other physical gestures. This type of interactive experience has been evaluated successfully in the cultural heritage domain (Marshall et al., 2016), where tangible interaction with exhibit objects, i.e., the encounter with the materiality dimension of museum artefacts or replicas, has the potential to increase visitors' engagement (Dudley, 2010; Petrelli et al., 2013). But the full application of tangible interaction to the development of novel tourism information services is still in its infancy. In fact, these types of scenarios, as we have mentioned in the introduction, have not been systematically investigated in a wider tourism perspective yet, e.g. when applied to the promotion of local products and in synergy with the other online information of tourism services.

To fill this research gap, the technological infrastructure presented in this paper has been purposefully designed and implemented (i) to speed up the deployment in the tourism domain of IoT installations that support the material exploration of artefacts, (ii) to easily interface with a wider network of digital services accessible through mobile devices and info points, and (iii) to put in place the necessary services for logging both the online user experience and the tangible interaction of tourists, thus enabling future studies on consumer behaviour to evaluate the impact of IoT applications in the tourism domain.

¹ <https://developers.google.com/beacons/eddystone>.

3 Research Method

The exploratory research on tangible tourism reported in this paper was articulated into four stages: the development of a light-weight IoT infrastructure; its use to build interactive installations that allow visitors of cultural/commercial events to interact with artefacts and products; the evaluation of pilot installations with actual users to derive possible design shortcomings, guidelines for the elaboration of log data and requisites for integrating the IoT technology into a larger service network; the extension of an existing platform for web-based and mobile tourism services with the IoT component.

3.1 The IoT Infrastructure

We started our investigation from the development of a light IoT infrastructure that allows to couple the tangible experience of objects with the concurrent presentation of digital information. The technological infrastructure was purposefully developed to facilitate the monitoring, maintenance and update of the system logic as well as the prospective integration into a wider network of the other information services. It includes three main components (Fig. 1): a light local processing unit (Hub), a module managing the content play (Viewer), and one or more preconfigured clusters of sensors (ioBox).

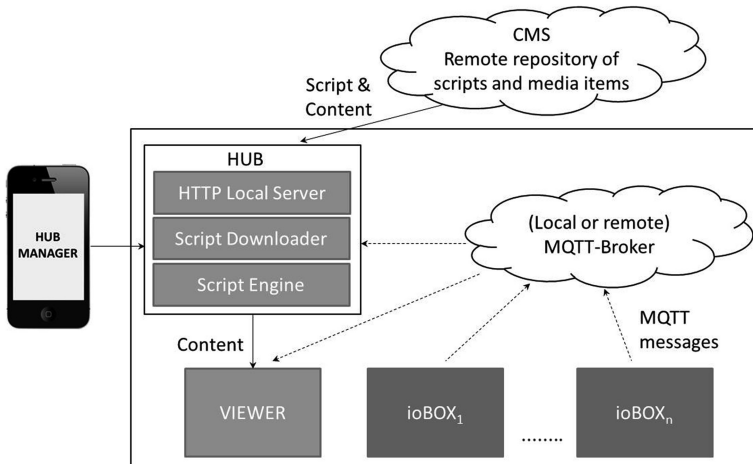


Fig. 1. The IoT infrastructure required to implement an interactive plinth

The Hub is a miniPC coupled with an output device like a HDMI monitor or a projector and it hosts a server engine that manages the execution of the interaction script. The script monitors the signals received from the sensors, decides which content should be presented and controls the output display by sending messages to the Viewer. It is possible to manage the start/restart of the server engine running on the Hub and to

control the download/update of the script through an application running on any Android device. This makes it very easy to test the same hardware with different interaction scripts or with different multimedia content even when the IoT installation is already deployed in place. The preparation of the media content (selection of the files and their semantic annotation) is done with a bespoke authoring tool that can be used also by users with minimal technical background (e.g. tourism or cultural heritage professionals) (Risseeuw et al., 2016). The ioBox (which is a replicable hardware setup with sensor capabilities) includes an Arduino MKR1000 with wifi connectivity and supports various sensors: an NFC Reader, up to five touch buttons, a proximity sensor, temperature/humidity measurement and a light detector. Different ioBoxes can be combined together to create complex scenarios (e.g. with multiple NFC-readers). Finally, the MQTT protocol is used for signal exchange between the components. Should the plinth be installed in a setting where good internet connection is available, the logs generated by the IoT installation, and in particular distinct information about the actions performed by the users on the augmented objects, are broadcasted to a central server for real time monitoring of its usage, detection of anomalous functioning and remote maintenance. Otherwise logs are stored locally.

3.2 Smart Installations for Experiencing Objects

Figure 2 shows one of the prototypes that we deployed in the Museo Storico Italiano della Guerra (Rovereto, Italy) since January 2017. Here, visitors have a direct material experience of original historical objects (artefacts from the WWI period) combined with information provision. It comprises two distinct areas, one to showcase the objects and one central active area. An initial presentation message invites visitors to select one object and put it within a clearly marked area. This starts an audio and a graphical animation describing what the object is, how it was made, and what it was used for. The visitor is invited to pick up and touch the object, observe it closely, possibly handing it to visit companions: these actions do not interrupt the presentation. Two buttons are available to select the output language (Italian or English).



Fig. 2. Museum visitor manipulating exhibited objects while hearing their description (left) and choosing a different language of presentation via pressing a button (right)



Fig. 3. IoT installation for product presentation at the Vinitaly 2017 fair (left) with a detail of its internal technical setup (right)

Figure 3 shows a second prototype that was developed to test similar IoT technologies to those illustrated above, but in a commercial setting where different challenges come at the forefront: the need to homogenize the installations to the company brand strategy; the requirement to attract and engage visitors to foster subsequent interactions with the salespersons; the utility of collecting product popularity statistics to initiate further marketing campaigns. Two exemplars of this prototype were tested with end-users during the four days of Vinitaly 2017 fair (Verona, 9–12 April 2017). Bottles of wine were available to visitors for a closer inspection of the packaging and for activating multimedia descriptions when bottles were placed onto wooden boxes of the selling winery, which were augmented with an RFID reader and buttons. Touch areas on the box surface were available to select the preferred output language (Italian, German, and English) and the type of information to display (information about the winery, the land of grapes growth, and the properties of the wine). Although very specific, this scenario can be generalized to many similar situations in which: there is a collection (catalogue) of objects with related information; stakeholders (e.g. retailers, exhibitors in fairs or markets, museum curators) are interested in conveying detailed information about the objects (e.g. technical features, organoleptic properties, manufacturing techniques, or their history); end-users are interested/need to learn about the objects; the physical engagement with the objects might improve the user experience; it would be difficult for the organization to provide personally all the details to individual users.

Within the two pilot installations described above, the IoT infrastructure proved to be robust, and easy to update and monitor remotely. The interactive plinth illustrated in Fig. 2 has been running for 8 months now, with only minor technical problems related to the instability of the internal museum wifi network that often prevents the connection from remote. The two interactive plinths illustrated in Fig. 3 were made available to the public for 4 days in a very crowded environment (the fair had about 128,000 visitors in total) with some problems on the usability side (as discussed in Sect. 4 below) but not on the technical side. The infrastructure scalability and modularity were also tested during the recent refurbishment (June 2017) of an exhibition at the Artillery section of the Museo della Guerra where a network of 5 different interactive stations (with multiple NFC readers each) provides multimedia information on a historical theme through object activation.

4 Lesson Learned from the Pilot Studies

When IoT installations support tangible interaction with products/objects (as those illustrated in the previous section), are deployed in shops, street markets, fairs, or exhibitions, they become a valuable source of information on activities of the consumers during the decision-making process. In fact, several automatic measures can be computed over the system logs, i.e., the snippets of data that register users' actions and events. Similar to web analytics of online information services and data mining of mobile apps usage (Liu, 2007; Pitman et al., 2010), the log of IoT installations can be analyzed for different purposes: (i) at run time, to collect information useful to understand the preferences of individual visitors and dynamically improve the relevance of the provided information and to feed user models that bootstrap the personalization of other online or mobile services used at following stages (Petrelli et al., 2017); (ii) to predict visitors' next actions and movements for better tuning the system behavior, e.g. when recommending sequences of POIs to visit (Hashemi & Kamps, 2017; Massimo et al., 2017); (iii) at periodic intervals, to compute statistics on system usage and visitors' preferences that may be of interest to the tourism/cultural organization for tuning marketing strategies or to understand the impact on their visitor experience; (iv) to identify system faults or usability problems.

In the pilot IoT installations described in Sect. 3 the following logs were collected: when an object (NFC tag) is placed in or removed from an active area (NFC reader) of the interactive plinth; when a button associated to a thematic or language choice is pressed; when a media file has started playing; when a media file play comes to an end; and when a media file play is interrupted. These types of logs allow to identify: the objects the visitors spent more time with; the types of information (themes) that were more frequently requested; which information is more frequently interrupted; but also, more advanced models of system usage, such as preferred sequences of actions and topics' relative importance for the users. For example, the logs collected at the multi-station installation at the Artillery section of Museo della Guerra were successfully used in an experiment addressing the challenging problem of learning the preferences of users (what item is chosen next and why) from low-level behaviour data by focusing on modelling and learning these preferences in a sequential decision-making problem, and using a novel machine learning technique called Inverse Reinforcement Learning (Massimo et al., 2017).

However, the experiences made in the first pilot studies reveal that caution must be exercised when automatically analyzing the logs of IoT installations, as not all the recorded interactions correspond to a meaningful user behavior and that extracting user interests and preferences from raw interaction data is not straightforward. Several issues need to be carefully taken into account: some irrelevant data may simply correspond to user attempts to understand how the system works or what type of information is available; usability problems might cause mistakes or repeated actions; the context where the IoT installation is placed might influence how it is used, e.g. crowding might urge users to free the installation earlier than actually desired. These

phenomena are clearly confirmed by the logs collected during the four days of the Vinitaly 2017 fair, which was our first attempt at deploying the IoT infrastructure in a commercial setting with high volumes of people and with a shallow user motivation for using the installations. The log analysis conducted over the 5600 recorded events of users' actions shows that the vast majority of the logged events (88%) are button pressing (for changing the output language or choosing the type of presented information) and only 335 events (6%) are selections of a new object to be described (6 different bottles of wine were available for the first plinth and 3 for the second). There are several sequences where the same "button" (which is a visually marked active area) is pressed repeatedly within a few seconds, with users apparently just testing how the system works or not sure they had pressed the desired option successfully. The latter usability problem is related to the adoption of the original wooden boxes used to ship wine bottles as the physical casing for the system: it came out that augmenting the wooden surface with touch capabilities was not completely intuitive for users who did not receive explicit feedback on the fact that the touch-active area had been successfully pressed apart from the media play start. The reduced number of product changes on top of the plinth is instead probably due to the location where plinths were placed, that is, very close to the entrance of the two selected fair booths with flows of visitors not favouring the stop and tranquil use of the system: when the second plinth was moved to an inner location, the higher quality of the recorded logs confirms a more proper system usage.

5 Towards an IoT Enhanced Destination Information System

In the final step of our research, we addressed the challenging problem of generating the full design of a Destination Information System that can leverage the new data and services enabled by an IoT infrastructure. Smart installations for experiencing objects have the potential to increase the time spent by visitors in learning about local products and places and to enhance their engagement in the overall tourism experience. To take the most out of this opportunity, however, it is necessary to integrate and harmonize the IoT-based services with the other existing destination information services. The experience gained with the specific IoT installations, described earlier in this paper, has allowed us to define the building blocks of a more general and comprehensive infrastructure. We are currently implementing an information system in which we will validate the exploitation within a unique network of services of: (i) interactive stations in shops for the tangible experience of objects and products, (ii) beacons for optimal visitor localization and identification, (iii) information kiosks, and (iv) mobile services that exploit the logs of all the visitors' interactions to personalize the information delivered on request or in a push mode. Figure 4 illustrates how these different types of technology are interconnected in a unique network.

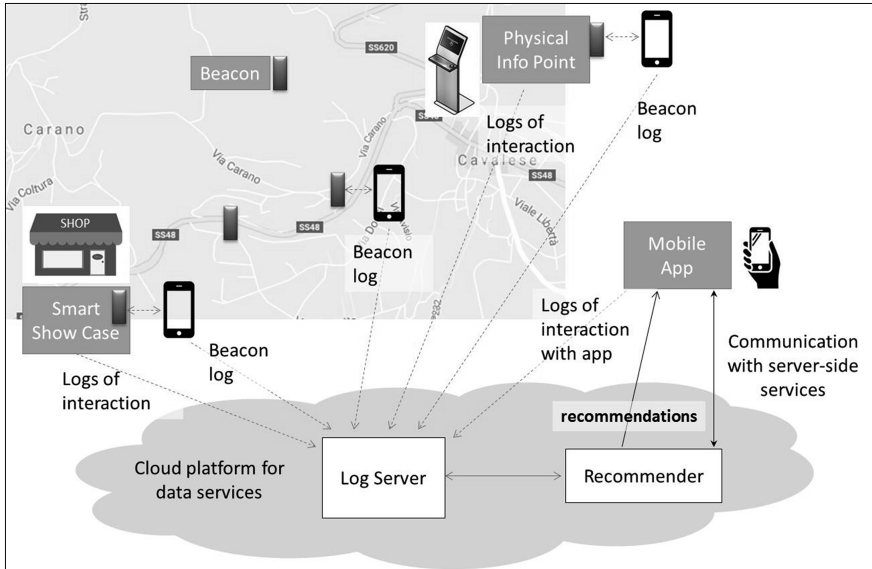


Fig. 4. Scenario integrating interactive showcases, physical info points, beacons and mobile services

Fourteen existing physical info points (kiosks with touch screen) installed at hotels and tourist offices in the tourist area of Val di Fiemme (Italy) and providing information about local events, accommodation, restaurants, points of interest, natural trails, and transport, have already been integrated with the central cloud platform that orchestrates the server-side data services and collects all the interaction logs produced within the network. The same server-side cloud platform supports a mobile app implemented for IOS and Android mobile devices that complements the information provided by the physical info points. The app is a map-based mobile tourist guide featuring information exploration and filtering by category, with additional functionalities for keeping a diary of the travel and receiving personal suggestions for interesting things to do and products to purchase. The logs of the users' interaction with the mobile app are collected and sent to the central server in order to feed a recommender component that helps filtering, reordering and pushing information which is deemed relevant for each user according to what they have searched so far, the places they have been to and their profile information. We are now completing this infrastructure and deploying four pilot interactive showcases at handicraft shops, which are based on the IoT platform described in Sect. 3.1, to allow visitors inspect and learn about products. About forty beacons will be distributed at important points of interest (monuments, museums, parks and natural trails) and at selected shops selling local specialities. Beacons will also be used to mark the location of physical info points and interactive show cases for the purpose of identifying the current user interacting with them: when the personal device of the visitor detects a nearby beacon associated to a kiosk or to smart show case a log is sent to the central server that associates the subsequent interactions to that user.

These log data complement what is separately collected by the mobile app: the sequence of pages the user has navigated to; whether the search filters have been opened to change some of the options or a string of text has been searched for; whether the user has requested to see more products similar to the currently displayed one; when a product or a point of interest has been bookmarked or rated; when a beacon has been detected; whether the user has opened a pushed notification and performed a related action.

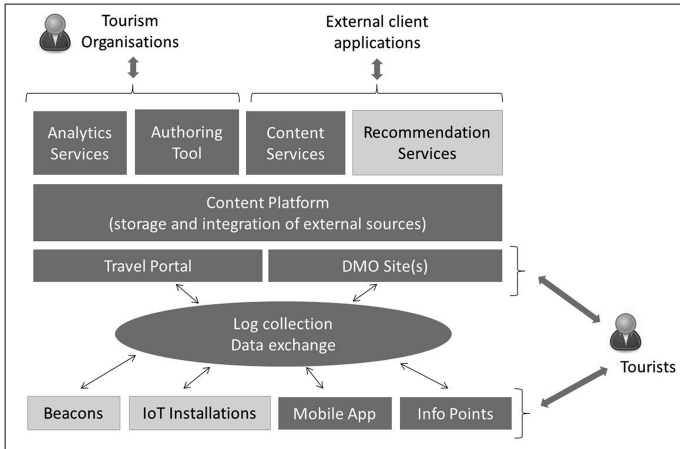


Fig. 5. The logical components of the Suggesto Marketplace platform for electronic tourism (in light grey the new components being integrated)

The implementation efforts are based on the extension of the existing Suggesto Marketplace platform for electronic tourism, already supporting the flexible creation of web sites for DMOs and their companion mobile apps and info points, with the IoT infrastructure described in Sect. 3 and with the management of beacons (Fig. 5). New recommendation algorithms are being implemented to reason over the extended set of logs generated online and onsite. We have already implemented a core user modeling approach that learns user's preferences in sequential decision-making scenarios, and can be used to suggest items to be consumed in a sequence. Predicting (or recommending) a full sequence of objects is appealing in the considered scenarios where the user is actually faced with multiple choices, e.g., which Point of Interest to visit next or which objects to manipulate next. User preference learning is made possible by (1) exploiting the mentioned observations of user's actions while the user is consuming items (POIs or objects), and (2) leveraging item's descriptive features and environment's contextual information.

In order to reach this goal, we have adopted an approach based on Inverse Reinforcement Learning (IRL) (Ng and Russel, 2000). IRL allows the recommender system to learn a policy that dictates for each possible state of the user interaction with the environment the best action the user should perform (which object to consume). This

policy fully describes the sequential preferences of a user or a group of users and can generate relevant recommendations for these users, as well as, new users deemed as similar to the observed ones. For instance, when facing a new user, the system can reuse a model learnt for the users who have a similar information need (goal) or belong to the same socio-demographic group. IRL accomplishes user's preference learning by discovering the importance weights of features of items at disposal for being consumed (more precisely, features describing the state of the user). These weights define the utility (reward) a user gains by consuming items.

We have tested our general approach for learning the user model in the context of the multi-station installation at the Artillery section of Museo della Guerra (mentioned in Sect. 3.2), where a recommender could suggest which media items to consume next by reasoning on the logs of IoT interactions. In particular, we studied how visitors' preferences can be learnt, by relying on the observation of the users' consumption of the available media. The experiment results show that, by just using low-level behaviour data, our approach can learn users' preferences (reward function) and the policy adopted by users when consuming items sequentially (Massimo et al., 2017).

6 Conclusions and Further Research

The experience made with the pilot case studies of smart showcases and the analyses of the collected log data allowed us to derive some design guidelines for the integration of localized IoT solutions into a comprehensive mobile information system infrastructure for tourism. First of all, the importance of an appropriate design of the interaction and the physical affordances that are offered to users should not be underestimated. Visitors can successfully use smart installations only if: they immediately understand how they work; they perceive a value and pleasure in touching and manipulating physical objects; they have a motivation for learning about objects that stimulates their information exploration both at the physical and the digital level; and smart things are placed in a proper space that facilitates a tranquil usage. A second observation relates to the reliability of the log data automatically collected by the smart things. Noise in the data can be easily introduced, for example, by fast repetitions of the same action (users making unprecise gestures), fast-paced random actions (users exploring the system functioning), very short interaction sessions (staff testing the system at the switching on), but also very long interaction sessions (system failing to recognize session end). Should the IoT installations be integrated in a larger network of information services with a centralized recording of action logs and personalization services adjusting what is shown or pushed to visitors, filtering methods need to be implemented to remove the noise in the IoT logs before this information is used by any user modeling and recommendation algorithm. When this is done, our analyses show that learning preferences from low-level behavior data is possible and that recommendation functions can be reliably implemented to predict and suggest sequences of objects or points of interest that may be appealing for visitors.

One limitation of these findings is related to the small scale of the tested case studies. The scale-up to a comprehensive scenario of interconnected physical and digital information services certainly poses additional challenges related to: (i) the

heterogeneity of the data collected at the different touch points of the visitor with the system (IoT installations, mobile app, info points) that are representative of different information goals and contexts of use; (ii) the greater sparsity of the data (both with respect to time and space) that increases the complexity of learning models of users' preferences and behaviours; (iii) the need for an overarching strategy to design a coherent user experience that seamlessly spans across different services. To further investigate these challenging issues, we are currently completing the implementation of the overall infrastructure discussed in Sect. 5 which involves a network of four pilot IoT installations in shops and forty beacons interconnected with mobile personalized services accessible from personal devices and fourteen info points. The scenario will be tested on the field with the support of the Val di Fiemme DMO in Winter 2017.

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Part VII

Data Mining and Sentiment Analysis

Aspect-Based Sentiment Detection: Comparing Human Versus Automated Classifications of TripAdvisor Reviews

Christian Weismayer¹(✉), Ilona Pezenka²,
and Christopher Han-Kie Gan³

¹ Department of Applied Statistics and Economics, MODUL University Vienna,
Vienna, Austria

christian.weismayer@modul.ac.at

² Department for Communication, Marketing & Sales, FHWien University of
Applied Sciences of WKW, Vienna, Austria

ilona.pezenka@fh-wien.ac.at

³ Department of East Asian Studies, University of Vienna, Vienna, Austria

a9451232@unet.univie.ac.at

Abstract. Review platforms are gaining more and more importance in the tourism industry. From a consumer's point of view, reviews facilitate information search and influence the decision making process. Service providers are unable to neglect the impact of such websites and are thus forced to track reviews. However, due to the massive load of reviews, this task becomes more and more time consuming. Text mining tools assist in extracting decision-relevant knowledge from user-generated content (UGC). In order to assess the appropriateness of machine-driven approaches, TripAdvisor reviews of restaurants as well as hotels were collected and analysed applying the AYLIEN Text Analysis API on RapidMiner. The conclusions hereof were then compared with results generated by traditional manual content analysis. Findings support the adequacy of fully automated domain specific aspect-based sentiment analysis tools. The authors argue that the suggested methodology facilitates the analysis dramatically and can thus be simply applied on a regular basis with the aim to constantly monitor reviews.

Keywords: Aspect-based sentiment detection · Opinion mining
Review · TripAdvisor

1 Introduction

Since the dawn of the digital age, users have been able to interact online and generate content to share publicly. This technological progress has in turn facilitated the development of online rating websites such as TripAdvisor. Today, online reviews enable consumers to share information on virtually any type of product or service. Over the past decade, social travel websites have made a significant impact on tourism. User-generated content (UGC) has become especially important with regards to the tourism-related decision-making processes (Gretzel & Yoo, 2008). By providing

reviews and other information, these websites (e.g., TripAdvisor, Expedia, and Yelp) have revolutionized the behavioural means in which consumers seek information. Hence, users have the chance to compare hotels, gain information about local offers and determine the price which meets their budget best (Miguéns, Baggio, & Costa, 2008).

Amongst all these travel websites, TripAdvisor (2017a) claims to be the largest. Founded in 2000 by Stephen Kaufer (CEO) and Nick Shanny (Senior Vice President), TripAdvisor covers more than 7 million accommodations, airlines, attractions, and restaurants worldwide and provides about 500 million reviews and opinions. The website compares prices from more than 200 hotel booking sites and has approximately 390 million unique visitors on average every month (TripAdvisor, 2017b). According to TripAdvisor (2015), 96% of these users consider reading reviews as important when planning trips and booking hotels, while 83% of the users usually read reviews before booking a hotel. More than half of the TripAdvisor users indicated that they would not book an accommodation without reading a review first. 87% regard restaurant reviews as important. Such findings are also supported by the results of Vermeulen and Seegers (2009). The authors found that reading an online review raises awareness and thus, improves the probability to consider booking a room in a reviewed hotel. Furthermore, user-generated reviews are regarded as being more trustworthy compared to the information offered by hotels (Litvin, Goldsmith, & Pan 2008; Chung & Buhalis 2008).

Schuckert, Liu and Law (2015) claim that academic interest in exploring content of online reviews has declined in the past years. The authors argue that “the academic findings have not been applied to practice, either because they have limited practical value or because it is simply too costly to adopt such mining technology in daily business, an issue which is related to the uncertain return on investment of reputation management” (Schuckert et al., 2015, p. 613). However, mining technology is advancing and new tools facilitate the implementation of these techniques in academia and practice. RapidMiner is a software platform that provides an environment for machine learning, data and text mining, predictive and business analytics. It is used for commercial applications as well as for research. The tool supports all steps of the data mining process. Several applications of RapidMiner can be found in tourism (e.g., Boon, Bonera, & Bigi, 2013; Dirsehan, 2015; Markopoulos, Mikros, Iliadi, & Liontos, 2015; Menner, Höpken, Fuchs, & Lexhagen, 2016) and in other disciplines (e.g., Alkalbani et al., 2017; Ngo-Ye & Sinha, 2014). However, most studies employing new tools suffer from validity problems. Due to the growing number of methodologies with increasing complexity, researchers cannot be sure if the applied method is accurate and thus, reflecting the ground truth. Therefore, validation studies are needed.

With regards to the study in question, RapidMiner with Aylien Text Analysis API (Ruder, Ghaffari, & Breslin, 2016) is used, as a package for Natural Language Processing, Information Retrieval and Machine Learning to extract meaning from textual content (<http://aylien.com/text-api>). It was chosen due to its better performance compared with other recent techniques (Ruder et al., 2016). In order to test the accuracy of its domain specific aspect-based sentiment analysis tool, results of the automated analysis are compared with the outcome generated by traditional manual content analysis.

2 Literature Review

2.1 Aspect-Based Sentiment Analysis

Sentiment analysis or opinion mining help to determine the negative or positive polarity of a written text. Depending on the piece of text, there are different levels of interest, namely document, sentence, and aspect. Document-level sentiment analysis is the simplest form of sentiment analysis, assessing the overall polarity of the whole document (Feldman, 2013). Pang, Lee and Vaithyanathan (2002) applied various machine learning methods [Naïve Bayes, maximum entropy classification, and support vector machines (SVM)] on review data, to automatically classify them into one of the following three categories: positive, neutral, or negative. Saleh, Martín-Valdivia, Montejo-Ráez and Ureña-López (2011) applied SVM with different features on three different corpora and found that the corpus size and domain have an effect on the performance. However, in many cases, identifying overall polarity is not enough, as valuable information included in the review is lost due to the aggregated level. Reviews often contain information on many different aspects about a product or a service on sub-sentence level. Some of these aspects can be negative and others positive. With regards to analysing reviews containing different product or service features, aspect-based sentiment analysis is well suited. It is the most fine-grained method as it “focuses on the recognition of all sentiment expressions within a given document and the aspects to which they refer” (Feldman, 2013, p. 85).

In tourism studies, there is a growing body of literature dealing with the identification of product and service aspects in order to evaluate how those aspects contribute to overall satisfaction (e.g., Albayrak & Caber, 2015; Xiang, Schwartz, Gerdes, & Uysal, 2015; Xiang, Du, Ma, & Fan, 2017). More than a decade ago, a meta-analysis of 21 publications by Dolnicar and Otter (2003) identified the most important hotel attributes out of 173 attributes. Location was found to be the most important attribute, followed by service quality, reputation, friendliness, price, and cleanliness. Conversely, room size and parking facilities were least important among the identified attributes. Regarding hotel attributes in reviews, Berezina, Bilgihan, Cobanoglu and Okumus (2016) found that some common attributes (e.g., place, room, furnishing) are used in positive and negative reviews as well, whereas positive reviews more often refer to intangible aspects (e.g., service quality). In contrast, tangible aspects are mentioned in negative reviews more often. Xiang et al. (2017) analysed the connection between different aspects and overall ratings. The authors collected review data from three travel platforms, namely TripAdvisor, Expedia, and Yelp. They analysed the data by applying Latent Dirichlet Allocation (LDA), a topic modelling method, and identified five major topics, namely Basic Service, Value, Landmarks & Attractions, Dining & Experience, and Core Product.

As far as methodology is concerned, Tystsarau and Palpanas (2011) identified four sentiment techniques in the field: Machine learning, dictionary-based, statistical and semantic approaches. Within the field of supervised machine learning algorithms, Schuckert et al. (2015) found Naïve Bayes, SVM, and N-gram models being used for online review analyses. Schmunk, Höpken, Fuchs and Lexhagen (2014) compared dictionary-based and machine learning approaches and concluded that SVM achieved the best results in terms of property recognition and sentiment classification into

positive and negative polarity. Nevertheless, the dictionary-based method was superior concerning the recognition of the subjectivity of a sentence.

The AYLIEN Text Analysis extension of Rapidminer, which was applied here, uses a hierarchical bidirectional long short-term memory (H-LSTM) (Ruder et al., 2016). It takes the sentential context and the structure of reviews into account, i.e. the intra- and inter-sentence relations, by making use of the relationship between a word/sentence to its preceding and successive words/sentences on sentence/review level. In this way it outperforms several different hand engineered features as well as approaches based on large sentiment lexicons. Based on a new corpus, conclusions derived from the automated aspect-based sentiment analysis tool mentioned before, will be compared with findings based on traditional manual content analysis.

3 Methodology

3.1 Data Collection and Generation

808 restaurants and 875 hotel reviews were manually collected from the TripAdvisor platform between April and May 2017. To ensure a broad variety of evaluations, hotels from Europe, Asia, Africa, America, and Oceania were selected. For the restaurants, five different types of food out of 94 categories were chosen (Chinese, Italian, Turkish, Austrian, and Japanese). Reviews on TripAdvisor include, besides other information not used here, an overall rating (ranging from 1 [terrible] to 5 [excellent]) and a comments section where customers are free to fill in everything they want to share.

Eight different aspects in hotel and restaurant reviews were first evaluated by human coders and in a second step by a fully machine-driven text mining extension within the RapidMiner Studio platform (version 7.5.3) and its Text Processing operators (version 7.5.0), the AYLIEN Text Analysis API (version 0.2.0). The latter provides domain specific aspect-based sentiment detection for four industry domains, whereby the number of aspects is given in brackets (AYLIEN, 2016): cars (19), hotels (15), airlines (10), and restaurants (14). Eight specific service items present in both industry domains were used: food/drinks, staff, facilities, location, quietness, value, cleanliness, and payment. Food and drinks, which were classified separately for hotels but together for restaurants, were merged. To be able to compare the human-coded evaluation with the machine-driven analysis all reviews were evaluated in two different ways:

- (1) *Machine-driven attempt*: The AYLIEN Text Analysis API was used to provide domain specific aspect-based sentiment polarities of the eight service items for both industries as well as the overall sentiment polarity of each review ('-1 negative', '0 neutral', and '1 positive'. The RapidMiner Studio process for hotels is visualised in Fig. 1. The same procedure was performed for the restaurants. The 'Retrieve hotel reviews' box loads the dataset. The 'Multiply' box duplicates the same. The 'Analyze Sentiment' box determines the overall sentiment polarity for each review. The 'Analyze Aspect-Based Sentiment' box delivers the domain specific aspect-based sentiment polarities for the eight aspects on the individual review level. If an aspect was not mentioned within a review a value of '0'

(neutral) was assigned. This is based on the assumption that an aspect neither mentioned positively nor negatively is not perceived as an extreme outcome and therefore neutrally tagged.

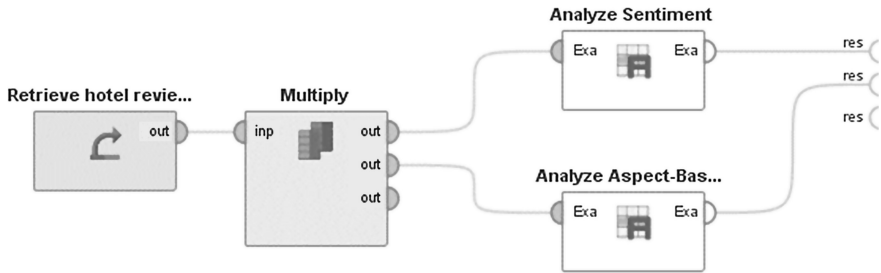


Fig. 1. The Rapidminer—AYLIEN text analysis process

- (2) *Human-coded attempt*: 62 international students manually collected the reviews. Furthermore, the overall star rating (1* star–5* stars) indicated by the reviewers on TripAdvisor was recorded. The authors of the paper at hand evaluated the eight service aspects on a rating scale from ‘-1 negative’, ‘0 neutral’, to ‘1 positive’.

For comparison purposes between the (1) *objective* and the (2) *subjective* dataset, the overall evaluation of the review was regressed on the eight service aspects for the hand-coded and the machine-driven dataset. Both, data collection and analyses were conducted for hotels and restaurants to cross-validate the results. Similar results support the fully automatic sentiment detection tool whereas high deviations do not.

3.2 Analytical Model

Both the human and the computationally determined dependent variables (overall evaluations) are not continuous but categorical. The former one was measured on a 5-point star rating scale, the latter one on a 3-point polarity scale. Therefore, models for ordinal response variables, namely ordered logistic (logit) regressions, were applied. For an overview on ordered logit models with polytomous response variables see e.g. Demaris (1992), or Liao (1994) for ordinal logit and probit models. O’Connell (2006) describes the treatment of response effects (slope) of successive probabilities by means of the adjacent categories (AC) model. A homogeneous series of logits between two adjacent probabilities ensures that the effect of the explanatory predictor variables is constant through each pair of neighboured categories. The transition along the categories of the response variable is translated into the cumulative logit function (Agresti, 1989). For an overview on cumulative (proportional) odds models for ordinal outcomes see O’Connell (2006). An alternative method is the application of ordered probit models that typically lead to identical conclusions (Liao, 1994). However, as the interpretation of regression parameters derived by probit models is much more complicated, typically logit models are preferred. Differences between logit and probit solutions of ordered and multinomial models are discussed by Borooah (2002).

The eight predictors containing three categories each were split up into two dummy-coded items per predictor (indicator variables): one for ‘positive’ and one for ‘negative’ reviews (e.g. for the positive case: values of 1 were assigned if a particular service item was mentioned positively, values of ‘0’ in the case of a ‘neutral’ or ‘negative’ pooling). The reference category is ‘neutral’. To avoid linear dependencies there are no dummy-variables for the ‘neutral’ category of an aspect included in the models.

4 Results

4.1 Descriptive Statistics

Table 1 exhibits the relative frequencies within each of the two industry domains (restaurants and hotels) of the reviewers’ star ratings. Most observations are rated positively, 5* and 4* stars respectively. The mean character length of the reviews gives an impression about the average length (spaces were included, multiple adjacent spaces were trimmed to one single space). Hotel reviews are much longer (596 characters on average) compared with restaurant reviews (350 characters). The overall sentiment polarity derived from AYLIEN text analysis underlines the often-mentioned *J*-shaped distribution of the overall ratings (e.g., Hu, Zhang, & Pavlou, 2009).

Table 1. Sample descriptives

		Restaurant	Hotel
Reviewer’s star rating on TripAdvisor	1 star	6.6%	4.6%
	2 stars	5.8%	5.7%
	3 stars	9.5%	11.3%
	4 stars	29.5%	25.0%
	5 stars	48.6%	53.4%
Review character length (including spaces)	Minimum	12	12
	Maximum	2879	8992
	Arithmetic mean	351	596
	Standard deviation	297	562
Overall sentiment	Positive (+1)	83.2%	81.6%
	Neutral (0)	6.2%	6.9%
	Negative (-1)	10.6%	11.5%

4.2 Human Versus Machine Coded Results

Table 2 lists the cross-tabulated absolute frequencies of the eight service aspects for the two different coding procedures, human (rows) and machine (columns). The upper value within each cell represents the hotels’ frequencies, the lower value those of the restaurants. The values in brackets list performance metrics (precision/recall/F1-score).

Table 2. Aspect-based comparison

		Machine				Machine					
Human	-1	<i>Staff</i>	-1	0	+1	-1	<i>Food/drinks</i>	-1	0	+1	
		(0.49/0.70/0.58)	59	13	12		(0.40/0.54/0.46)	43	14	22	
	0	(0.68/0.78/0.72)	75	15	6	0	(0.47/0.79/0.59)	60	10	6	
		(0.62/0.62/0.62)	33	<i>152</i>	62		(0.80/0.68/0.73)	41	292	98	
	1	(0.76/0.85/0.80)	14	285	35	1	(0.34/0.42/0.38)	32	<i>36</i>	18	
		(0.85/0.80/0.82)	29	82	<i>433</i>		(0.70/0.78/0.74)	23	58	<i>284</i>	
		(0.87/0.74/0.80)	22	76	<i>4280</i>		(0.96/0.85/0.90)	36	60	<i>550</i>	
		<i>Value</i>	-1	0	+1			<i>Cleanliness</i>	-1	0	+1
Human	-1	(0.52/0.51/0.51)	43	24	18	-1	(0.63/0.65/0.64)	36	18	1	
		(0.46/0.41/0.43)	22	17	15		(0.54/0.46/0.50)	6	7	0	
	0	(0.87/0.82/0.85)	30	<i>551</i>	88	0	(0.85/0.95/0.90)	10	<i>566</i>	19	
		(0.85/0.91/0.88)	17	<i>477</i>	31		(0.98/0.99/0.99)	4	<i>772</i>	1	
	1	(0.34/0.45/0.38)	10	57	<i>54</i>	1	(0.86/0.59/0.70)	11	81	<i>132</i>	
		(0.77/0.66/0.71)	9	69	<i>151</i>		(0.91/0.56/0.69)	1	7	<i>10</i>	
		<i>Location</i>	-1	0	+1			<i>Payment</i>	-1	0	+1
Human	-1	(0.09/0.41/0.15)	<i>11</i>	11	5	-1	(0.17/0.53/0.26)	9	7	1	
		(0.09/0.33/0.14)	3	4	2		(0.53/0.32/0.40)	9	17	2	
	0	(0.62/0.69/0.65)	54	<i>257</i>	62	0	(0.99/0.93/0.95)	42	<i>789</i>	21	
		(0.91/0.89/0.90)	22	<i>619</i>	55		(0.95/0.99/0.97)	8	<i>752</i>	0	
	1	(0.80/0.58/0.67)	56	144	<i>275</i>	1	(0.00/0.00/NaN)	1	5	<i>0</i>	
		(0.37/0.32/0.34)	10	60	33		(0.00/0.00/NaN)	0	20	<i>0</i>	
		<i>Facilities</i>	-1	0	+1			<i>Quietness</i>	-1	0	+1
Human	-1	(0.39/0.34/0.37)	35	54	13	-1	(0.66/0.51/0.58)	21	15	5	
		(0.20/0.02/0.04)	<i>1</i>	42	1		(0.83/0.29/0.43)	5	8	4	
	0	(0.60/0.72/0.65)	31	295	85	0	(0.95/0.96/0.96)	10	<i>743</i>	23	
		(0.77/0.98/0.87)	2	<i>613</i>	8		(0.98/0.99/0.99)	1	<i>778</i>	5	
	1	(0.67/0.54/0.60)	23	144	<i>195</i>	1	(0.56/0.60/0.59)	1	22	<i>35</i>	
		(0.25/0.02/0.04)	2	136	3		(0.18/0.29/0.22)	0	5	2	

Italicized values of the main diagonal depict consistency between the two approaches. The remaining upper and lower triangle matrix cells are violations in terms of inter-coding agreement. For the following items the highest overlaps within each human coded category signalize concordance between the human and the machine-driven attempt: staff, food & drinks, cleanliness, and quietness. For the items value and payment, human perceived positive evaluations have been classified less positive by the machine than by humans. For the items location (hotel) and facilities, human perceived negative evaluations have been classified more positive by the machine. All neutral evaluations were mainly equally categorised by the machine and by humans.

Table 3 lists Spearman's rho (ρ) correlation coefficients (hotels: upper value; restaurants: lower value). The strongest relationships of each human coded item match with the same item coded by the machine in 15 out of 16 cases. The only exception is

Table 3. Aspect-based comparison—spearman’s ρ (* p -value < 0.05)

		Machine									
Human	Value	Location	Staff	Facilities	Food/drinks	Cleanliness	Payment	Quietness			
	Value	0.120*	0.210*	0.113*	0.171*	0.218*	0.204*	0.090*			
	Location	0.058	0.188*	-0.036	0.288*	0.106*	0.148*	-0.003			
	Staff	0.364*	0.170*	0.113*	0.152*	0.134*	0.071*	0.075*			
	Facilities	0.165*	0.005	0.056	0.023	-0.021	0.017	0.010			
	Food/drinks	0.192*	0.583*	0.190*	0.301*	0.167*	0.199*	0.105*			
	Cleanliness	0.095*	0.668*	0.018	0.447*	0.114*	0.123*	0.066			
	Payment	0.122*	0.254*	0.373*	0.302*	0.141*	0.116*	0.099*			
	Quietness	0.157*	0.147*	0.002	0.109*	0.061	0.035	0.097*			
		0.162*	0.254*	0.171*	0.506*	0.143*	0.117*	0.117*			
		0.115*	0.380*	0.072*	0.652*	0.109*	0.206*	0.017			
		0.146*	0.140*	0.081*	0.156*	0.622*	0.142*	0.130*			
		0.027	0.107*	0.128*	0.140*	0.575*	0.004	-0.045			
		0.087*	0.114*	0.085*	0.101*	0.120*	0.165*	0.031			
		0.034	0.181*	0.002	0.197*	<0.001	0.231*	0.002			
		0.059	0.113*	0.082*	0.110*	0.101*	0.078*	0.513*			
		0.067	0.025	0.054	0.083*	0.044	-0.009	0.150*			

the human coded item facilities that is stronger related with the machine coded item location for the restaurants.

Ordinal logit regression results (see Table 4) reveal which polarities of the eight service aspects significantly influence the overall sentiment or star rating respectively. All significant coefficients of the two human coded models are of logical order, assuming that positively evaluated service items enhance the overall evaluation. This does not apply to one hotel item (payment) and three restaurant items (cleanliness, facilities and payment) for the machine-based models. However, these items contain only non-significant thresholds. Therefore, these thresholds are not empirically supported and the logical order is not violated. Furthermore, goodness of fit was evaluated by the likelihood ratio χ^2 -tests test to compare the actual with the baseline model. All models are significant ($p < 0.001$) indicating good fit.

For the hotels, consistent results were detected for the items value, staff, cleanliness and location. For the human coded model additionally significant negative effects for facilities and payment, and positive effects for food & drinks and quietness were found. The human coders seem to be more sensitive in this case.

For the restaurants, there are consistent results for food & drinks and staff. Additional effects for one or the other model are rather vague. There is an additional negative effect for the location and a positive one for value in the machine coded model. Significant negative effects of the human coded model are confirmed for value, cleanliness, facilities, quietness, and payment, as well as an additional positive one for payment.

For the restaurants and hotels together, out of 12 deviations, the biggest part, namely seven negative effects and three positive ones are detected by humans but not by the machine. This leads to the assumption that human coders are more sensitive. However, 20 out of 32 totally estimated parameters are equally assessed. Considering the time effort of human coding, this result underpins the accuracy of the automated annotation.

Table 4. Ordinal logit models

Items	Response category		Restaurant				Hotel				
	H	M	Human		Machine		Human		Machine		
			B	Sig.	B	Sig.	B	Sig.	B	Sig.	
Threshold	5*		-1.940	<0.001				-0.618	0.002		
	4*		0.343	0.214				1.417	<0.001		
	3*	+1	2.054	<0.001	1.741	<0.001	3.242	<0.001	<0.001	1.379	<0.001
	2*	0	3.378	<0.001	2.790	<0.001	4.804	<0.001	<0.001	2.327	<0.001
Food & drinks	Positive		-2.257	<0.001	-1.119	0.002	-0.464	0.004	0.004	-0.483	0.102
	Negative		1.291	<0.001	1.887	<0.001	1.349	<0.001	0.884	0.946	0.001
Value	Positive		-0.161	0.336	-0.994	0.031	-0.031	0.884	0.884	-0.354	0.300
	Negative		1.540	<0.001	0.644	0.092	1.491	<0.001	<0.001	0.973	0.002
Staff	Positive		-0.261	0.093	-0.652	0.073	-1.008	<0.001	<0.001	-1.054	<0.001
	Negative		2.149	<0.001	1.381	<0.001	1.603	<0.001	<0.001	1.438	<0.001
Cleanliness	Positive		0.338	0.468	1.060	0.227	-0.014	0.932	0.932	-0.587	0.094
	Negative		1.237	0.033	1.010	0.174	1.467	<0.001	<0.001	1.296	<0.001
Facilities	Positive		-0.305	0.130	-0.235	0.854	-0.860	<0.001	<0.001	-0.910	0.004
	Negative		0.746	0.016	-0.829	0.466	1.437	<0.001	<0.001	-0.079	0.797
Quietness	Positive		0.859	0.303	-1.070	0.273	0.698	0.011	0.011	0.115	0.810
	Negative		1.556	0.001	0.068	0.945	1.375	<0.001	<0.001	2.129	<0.001
Payment	Positive		-1.651	0.011	1.517	0.489	0.252	0.766	0.766	0.567	0.445
	Negative		0.835	0.039	0.511	0.407	1.723	0.001	0.001	0.368	0.360
Location	Positive		0.100	0.649	-0.847	0.138	-0.206	0.177	0.177	-0.249	0.363
	Negative		0.727	0.234	1.434	0.001	0.480	0.221	0.221	0.031	0.916

The remaining results focus on the replacement of human by machine-coded aspects. Table 5 exhibits cross-tabulated frequencies of TripAdvisor star ratings predicted by both coding techniques. In contrast to the models in Table 4, the predictive power of the aspects, depending on the coding type, is compared. The response variable, the 5*-rating on TripAdvisor, is the same for all models. The independent variables vary, once human and once machine coded. Columns split up the ratings by the observed and rows by the predicted (most likely) category of the ordered logit models. Cells contain column percentages to ease the interpretation of correct classifications within each category of the originally observed rating. 1* ratings are predominantly correctly classified for the restaurants. For the hotels, an equal part will be predicted in the 3* category in the human model. Most of the few predicted 2* ratings are assigned to the 1* category for the restaurants. This is not true for the hotels whose 2* ratings lean towards the 3* category. The 3* category shows diverse orders with a general tendency into the more positive direction. 4* star and 5* star ratings are both mainly predicted in the 5* star rating category. For the restaurants/hotels, 57.81%/61.94% were correctly predicted by human coded items, 52.72%/60.00% by machine-coded ones. Machine based models come close to the result of human based ones.

Table 5. Observed versus predicted ratings (column percentages)

		Observed															
		Restaurant					Hotel										
		1*	2*	3*	4*	5*	1*	2*	3*	4*	5*	1*	2*	3*	4*	5*	
Predicted	Human	1*	52.8	55.3	13.0	0.0	0.0	42.5	30.0	6.1	0.9	0.0					
		2*	5.7	0.0	0.0	0.0	0.4	7.5	10.0	6.1	0.0	0.0					
		3*	24.5	31.9	40.3	2.5	0.3	42.5	30.0	31.3	5.5	0.9					
		4*	15.1	8.5	19.5	21.0	8.7	7.5	22.0	43.4	30.7	9.0					
		5*	1.9	4.3	27.3	76.5	91.1	0.0	8.0	13.1	62.8	90.2					
	Machine	1*	50.9	59.6	22.1	2.5	0.3	45.0	14.0	7.1	0.9	0.0					
		2*	0.0	0.0	0.0	0.0	0.0	7.5	14.0	8.1	0.0	0.4					
		3*	18.9	10.6	13.0	2.9	0.5	27.5	34.0	24.2	6.0	1.7					
		4*	24.5	27.7	35.1	18.1	11.2	10.0	20.0	28.3	18.8	4.9					
		5*	5.7	2.1	29.9	76.5	88.0	10.0	18.0	32.3	74.3	92.9					
		100	100	100	100	100	100	100	100	100	100						

Figure 2 visualizes the cumulative predicted probabilities of the models in Table 5. 5* ratings are the most likely predicted outcome for the human as well as the machine-driven attempt. Negative evaluations are rather less represented. The column-wise shapes of the cumulative predicted probabilities are highly similar and emphasize the agreement between the results of both data generation attempts.

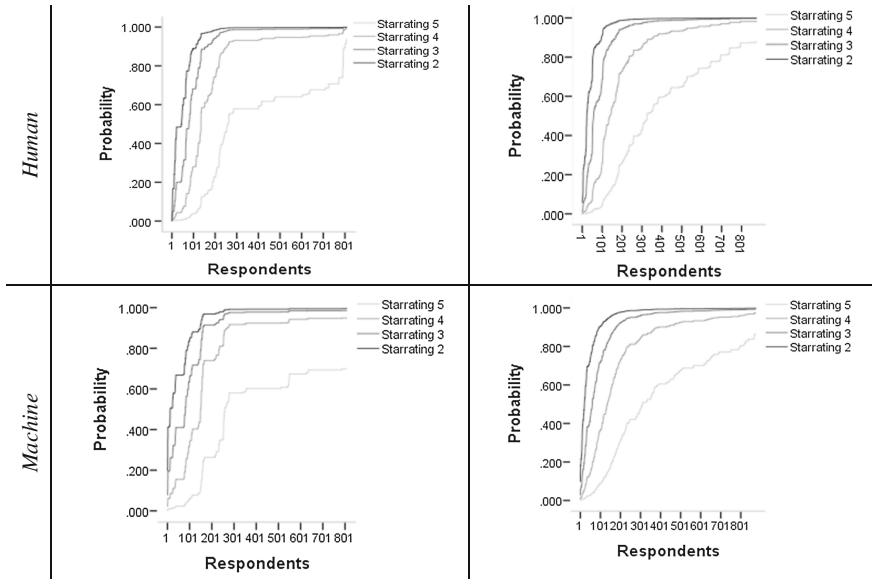


Fig. 2. Cumulative predicted probabilities

5 Discussion and Conclusion

In order to assess the appropriateness of machine-driven text mining approaches, TripAdvisor restaurant as well as hotel reviews were collected and analysed in a first step by applying the AYLIEN text analysis extension of RapidMiner and in a second step with traditional manual content analysis. The outcomes were then compared. Findings support the accuracy of the fully automated aspect-based sentiment analysis. Result comparison of the automated approach with the human-coded content analysis demonstrate that the automated categorisation do reflect human-perceived sentiments. We argue that the tool facilitates the analysis dramatically and can thus be simply applied on a regular basis to monitor reviews. As reviews are extremely important for companies in order to (1) get timely feedback about their products and services, (2) increase guest satisfaction, and (3) foster reputation, monitoring of the same is essential.

Due to the complexity of manual qualitative content analysis, hotels or companies employing this method can only analyse a smaller number of reviews. However, the growing popularity of reading and writing reviews has in turn also significantly

increased the amount of online product and service reviews, as well as the speed in which such information is spread throughout the internet.

Consequently, it becomes increasingly difficult for companies to analyse this content and to reply properly. Nevertheless, studies reveal that management replies to reviews have a significant positive impact on sales (e.g., Ye et al., 2008). While studies published a decade ago claim that the right-of-reply, offered by most review platforms, is marginally used (Briggs et al., 2007; O'Connor, 2008), more recent publications (Heyes & Kapur, 2012; Smyth et al., 2010; Vasquez, 2014) found a significant increase in the use of management responses. According to Smyth et al. (2010) around 10% of reviews were receiving responses by late 2009. These figures might have changed slightly in the last few years but remain low.

Regarding the limitations of this study, it must be recognized that only one platform, namely Tripadvisor, has been analysed. However, as the goal was to demonstrate the accuracy of a machine-driven text mining approach by comparing the results with findings derived from content-analysis by hand, this is not an issue here. What has to be mentioned is the missing inter-rater agreement due to coding by a single person.

Second, the tool used (RapidMiner with AYLIEN text analysis API) has its inherent limitations. For instance, it provides domain specific aspect-based sentiment detection for four industry domains, whereby the aspects for each domain are already given.

Finally, there are several limitations regarding studies using UGC in general, e.g., the authenticity of online reviews (Luca & Zervas, 2016), the detection of sarcasm and implicit aspects, the handling of different languages, and consumers' tendency of writing reviews only in extreme cases (Hu et al., 2009).

Although the approach has been applied to two industries, comparison studies of qualitative content analysis approaches and the proposed software tool would be useful to test for the reliability of the latter one. Such attempts can be based on already existing qualitative studies to minimize the effort (e.g. Pontiki, Galanis, Papageorgiou, Manandhar, & Androutsopoulos, 2015).

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Search Engine Traffic as Input for Predicting Tourist Arrivals

Wolfram Höpken¹(✉), Tobias Eberle¹, Matthias Fuchs²,
and Maria Lexhagen²

¹ University of Applied Sciences Ravensburg-Weingarten, Weingarten,
Germany

wolfram@hoepken.org, tobias.eberle.89@outlook.de

² The European Tourism Research Institute (ETOUR), Mid-Sweden University,
Östersund, Sweden

{matthias.fuchs, maria.lexhagen}@miun.se

Abstract. Due to the perishable nature of tourism services and the limited capacity of tourism firms in serving customers, accurate forecasts of tourism demand are of utmost relevance for the success of tourism businesses. Nowadays, travellers extensively search the web to form expectations and to base their travel decision before visiting a destination. This study presents a novel approach that extends autoregressive forecasting models by considering travellers' web search behaviour as additional input for predicting tourist arrivals. More precisely, the study presents a method with the capacity to identify relevant search terms and time lags (i.e. time difference between web search activities and corresponding tourist arrivals), and to aggregate these time series into an overall web search index with maximal effect on tourism arrivals. The study is conducted at the leading Swedish mountain destination, Åre, using arrival data and Google web search data for the period 2005–2012. Findings demonstrate the ability of the proposed approach to outperform traditional autoregressive approaches, thus, to increase the predictive power in forecasting tourism demand.

Keywords: Tourist arrival prediction · Web search traffic · Google trends data · Data mining

1 Introduction

With a worldwide turnover of more than 7 trillion US dollars in 2015 and a total share of around a tenth of the global GDP, travel and tourism contributes significantly to the global economy. As nearly every tenth job relates directly or indirectly to the travel and tourism industry, an annual labour market growth of 2.2% is expected (WTTC, 2016). However, the success of tourism-related service businesses, such as airlines or hotels, largely depends on the capacity to predict tourism demand accurately. Due to the perishable nature of tourism service products (i.e. the fact that services are forfeited in case of non-use), accurate forecasts of tourism demand are of utmost relevance (Frechtling, 2002). More precisely, for successful tourism businesses it is pivotal to

respond promptly to upcoming demand, thus, making limited resources available for co-creative service production processes (Fitzsimmons & Fitzsimmons, 2001). Thus, knowledge about long-term trends, imminent changes and short-term intra-period fluctuations of customer demand are essential for tourism management in planning capacities. Furthermore, predictions of tourist arrivals help governments in shaping medium and long-term strategies for local and regional tourism development and planning. Accordingly, the accuracy and reliability of demand forecasts can hardly be overestimated for businesses and policy makers in the travel and tourism domain (Frechtling, 2002). However, predicting future tourism demand is a difficult and non-trivial task, due to the lack of historical data, seasonal fluctuations, and influences of unexpected events, the variety of input factors and the complexity of the travel decision-making process (Song et al., 2010). As potential travellers extensively search the web before visiting a specific destination (Fesenmaier et al., 2010), the aim of this study is to extend the autoregressive forecasting approach (i.e. prediction based on past arrivals alone) by including travellers' web search behaviour as additional input (i.e. explanatory variable) for the prediction of tourist arrivals. First, the study evaluates whether the inclusion of time series data on web search behaviour can increase the performance when forecasting tourist arrivals compared to the purely autoregressive approach. Second, the study examines behavioural aspects of travellers related to concrete *search terms* used in online search for trip planning. More precisely, by considering patterns that reflect the online planning behaviour of travellers before visiting specific destinations, temporal relationships between search terms used and tourist arrivals are analysed. The study is conducted for the leading Swedish mountain destination Åre using arrival data and web search data for major sending countries (i.e. Denmark, Finland, Norway, and the United Kingdom) for the period 2005–2012.

The paper is structured as follows: Sect. 2 describes related work tackling the task of tourism demand prediction when additionally considering travellers' online search behaviour. Section 3 discusses issues and related methods of data collection and preparation, respectively. Section 4 describes the process of model building, while major findings are discussed in Sect. 5. Finally, Sect. 6 summarizes the gained insights and provides an outlook on future research activities.

2 Related Work

During the last decade, various researchers adopted search engine information for predicting economic variables. For example, Vosen & Schmidt (2011) constructed an indicator for private consumption based on *Google Trends* data and have shown, that the inclusion of search data outperforms nearly all other survey-based indicators in terms of prediction accuracy. Other studies successfully used online search data to enhance, for instance, the forecast accuracy of automobile purchases (Carrière-Swallow & Labbé, 2013) or cinema admissions (Hand & Guy, 2012). Very recently, also tourism researchers have started to adopt search query data to predict tourist arrivals. For instance, Bangwayo-Skeete & Skeete (2015) highlighted that time series data

obtained by *Google Trends* show the capacity to improve the accuracy in tourism demand forecasting, both for long- and short-term predictions. While Pan et al. (2012) utilize search engine data to enhance the forecast accuracy of hotel (i.e. room) demand, other studies are primarily focussing on the prediction of tourist arrivals (Önder & Gunter, 2016; Höpken et al., 2017).

Despite there is no standard methodology for pre-processing web search data, three main necessary tasks in pre-processing search engine queries for prediction purposes can be found in the literature. First, researchers start selecting domain specific keyword candidates either by using domain knowledge or web scraping and text mining approaches to capture domain specific grammar, or by the help of keyword recommendations from search engine providers (Liu et al., 2012). Second, recent studies have typically calculated temporal relationships between candidate queries and dependent (i.e. time series) variables (e.g. tourist arrivals) to identify most significant time differences between arrivals and respective search queries. Since multi-collinearity and overfitting problems may occur when fitting linear models with a large number of high-dimensional time series data, *dimensionality reduction* is a further crucial task when specifying input data (Varian, 2014). Therefore, the third typical task when applying search engine data for forecasting purposes is the construction of an appropriate data set consisting of input variables with significant predictive power. For example, Liu et al. (2012) prevent possible collinearity by aggregating highly correlated search query series with the target series into one single index variable. More precisely, their study employed search engine queries for the prediction of the Chinese stock market and could proof that using lagged search query data results in significantly higher forecasting performance. Recently, Yang et al. (2015) adopted this approach when forecasting tourism demand by considering online search data.

The importance of identifying significant time lags between predictors and the target data series is highlighted in the literature, thus, several measures for estimating lag relationships exist. While Liu et al. (2012) use mixed metrics for measuring the similarity between lagged predictors and the target time series variable (i.e. *Pearson correlation* and *Kullback-Leibler divergences*), other studies exclusively rely on *Pearson correlation* to identify significant lags (Yang et al. 2015; Xiaoxuan et al. 2016; Pan et al. 2017). However, the reliability of the *Pearson correlation* coefficient is limited as it depends on statistical assumptions. Thus, it can only consider linear relations in data, but it cannot capture such issues as non-stationary time series. Kristoufek (2014) has shown that the use of *Pearson correlation* coefficients is “*practically useless for non-stationary time series*” (ibid., 2014, p. 293). This conclusion is supported by Zebende (2011) and Podobnik et al. (2011), suggesting the ‘*Detrended Cross-Correlation Analysis*’ coefficient (DCCA) as most appropriate to calculate an unbiased correlation coefficient between potentially non-stationary time series.

As search query data can also contain useless information, Xiaoxuan et al. (2016) proposed a method for noise reduction of search query series, which builds on the methodology by Yang et al. (2015). The authors conclude that noise processing is an essential step in forecasting with *Google trends* data. Typically, ‘*Hilbert-Huang-Transformation*’ (HHT) is applied for noise processing, which reduces prediction errors

significantly (Xiaoxuan et al., 2016). Recently, another progress was made by Peng et al. (2017). The authors have shown that amending search queries with *Hurst exponent* values different to the target series yields to higher prediction accuracy. Finally, a common drawback when using aggregated variables for forecasting purposes is that relevant information could be lost. Thus, according to Pan et al. (2017), *Principal Component Analysis* (PCA) or *generalized dynamic factor models* are recommended.

3 Data Collection and Preparation

3.1 Specification of Data Set

The initial data set consists of monthly aggregated tourist arrivals (i.e. December 2005–April 2012) for the leading Swedish mountain destination Åre, specified separately for its major sending countries (i.e. Denmark, Finland, Norway and the United Kingdom). Overall, the data set contains past tourist arrivals for 77 months separated by the four sending countries, which results in a total of 308 data entries. Besides past arrival data, aggregated web search traffic information is included. The latter attribute is extracted for each sending country, separately. As in previous studies, *Google Trends* was selected as an appropriate data source for web search traffic since Internet users from most sending countries mainly use Google for searching the web. *Google Trends* is a service provided by Google, which represents the relative search volume of popular search terms over time and, thus, reflects peoples' interest in specific search terms across different geographic regions and topical domains. More precisely, according to Pearson CMG (2017), Google's market share is higher than 90% for Denmark, Finland, Norway and the United Kingdom, respectively.

3.2 Collection of Web Search Data

In contrast to Yang et al. (2015), the selection of appropriate keywords was limited to search engine-based keyword recommendations. Accordingly, keywords suggested by *Google's Keyword Planner* tool for 'åre' were obtained to generate appropriate seed queries that Åre visitors from different sending countries are likely to use. Next, queries were filtered by region and language for each sending country to reflect sending country specific search behaviour. Subsequently, the suggested keywords were filtered according to two matching rules in order to prevent potential noise caused by irrelevant search queries. Therefore, only keywords strongly related to Åre (i.e. keywords containing 'Åre', 'åre', 'are' or 'ore') as well as keywords containing 'ski' and either 'sweden' or 'sverige' were chosen. For query extraction, an algorithm for automatically crawling *Google Trends* with keyword suggestions has been developed. The algorithm iterates over the suggested keywords and extracts corresponding query series. In case a query series was found for a specific keyword, the algorithm further tries to resolve related queries (i.e. specified alternatives for the given keyword). In case no related

queries were found for a given keyword, the keyword is skipped. It should be noted that Google trends data, used in this study, are provided in a normalized format. First, the search intensity for a given search term or topic is provided as a proportion of all searches on all topics on Google at that time and location. Second, Google trends data are normalized between zero and 100 for the selected time period and location.

3.3 Normalization of Search Terms

Search terms were further examined for close similarity based on linguistic variations, synonyms or misspellings. Similar search terms were merged for two reasons. Due to low search intensity, some query series were found to contain many zero values and are therefore lacking sufficient data quality. It is assumed that normalization of semantically identical search terms can improve predictive power (Liu, 2008). Additionally, it was intended to capture travellers' interests more naturally. As there is no difference whether users search for "skiing in sweden" or "sweden skiing" or "ski sweden", the queries are likely to point to one subject: Skiing in Sweden. In summary, the normalization procedure aims at generating more meaningful search queries, which reflect travellers' intentions more accurately. Therefore, the search terms of the query series were, first, transformed using text processing techniques to achieve similarity matches between search terms. More precisely, tokenization, character substitution, stemming and elimination of stop-words has been performed (ibid., 2008). After these pre-processing steps, the search terms for each query were transformed into a word vector in order to calculate similarity matches based on cosine similarity. Finally, search terms with cosine similarity equal to 1 (i.e. containing the same words and having the same word occurrences) have been merged.

4 Construction of Web Search Indices with High Predictive Power

4.1 Construction of Aggregated Search Indices

As query series reflect certain behavioural aspects of tourism demand, the entirety of all queries may represent drivers behind future tourism demand, thus, discovering important trends for the development of a specific destination (Liu et al., 2012). According to the methodology proposed by Yang et al. (2015), search query series for each sending country were aggregated to compound search indices by shifting single search query series by the most appropriate time lag. Thus, before constructing search indices, temporal relationships between the search query series and tourism arrival data need to be identified, as the use of time-lagged predictors can raise forecasting performance significantly (Liu et al., 2012). As a common method to verify temporal relationships of different economic indicators with certain target variables, *cross-correlations* were calculated to identify time lags with maximum correlation between search queries and arrival series. However, as suggested in the literature, instead of the *Pearson correlation* coefficient, the *De-trended Cross-Correlation Analysis* coefficient (DCCA) was

used to reliably handle the correlation between possibly non-stationary time series (Zebende, 2011; Podobnik et al., 2011).

As it is assumed, that $y = \{y_1, y_2, \dots, y_n\}$ is the target variable (i.e. time series of tourist arrivals) and $x = \{x_1, x_2, \dots, x_n\}$ is an indicator time series (i.e. search query from *Google Trends*), then the DCCA coefficient r for time lag l can be calculated for up to L time lags as follows:

$$r_l = \rho_{\text{DCCA}}(S)_l = \frac{F_{\text{DCCA}}^2(S)}{F_{\text{DFA},x}(s)F_{\text{DFA},y}(S)}, \quad l = 0, 1, 2, \dots, L. \quad (1)$$

where, $F_{\text{DCCA}}^2(s)$ is the *de-trended covariance* between partial sums $\{y_t\}$ and $\{x_t\}$ for a window size s , while $F_{\text{DFA},x}(s)$ and $F_{\text{DFA},y}(s)$ are de-trended variances of partial sums $\{y_t\}$ and $\{x_t\}$ for a window size s , respectively. The window size was specified as $s = 25$ to capture long-term dependencies between both series. The largest cross-correlation of r_i^n is denoted by R_i^n and represents the most significant lag for x when estimating values of y . From a statistical point of view, the maximum correlation coefficient indicates that keyword i was most likely queried n periods prior to the specific arrivals, and is denoted as:

$$R_i^n = \max(r_i^l, r_i^{l+1}, \dots, r_i^L). \quad (2)$$

All search queries were lagged by up to six months in order to capture travellers' short- and mid-term online travel planning behaviour. Accordingly, *de-trended cross-correlations* were calculated between the arrival series and each of the search queries series at lag (0, 1, 2, 3, 4, 5, 6), respectively. Thus, in total, 7 correlation coefficients were calculated for each search query and corresponding tourist arrivals, zero to six months ahead, respectively. Based on the results of the *de-trended cross-correlation analysis* (DCCA), the queries were weighted by their maximum *cross correlation* coefficient by multiplying each query i by R_i^n . Next, each query $R_i^{n < 0}$ was shifted according to n time lags towards the arrivals series, while queries with R_i^0 were excluded from the data set, as according to Yang et al. (2015), only web search activities executed at least one month prior to departure typically do show any predictive power in forecast models for tourism demand. Furthermore, according to Peng et al. (2017), the queries were filtered by *Hurst exponent* in order to assure the search indices to be constructed following the same auto-correlative patterns as its corresponding tourist arrival series. Finally, for each sending country, the number of queries to be included in each of the search indices was limited by a (i.e. backward-stepwise) regression approach, assuring that only significant predictor series are selected for index aggregation. Hence, the limitation of search query series to be included in the index aggregation procedure is based on a trade-off between forecasting performance and model parsimony and generalizability, respectively.

Table 1. Index evaluation metrics

Data set	Structural similarity		Fluctuation memorability		Granger causality	
	Squared correlation	DCCA	Hurst exponent (Arrivals/Index)		t-statistic	F-value
Denmark	0.606	0.891	0.572	0.635	3.663	0.061
Finland	0.504	0.825	0.541	0.613	5.638	0.023
Norway	0.530	0.794	0.590	0.569	6.699	0.011
United Kingdom	0.610	0.834	0.564	0.603	5.684	0.025

4.2 Evaluation of Search Indices

Although a high correlation between input and target series suggests that most fluctuations of the target series can be well explained, it does not necessarily imply predictive power. Thus, as mentioned, in addition to squared correlation and *de-trended cross correlation* coefficients describing the structural similarity between time series, the *fluctuation memorability* was analysed by calculating *Hurst exponents* for both series. Moreover, as suggested in the literature (Song et al., 2010), Granger causality has been chosen as an additional criterion for index evaluation. According to Granger (1969), a variable x_t is causal to y_t , if the forecasting performance of y_t marginally improves by the inclusion of x_t . Results in Table 1 show that the structural similarity between indices and corresponding target series is high (i.e. all squared correlation coefficients greater than 0.5; all *de-trended cross-correlation* coefficients greater than 0.75). As expected, the results also show that both the predictors and target series follow long-term positive auto-correlation patterns, i.e. following the *Hurst exponent*, all arrival and corresponding search index data sets are in the range 0.5–1. This means, that high values will likely be followed by high values and, moreover, values of both series tend to increase over time. Finally, the statistically significant results of the *Granger-Causality* test empirically show that prediction accuracy can be improved when autoregressive forecasting models are extended by an additional predictor variable in terms of search query indices.

5 Model Building and Evaluation

As a traditional statistical approach, linear regression has been chosen as modelling technique for predicting tourist arrivals (Frechtling, 2002; Song et al. 2010). While predictions of future tourist arrivals using univariate approaches typically rely on past tourist arrivals exclusively, multivariate forecasts make additional use of ‘*exogenous*’ variables possible. In the study at hand, travel-related search engine traffic over time is used as an additional input attribute. The aim of this study is to evaluate how prediction accuracy is affected by search traffic data defined as a reduction of prediction errors in tourism demand forecasting. In this study, prediction accuracy is measured by the Root

Mean Square Error (RMSE), which according to Frechtling (2002) and Kim & Kim (2016), is among the most commonly used metrics when evaluating the performance in time series forecasting.

Besides choosing the right measure to evaluate forecasting performance, another important consideration is to choose the appropriate validation method for time series data. In order to avoid overfitting in this study, the evaluation of the forecasting performance is based on a *sliding window* approach (Song et al., 2010). Accordingly, a fraction of data entries is used as training data, while a consecutive fraction of data entries as test data (Liu et al., 2012). Both fractions are successively shifted along the complete data set to compute specific forecasting performance measures for each fraction. Thus, prediction accuracy was calculated by averaging forecasting errors of each fraction. To validate whether the regression models captured the relationship between input and output attributes well, the residuals of the forecasting models were tested for normal distribution by applying the *Shapiro-Wilk* test (Hill et al., 2011).

When modelling time series with statistical approaches it is common to ensure that the time series is within probabilistic limits of *stationarity*. Time series are stationary when their mean and variance are constant and the auto-correlations between two values only depend on the time lag but not the point in time within the series (Frechtling, 2002). Thus, “when regressing over non-stationary time series, traditional statistical approaches fail to generate reliable results” (Mukherjee et al., 1998, p. 335). Therefore, before building the regression model for evaluating the predictive power of the indices, the series were checked for stationarity by applying the *Augmented Dickey-Fuller* (ADF) test, which is testing an autoregressive model for the existence of *unit-roots* as an indicator for non-stationarity (Baddeley & Barrowclough, 2009). Additionally, the *Kwiatkowski-Phillips-Schmidt-Shin* (KPSS) test has been applied (Hill et al., 2011). In contrast to the ADF test having non-stationarity as the null hypothesis, the KPSS test’s null hypothesis is stationarity. Additionally, *co-integration* relationships were tested by applying the *Johansen* test to check whether any further data transformations were necessary in case a time series was found to be non-stationary (ibid., 2011).

Table 2. Tests for stationarity and co-integration for arrival data sets and corresponding indices

Data set	Stationarity-tests				Cointegration-test	
	ADF-test		KPSS-test		Johansen-test (maximum Eigenvalue; r = 1)	
	Test statistic	p-value	Test statistic	p-value	Test statistic	c-value ^{1%}
Arrivals _(DK)	4.827	0.01	0.107	0.100	20.410	11.650
Index _(DK)	5.703	0.01	0.050	0.100		
Arrivals _(FI)	5.130	0.01	0.027	0.100	15.842	11.650
Index _(FI)	5.645	0.01	0.057	0.100		
Arrivals _(NO)	4.217	0.01	0.690	0.014	18.146	11.650
Index _(NO)	4.910	0.01	0.502	0.041		
Arrivals _(UK)	5.425	0.01	0.027	0.100	17.548	11.650
Index _(UK)	6.301	0.01	0.046	0.100		

Results in Table 2 confirm stationarity for the data sets Denmark (DK), Finland (FI) and the United Kingdom (UK) as no unit roots could be found with statistical significance. KPSS results of Arrivals_(DK) can be considered as borderline, as test statistic ranges slightly above the outlined p -value. The null hypothesis of stationarity was rejected for both data sets corresponding to Norway, suggesting that both data sets are non-stationary. Nevertheless, the results of the *Johansen* test clearly show the existence of co-integration relationships between the constructed search indices and their corresponding arrival series, as the null hypothesis (i.e. no co-integration) could be rejected for all the data sets at a significance level of 1% (i.e. all values greater than corresponding c -values). Therefore, no further data transformations were necessary to prevent spurious regression caused by non-stationary data sets.

6 Results

6.1 Comparison of the Forecasting Performance

The prediction of tourist arrivals has been executed *autoregressively* (i.e. based on past tourist arrivals alone) and based on search engine data as additional model input. The prediction models (i.e. ‘autoregressive only’ and ‘autoregressive with search query indices’) have been learned and evaluated for all four sending countries, separately. For evaluating different forecasting characteristics of the specific search indices, the prediction task was executed with forecasting horizons of 3, 6 and 12 months, respectively. Table 3 shows the *Root Mean Squared Error* (RMSE) of the different autoregressive models, the error reduction by adding *Google Trends* data to the pure autoregressive approaches. A *Shapiro-Wilk* test has been executed for models with *Google Trends* data to check if residuals (i.e. the difference between predicted and actual values) are normally distributed, what is considered as an indicator that the regression model has captured the relationship between input and output attributes well (Hill et al., 2011).

Table 3. Comparison of prediction accuracy at different forecasting horizons

Forecasting horizon	Sending country	Autoregressive only (RMSE)	With Google Trends (RMSE)	Difference in (%)	Shapiro-Wilk
3 Months	Denmark	1035.40	966.25	-6.68	0.00
	Finland	782.79	737.92	-5.73	0.00
	Norway	1439.54	949.48	-34.04	0.01
	UK	327.64	326.55	-0.33	0.00
6 Months	Denmark	833.44	809.09	-2.92	0.00
	Finland	935.69	740.03	-20.91	0.04
	Norway	1336.86	1080.63	-19.17	0.03
	UK	328.83	322.32	-1.98	0.00
12 Months	Denmark	892.15	726.95	-18.52	0.05
	Finland	1052.90	719.11	-31.70	0.06
	Norway	1335.23	1307.61	-2.07	0.01
	UK	426.23	381.13	-10.58	0.00

Results in Table 3 clearly show that utilizing online search traffic in forecasting tourism demand raises the performance significantly, as the *RMSE* are reduced for all sending countries and at any forecasting horizon, if autoregressive models were extended by search query series. Furthermore, the results show that all models that are including *Google Trends* data fit the data well, as the *Shapiro-Wilk* test indicates that the residuals are all normally distributed (i.e. *p*-values 0.06 or below).

6.2 Analysis of Relevant Search Queries

As highlighted above, analysing the correlation between tourist arrivals and query series with different time lags enables conclusions to be drawn about consumers' online search behaviour. While travellers from Denmark start to search for inspiration first by activity-related topics (i.e. queries related to skiing) three months prior to departure without mentioning any destination, search queries are formulated more precisely two months ahead of departure (i.e. by mentioning Sweden as possible destination). Finally, queries executed one month prior to departure are formulated even more precisely, as Åre is mentioned more frequently. Interestingly, in contrast to visitors from other examined sending countries, travellers from Denmark perform web searches for trip planning at least one month prior to the trip, as none of the shifted queries pointed to lag zero. Table 4 lists search queries with their most relevant time lag, the corresponding *DCCA* value as well as topic and category the query deals with, exemplarily for the sending country Denmark.

Table 4. Significant query lags for sending country Denmark

Lag	DCCA	Query	Topic	Category
-1	0.599	Åre ski	Skiing in Åre, Sweden	Activities
-1	0.793	Åre	Åre, Sweden	Location
-1	0.670	Åre sverige + åre sweden	Åre, Sweden	Location
-1	0.841	Ski sverige + ski i sverige + skisport sverige	Skiing in Sweden	Activities
-1	0.515	Skistar åre	Skistar Åre, Sweden	Brand
-1	0.740	Skisteder sverige + skisteder i sverige + skisportssteder sverige	Ski resorts in Sweden	Activities
-2	0.783	Skiferie + ski ferie	Skiing holiday	Activities
-2	0.694	Skiweekend sverige	Skiing holiday in Sweden	Activities
-2	0.737	Val thorens skiferie	Skiing holiday in Val Thorens, France	Activities
-3	0.805	Billig skiferie	Cheap skiing holiday	Activities
-3	0.807	Skiferie sverige + skiferie i sverige	Skiing holiday in Sweden	Activities
-3	0.563	Skihytte sverige	Chalet in Sweden	Activities

For Finnish travellers, a rather high correlation coefficient of $r = 0.7$ can be observed for the queries “Levi” and “Ruka”. Since Levi and Ruka are popular skiing resorts in Finland, those queries indicate that, similarly to Danish visitors of the Swedish destination Åre, Finnish travellers more critically evaluate different ski resorts before they finally chose to visit Åre. However, in contrast to Danish travellers, Åre visitors from Finland start searching more specifically for Åre as a destination. For instance, searches for cottages in Åre are performed already four months prior to arrival, followed by queries for the destination Åre as a whole three months ahead of the trip. Finally, one month prior to arrival, especially skiing related queries are executed. Interestingly, the queries of Norwegian tourists are characterized by high diversity, thus, show much more detail concerning travellers demand. Primarily, Norwegian travellers search for lodging and activity-related information before visiting Åre. The queries suggest that Åre is a very popular skiing destination for travellers from Norway, as, instead of comparing different ski resorts like travellers from Denmark and Finland do, almost all the queries are pointing specifically to Åre (Kronenberg et al., 2016). Finally, the UK data set primarily contains search queries related to the topic “*Skiing in Are*” (i.e. “åre ski”, “åre sweden ski”, “åre ski resort”, “skistar åre”), queries with the topic “*Skiing in Sweden*” (i.e. “sweden ski resorts” and “sweden skiing”) as well as location-based queries that point to Åre and “Östersund, Sweden” (i.e. “ostersund” and “ostersund sweden”).

7 Conclusion and Outlook

The present study compared an autoregressive approach to forecast tourist arrivals by using only past arrivals as input attributes with an extended model that includes big data information sources as additional input. More concretely, *web search traffic* (i.e. obtained via *Google Trends*) has been added as additional input for predicting tourist arrivals. As a prediction method, the study used linear regression (Frechtling, 2002; Song et al., 2010). In addition, *Granger causality* tests were performed to examine the evidence for predictive power between constructed search indices and tourist arrival series. The proposed approach has been executed and evaluated for the leading Swedish mountain destination Åre by using arrival data and Google search data for the time period 2005–2012. *R-Statistics*[®] has been used for all statistical computations in this study. The algorithm for retrieving queries has been implemented with *Spyder*[®] (*Scientific Python Development Environment*), thus, it is heavily depending on the ‘*pyTrends*’ framework for the Python programming language. Moreover, the process for search query-based tourism demand prediction has been implemented with *Rapid Miner Studio*[®], a data mining tool set with integration capabilities for software modules written in ‘*R*’ and ‘*Python*’.

To sum up, findings clearly show that (1) tourism-related search queries show the capacity to *significantly increase the accuracy level in predicting tourist arrivals* compared to using past arrivals alone (i.e. autoregressive forecasting approach); and (2) *analysing search queries can reveal meaningful and managerially valuable insights* from sending country specific search behaviour. Therefore, the results reveal important implications for tourism managers and policy makers: *Google Trends* data can be

effectively used as a tool for forecasting short- and mid-term tourism demand as well as for the detection of future (i.e. long-term) trends and demand fluctuations. Additionally, search engine data can be used by local tourism suppliers for marketing purposes to better understand the decision-making process of travellers when choosing a specific destination, e.g. which tourism services and attractions are most heavily searched and, thus, of particular relevance for travellers from various sending countries (Fesenmaier et al., 2010). Thus, the study contributes to the literature by adding a novel approach for using *Google Trends* data as a ‘big data’ source for the prediction of tourist arrivals.

When it comes to study limitations, the matching capabilities of cosine similarity for merging semantically identical search queries are likely restricted. Thus, in order to detect further cases of semantically identical search queries automatically, for information extraction we recommend the application of text analytics tools with the capacity to identify entities and related topics without the need for human intervention (Menner et al., 2016). Finally, in future research, causal chain patterns between lagged queries could be explored by *Granger causality* analysis in order to analyse in further detail how travellers behave when planning a trip to a specific destination.

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Automatic Hotel Photo Quality Assessment Based on Visual Features

Aleksandar Trpkovski¹, Huy Quan Vu^{1(✉)}, Gang Li², Hua Wang¹,
and Rob Law³

¹ Centre for Applied Informatics, Victoria University, Melbourne, Australia
aleksandar.trpkovski@live.vu.edu.au, {huyquan.vu, hua.wang}@vu.edu.au

² School of Information Technology, Deakin University, Burwood, Australia
gang.li@deakin.edu.au

³ School of Hotel and Tourism Management, The Hong Kong Polytechnic
University, Hong Kong, China
rob.law@polyu.edu.hk

Abstract. Photos have been an important means to transfer destination image to potential travelers, as they are widely available on travel related web sites. However, there has been very limited attempt to assess visual quality of online photos, which plays an important role in influencing traveler emotion and their travel intention. This is probably due to the limited background in photography among tourism researchers, and the inefficiency of manual assessment approach. Aiming to overcome these barriers, this paper presents a computational approach to visual features extraction for automatic photo quality assessment. We describe a number of visual features, which are helpful in reflecting the photo quality, and then validate their performance through a number of experiments using a large-scale data set of online travel photos. The introduced approach has the potential to facilitate the evaluation of visual quality of photos on travel web sites and online travel photos.

Keywords: Hotel photo · Visual feature · Quality assessment · Social media

1 Introduction

The Internet has been serving as an effective marketing tool in tourism (Buhalis & Law, 2008). A well-designed website with appropriate visual content would support hoteliers to get better customer recognition of its products (Liu, Arnett, & Litecky, 2000), and build customer loyalty (Bai, Law, & Wen, 2008). Photo quality plays a critical role in influencing customer's emotion and their decision making (Sivaji, Tzuaan, Yang, & Russin, 2014). High-quality photographs are much easier to be remembered by customers (Molina & Esteban, 2006). Low quality photos could impact negatively to the experience of potential travelers (Sivaji et al., 2014). Website evaluation has been an emerging research topic in tourism literature, but it has not been focused on the visual quality of photos on the websites (Law et al., 2010). This is probably due to the lack of methods for assessing the photo quality in tourism literature.

Besides the photos posted online by business managers, a large number of photos have been posted by travelers on a variety of social media platforms such as social network sites, portals, virtual communities, wikis, blogs and travel-related consumer portals (Leung & Bai, 2013). Those online travel photos provide excellent sources for exploring travelers' perception about destinations and tourism products, which are useful to both potential travelers and the tourism and hospitality industry. Various attempts have been made in analyzing online photos to gain insights into travelers' perceptions (Garrod, 2009; Stepchenkova & Zhan, 2013; Pan, Lee, & Tsai, 2014; Hao, Wu, Morrison, & Wang, 2016). However, most existing research focused on the visual content rather than the visual quality of those photos, which can provide clues on travelers' emotional experience or photo taking behavior. Current analysis solely relies on the subjective assessment of the researchers involved in the studies by viewing the sampled photos (Stepchenkova & Zhan, 2013; Pan et al., 2014; Hao et al., 2016). The shortcoming is probably due to the challenges in examining the visual quality of photos. Unlike the visual content, visual quality is not easy to be justified by tourism researchers, who may have limited or no background in photography. It is also time consuming and impractical to examine the photos posted online by travelers at a large scale.

The lack of studies on quality assessment for both official photos on websites managed by businesses and travel photos posted by travelers is due to the lack of a method that can assess the photo quality effectively and at a large scale. Fortunately, the increasing volume of online visual content has attracted research attention from computer science researchers in developing automatic photo assessment techniques (Acharya & Ray, 2005). Measuring the visual quality of photos is an important task in computer applications, where the photos are ranked based on aesthetic properties to support users to select the best ones (Marchesotti, Perronnin, Larlus, & Csurka, 2011). Numerous approaches have been proposed to extract visual features of photos to describe their quality, such as colorfulness, blur, lighting contrast, texture, noisiness and camera setting (Ke, Tang, & Jing, 2006; Datta, Joshi, Li, & Wang, 2006; Chen & Bovik, 2009). By far, no attempt has been made to examine the practical capability of those techniques in assessing online travel photos. It is unclear about which visual features are effective in reflecting visual quality of photos, and how those features can be used to support tourism managers in assessing online visual content.

Aiming to address the aforementioned shortcomings, this paper adopts visual features for automatic photo quality assessment in the tourism context. Namely, we selected a number of visual features, which are helpful in reflecting the photo quality. We then validated their performance in a number of experiments using a large-scale data set of online travel photos, comprised of nearly 10,000 hotel photos from 120 hotels in a tourism destination (Melbourne, Australia). The introduced approach has the potential to facilitate the evaluation of visual quality on travel websites and online travel photos. Since this is the first attempt in adopting automatic photo quality assessment technique in tourism research, our experiments focus on examining the general validity of the visual features against some common assumptions about photo quality. We refine from examining the actual quality of a particular website or exploring perception of a particular travel group. In this paper, a high quality photo refers to photos with visual features that are more likely to have positive influence on viewer's emotion; and a low quality photo is vice versa.

2 Literature Review

Online travel photos have become a very important and powerful medium, especially in electronic marketing. Because visual content can create a public image of a place and reflects tourists' experience of that location (Pan et al., 2014). Attempts have been made to analyze online photos for insights into traveler's perceptions about destination. For instances, Pan et al. (2014) performed a content analysis of travel photos to uncover the connection among motivation, image dimensions and affective qualities of places. Garrod (2009) combined content analysis and quantitative statistical techniques to discover the relationship between tourism destination imagery and tourist photography. Stepchenkova and Zhan (2013) performed a comparative content analysis between travelers and marketers in Peru and revealed some differences in several dimensions. A similar approach using content analysis was adopted in a case study of Japan (Song & Kim, 2016). Hao et al. (2016) combined visual content analysis and photo interpretation for an outdoor tourism spectacular performance in China. In the existing works, the analysis has been carried out mainly using manual approaches and focused on the photo content. Very few attempts were made to directly assess the quality of the photos despite its vital role in influencing customer's emotion and their decision making (Sivaji et al., 2014).

Some attempts were found in the tourism literature to assess specifically online hotel photos to support hotel managers' decision marking. For instances, Jeong and Choi (2005) measured the influence of photo presentations on a hotel website to customers' attitudes and intentions. They found that customers tend to have favorable attitudes toward a hotel website, if a variety of photos are provided on the website. Stringam and Gerdes (2010) focus on exploring the impression of users about the visual content on hotel websites such as photos, color and other information. The presence of photographs on a hotel website was identified as the most significant factor impacting site appeal and influencing the booking decision (Phelan, Christodoulidou, Countryman, & Kistner, 2011; Ert, Fleischer, & Magen, 2016). Yet, these works have not taken photo quality into consideration.

The influence of online photos to travelers' attitudes and intentions was usually examined using surveys (Jeong & Choi, 2005; Stringam & Gerdes, 2010; Ert et al., 2016). Travelers were asked to describe their impression about visual content posted on the hotel websites. The problem with this approach is that travelers' opinions are often subjective. Different individuals may have different impressions or feelings about similar visual content. It is hard for hotel managers to objectively determine which photos are in fact of high quality to be appropriate to be included in their promotion materials. There is no existing quantitative method reported in literature that can help tourism managers to objectively evaluate the photo quality. As such, this paper introduces a method for automatic assessment of online photos and presents an experiment to validate their performance using a large-scale photo data set to facilitate analysis of photo quality for tourism applications.

3 Methodology

3.1 Visual Feature Description

A digital color photo is usually represented by a two-dimensional array of integer triplets; each includes color information of three color channels (National Instrument, 2016). We represent our photos in RGB color space as it is a standard default color space for the Internet (Stokes, Anderson, Chandrasekar, & Motta, 1996), and various photo progressing applications (Datta et al., 2006). We selected five representative features, including *brightness*, *colorfulness*, *contrast*, *sharpness* and *noisiness*, which were found to have influence on viewer's emotion (Valdez & Mehrabian, 1994). Their details are given below.

Brightness. Brightness is a measure of the amplitude of color intensity in digital photo, which has been shown to be effective in assessing the attractiveness of photos (Pedro & Siersdorfer, 2009). Let X and Y be the height and the width of a photo. The brightness visual feature is computed as follows:

$$brightness = \frac{\sum_{x,y} (0.299 * R_{x,y} + 0.587 * G_{x,y} + 0.114 * B_{x,y})}{X * Y} \quad (1)$$

where R , G and B take a value between 0 and 255 to represent the color intensity of each pixel at location x , y for red, green and blue respectively. The weights (0.299, 0.587, and 0.114) are defined by International Telecommunication Union for the brightness computation (ITU, 2011). The overall brightness of the photo is the average of brightness value over all pixels. Brightness feature take a value in $[0, 255]$. A higher value indicates a brighter photo, and vice versa.

Colorfulness. Colorfulness measures the diversity of spectrum contained in the photo, which have been shown to provide high correlation with the human perception of attractiveness (Savakis et al., 2000). Appealing photo tend to have higher colorfulness values (Pedro & Siersdorfer, 2009). We adopt a colorfulness metric proposed by Hasler & Suesstrunk, (2003) as it was proved to have strong correlation with human scores in a psychophysical experiment, and its computation is efficient. Assume that the photo is represented in RGB color space. The first step is to compute the complementary color images:

$$rg = R - G; \quad yb = \frac{1}{2}(R + G) - B \quad (2)$$

Next, the mean and standard deviation values of the pixels in the complementary color images are computed and denoted as σ_{rg} , μ_{rg} , σ_{yb} and μ_{yb} . The colorfulness of a photo is computed as:

$$colorfulness = \sigma_{rgyb} + 0.3 * \mu_{rgyb}; \quad (3)$$

$$\sigma_{rgyb} = \sqrt{\sigma_{rg}^2 + \sigma_{yb}^2}; \quad \mu_{rgyb} = \sqrt{\mu_{rg}^2 + \mu_{yb}^2}$$

The values as computed by Eq. (3) are usually in the range of 0–109, with 0 being not colorful and 109 being extremely colorful.

Contrast. Contrast is the difference in color and brightness of an object that makes it distinguishable from other objects within the same view. Although, multiple definitions for computing the contrast value have been proposed, we utilize the *Root Mean Square* (RMS) contrast, which has been proven effective in ranking and classifying attractiveness of photos (Pedro & Siersdorfer, 2009). Let i_{xy} denote the brightness of a pixel at location x, y in a photo, and \bar{i} is the average brightness of all pixels. The brightness of the photo was normalized such that $i_{x,y} \in [0, 1]$. The *contrast* is defined as the standard deviation of pixel brightness in a photo:

$$contrast = \sqrt{\frac{1}{XY} \sum_{x=1}^X \sum_{y=1}^Y (i_{x,y} - \bar{i})^2} \quad (4)$$

Contrast takes a value between 0 and 1, where a high value indicates a photo with high contrast.

Sharpness. Sharpness is relating to the clarity of detail and edge definition of a photo (Caviedes & Gurbuz, 2002). System sharpness can be affected by the quality of camera lens and sensor. Other inflecting factors are camera shake while capturing photo, focus accuracy, and atmospheric disturbances. In the context of our study, the photos are mainly taken in or around a hotel with reasonable stable environment. The sharpness of hotel photos is probably determined mainly by the camera quality. We use a relatively new Sharpness Index proposed by Blanchet and Moisan (2012), due to its computation efficiency.

$$sharpness = -\log_{10} \Phi\left(\frac{\mu - TV}{\sigma}\right) \quad (5)$$

In the Eq. (5), TV is the total variation that associates to a photo, which is defined in Blanchet and Moisan (2012). μ and σ are the expectation and standardization of TV respectively. Function $\phi(x) = (2\pi)^{-1/2} \int_x^{+\infty} e^{-t^2/2} dt$ is the tail x of the Gaussian distribution. There is no fixed range for the sharpness value. A higher value indicates better sharpness.

Noisiness. Noise is a random pixel level variation in the digital images, one of the key image quality factors that could cause image quality degradation. Noise can appear as randomly distributed black dots on a bright background or with dots on a dark background. We adopt a noise level estimation algorithm, recently proposed by Liu et al. (2013), to represent the noisiness in a photo. This feature was proven to produce better results than other existing methods. No fixed range of the noise was mentioned. Intuitively, a lower noisiness value indicates lower noise level and better photo quality.

The aforementioned visual features are suitable for quantitative assessment of photo visual quality because the features are represented in numeric form, which objectively reflects the characteristics of the photos. In order to compare the overall quality of different photo collections, researchers can compute and compare average values of the photo features in each collection. Statistical tests, such as t-test and ANOVA, will be used to verify the significance of the differences. We carry out experiments to verify the suitability of the visual features in assessing online travel photos in the next section.

4 Experiments

4.1 Data Collection

The data used in our study were taken from TripAdvisor (www.tripadvisor.com), one of the most popular travel review websites. This website has been widely used as a data source for research on hotel preferences and selection criteria of tourists' (Li, Law, Vu, & Rong, 2013; Li, Law, Vu, Rong, & Zhao, 2015). We deployed a web data extraction software in June 2016 to download photos, which were posted by travelers when they made review comments. Other demographic information such as traveler's location of origin and travel mode are also extracted. Photos posted by hotel managers are included in the data extraction process for later comparative analysis.

We use the term *traveler photos* and *management photos* to distinguish the photos posted by travelers and hotel managers respectively. We focus the data extraction on hotels in Melbourne, which is a popular Australian tourism destination. It is possible that some hotels are newly listed without any user reviews or photos, and some users did not provide their location of origins. We exclude them from our data collection. In addition, our study focuses on inbound tourists to Australia, therefore, we do not account for photos posted by Australian residents. Totally, 9448 photos for 120 hotels were collected, among which, 6514 photos were posted by travelers and 2934 photos were posted by hotel managers. A series of experiments are carried out in the subsequent sections to validate the introduced visual features for quality assessment.

4.2 Example Photos and Visual Features

We firstly examined the visual features through an analysis of some sample hotel photos. Figure 1 shows three photos with different visual quality as perceived by the authors. Five visual features were then computed for each photo and listed at the top of the figures. We can see that the brightness, colorfulness, contrast and sharpness of the photo in Fig. 1a are 152.37, 41.90 and 0.64, respectively, which are much higher than the same features of the photos in Fig. 1b, c. The visual features reflect the fact that the first photo appears to be brighter, more colorful, and more pleasant to human eyes than the others. If we zoom in closer to the photos, we can see that the first photo is smooth, whereas the others are noisy with watermark. Such differences were captured by the noisiness feature. The noisiness value for the photo in Fig. 1a is 0.04, which is smaller than those photos in Fig. 1b, c. Figure 1c appears to have lower brightness than Fig. 1b, probably because it was taken outside of the hotel at night time. However, its colorfulness is higher than Fig. 1b because various color tones exist in the background due to street lights.

It should be noted that human eyes can quickly distinguish photos with significant quality differences such as between Fig. 1a and other figures, but slow in comparing photos with relatively similar quality such as the photos in Fig. 1b, c. It is time consuming to examine each photo manually, especially when there is large number of photos available. The use of visual features as quality index can help assessing the photo in a quick and efficient manner.

We further examine the visual features at a larger scale using the collected hotel photo data set. It is worth pointing out that the photos can be taken at both day time and night time, such as in Fig. 1a, c. A photo taken at night time is not necessarily of low quality despite lower brightness. For fair comparisons, we classified the photo collection into two classes, *Day* and *Night*, to compare them separately in the subsequent experiments. Due to the large number of photo available, we adopted Support Vector Machine (SVM) (Tan, Steinbach, & Kumar, 2006), a powerful state of the art machine learning algorithm, to help with the automatic classification for the large number of photos in our data collection. More specifically, a small number of photos were selected first and manually grouped into *day* and *night* classes (100 photos for each class). A vector of color histogram was computed for each photo to represent the color distribution (Shapiro & Stockman, 2001). We divided every color channel into 4 intervals to reduce the dimension of the color vector, which results in 64 bins for the RGB color space. The color of photo pixels is vector quantized into the corresponding bin and normalized between 0 and 1, so that the values do not depend on the size of the photos. The SVM model was trained and tested on the selected day and night photos, using the 10-fold cross validation approach (Tan et al., 2006), which achieved 94% accuracy in agreement with human selection. The trained SVM model is then applied to the rest of the photos in our data collection to separate them into day and night photos for the subsequent analysis.



Fig. 1. Sample photos and visual features. *Note* Figures are best viewed in color and are available from the authors upon request

4.3 Management Versus Traveler Photos

High quality photos are commonly known to give travelers a positive feeling (Molina & Esteban, 2006). It is assumed that DMOs are interested in using quality photos in their promotional materials such as brochures, television commercials and picture postcards to promote tourism destinations and tourism products (Garrod, 2009). An example of management photo was shown in Fig. 1a. Photos in Fig. 1b, c were in fact posted by travelers. This section presents a comparative analysis to determine if photos posted by hotel *management* are of higher quality than those photos posted by *travelers*. The trained SVM model was used to classify the photo collections into day and night photos. We found that around 85% of the photos posted by hotel managers were classified as day time, and 15% were classified as night time. The proportions of the photos posted by travelers are 72 and 28% for day and night photos respectively.

The visual features for the photo collections were computed, whose average values are shown in Table 1. *T-test* with a significance level of $p \leq 0.05$ was applied. The results indicate that the photos posted by hotel managers tend to have higher quality than those posted by travelers for both day and night photos. More specifically, significantly higher mean values were found for the brightness and colorfulness. Contrast and sharpness of the management photos also have a relatively higher value than travelers' photos. Noise level in management photos was found to be lower than in travelers' photos. *P-values* are less than 0.05 in all cases, which verifies the statistical significant of the differences.

Table 1. Visual features for “Management versus Traveler” photos

Group	Features	Management	Travelers	<i>F</i> -statistic	<i>p</i> -value*
Day	Brightness	136.41	119.23	30.03	0.00
	Colorfulness	35.05	29.57	3.25	0.00
	Contrast	0.59	0.52	34.50	0.00
	Sharpness	6.40	4.07	14.32	0.00
	Noise	0.44	0.77	-8.84	0.00
Night	Brightness	80.28	76.44	3.80	0.00
	Colorfulness	42.84	31.66	12.78	0.00
	Contrast	0.40	0.38	3.81	0.00
	Sharpness	6.13	5.09	2.77	0.00
	Noise	0.49	0.69	-2.09	0.02

*Significant at $p \leq 0.05$

4.4 Recent Versus Before Photos

We consider the fact that photo capturing devices have become more advanced due to technological development. It is a natural assumption that the photos taken recently would have better quality than before. This section verifies the capability of the visual features in capturing the differences in terms of photo quality between *recent* years and *before* photos. The photos posted by travelers were grouped into recent years

(from 2013 to 2016) versus before (2012 and before) groups. SVM model was also applied to classify the photos into day and night classes. There are 4774 photos in the *recent years*' group, with 70% day photos and 30% night photos. There are 1739 in the *before* group, with 77% day photos and 23% night photos.

The mean values of visual features were computed for each photo groups, as shown in Table 2. *T-test* with a significance level of $p \leq 0.05$ was applied. No statistical significance was found concerning differences between *recent* and *before* photos in terms of brightness and contrast for both day and night photos. However, recent photos appear to have significantly better sharpness and lower noise level than before photos. This finding is consistent with the fact that the quality of photo capturing devices has been improved with high resolution and better lenses, which allow for capturing sharper and clearer photos. The brightness and contrast are more relating to the scene being captured rather than the camera quality. Therefore, there was no significant difference between *recent* and *before* photos for brightness and contrast. There was no significant difference between the colorfulness values of *recent* and *before* photos for the day class. But for the night class, *before* photos appear to have higher colorfulness than *recent* photos. This is probably due to the scene captured in the photos rather than the camera quality, and there is only a small number of photos in this group.

Table 2. Visual features for “Recent versus Before” photos

Group	Features	Recent	Before	<i>F</i> -statistic	<i>p</i> -value*
Day	Brightness	119.35	118.98	0.60	0.55
	Colorfulness	29.47	29.82	-0.69	0.49
	Contrast	0.52	0.51	1.30	0.19
	Sharpness	4.76	2.35	17.26	0.00
	Noise	0.52	0.87	-6.53	0.00
Night	Brightness	76.36	76.72	-0.32	0.75
	Colorfulness	30.89	34.52	-3.42	0.01
	Contrast	0.38	0.39	-0.41	0.68
	Sharpness	5.60	3.22	5.76	0.00
	Noise	0.48	0.75	-2.74	0.02

*Significant at $p \leq 0.05$

4.5 Travelers' Experience Reflected in Hotel Photos

A clean hotel room with good lighting condition would stimulate positive emotions for travelers, and they may give good ratings for the hotel. A hotel with low lighting condition or less pleasant scenes may produce the opposite experience. Some travelers could have documented their experience by taking photos of the hotel and posted them to online review websites in addition to ratings and comments. This section examines the hotel photos posted by travelers to determine if their visual features are aligned with travelers' experience. More specifically, when posting the comments and photos onto TripAdvisor platform, some users also provide their overall rating (between 1 and 5)

toward the hotel. We grouped the photos in reviews comments with 3-star ratings or above as positive group, photos in review comments with 2 stars or less into the negative group. Those photos were also classified into Day and Night photos using the SVM model, and we only considered photos posted in reviews with a rating in this analysis. There were totally 4412 photos in the positive group, with 70% day photos and 30% night photos. The negative group had 439 photos, with 67% day photos and 33% night photos. It appears that travelers are less likely to take or post photos if they did not have a positive feeling toward the hotel.

Table 3. Visual features for photos in “Positive versus Negative Reviews”

Group	Features	Positive	Negative	<i>F</i> -statistic	<i>p</i> -value*
Day	Brightness	119.32	115.35	2.56	0.00
	Colorfulness	29.82	26.38	2.72	0.00
	Contrast	0.52	0.50	3.40	0.00
	Sharpness	4.19	3.64	1.41	0.08
	Noise	0.74	0.99	-1.90	0.03
Night	Brightness	76.42	79.44	-1.31	0.09
	Colorfulness	32.49	28.96	1.82	0.06
	Contrast	0.38	0.40	-1.9	0.07
	Sharpness	5.37	5.10	0.34	0.37
	Noise	0.67	0.96	-1.47	0.07

*Significant at $p \leq 0.05$

Table 3 presents the mean values of the visual features in each photo group for day and night classes. We can see that the day photos in the positive review group generally have better quality than photos in the negative review group in terms of brightness, colorfulness, and contrast and noise level. A *T*-test with a significance level of $p \leq 0.05$ verified the statistical significant of the differences. No statistical significance was found for the comparison of night photos.

5 Discussions and Conclusion

Visual quality of photos on online travel platforms plays an important role in influencing travelers’ emotion and their travel intention. There were very limited attempts in the tourism literature to assess the photo visual quality. This is probably due to the limitation of the labor intensive manual approach and the limited background in photography of researchers. This paper presented a number of representative visual features and evaluated their performance on a large-scale hotel photo data set. This work is the first attempt to quantitatively assess photo qualities and verifies some assumptions, which were previously made in the manual qualitative approaches. Namely, hotel managers are more likely to post higher quality photos in terms of *brightness*, *colorfulness*, *contrast*, *sharpness* and *noise* than travelers. Photos posted

recently have higher quality than previously in term of *sharpness* and *noise*. Travelers who are not satisfied with the hotel tend to post lower quality photos than those satisfied.

The findings in Table 1 also indicate the fact that a gap exists between the visual quality of what hotel managers advertise and what travelers actually perceive. Hotel managers should be careful about the quality of the photos to be chosen for online marketing. The use of high quality photos, especially those polished by professional photographers, does not always result in a positive result. Because when travelers' experience is significantly different from their expectations, they are likely to have negative feeling (Govers, Go, & Kumar, 2007). Besides, the capability of the visual feature was verified in the comparison between recent and prior photos (Table 2), which may reflect the quality differences in terms of photo capturing devices. It would be beneficial for tourism managers to examine the *sharpness* and *noise* features of photos taken by different groups of travelers for insights into their photo taking preferences. Some travelers may like capturing high quality photos, while others do not care much about such aspect. Tourism marketing managers can incorporate high quality photo capturing devices as bonus gift or pool prizes into travel packages to promote the purchases by travelers who like taking quality photos of their trips. The proposed approach can help tourism managers in selecting suitable quality photos for their travel websites or assessing the existing websites in a quick and efficient way. Table 3 shows some consistency between visual quality of photos and reviewer's sentiment in case of hotel photos. It would be beneficial to incorporate both photo content and photo quality into future studies of hotel photos. A colorful and bright photo of hotel bedroom shared on social media would implicitly express the positive feeling of the photo taker about the room, while a dark photo of a messy room would deliver the opposite message. Tourism managers will not only be able to identify hotel features that attract tourists' attention, but also know their emotion experience for deep insights into tourist's perception.

Due to the limited scope of the paper, only five representative visual features were introduced and tested. Further research can be carried out to identify other features for assessing the photos in different aspects such as aesthetics and emotional influence of the visual content to viewers. Experiments can also be carried out for photos taken at restaurants and tourism attractions to further verify the capability of the visual features in different scenarios.

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Part VIII
Recommender Systems

Automated Assignment of Hotel Descriptions to Travel Behavioural Patterns

Lisa Glatzer^(✉), Julia Neidhardt, and Hannes Werthner

E-Commerce Group, TU Wien, Vienna, Austria
{lisa.glatzer, julia.neidhardt, hannes.werthner}
@ec.tuwien.ac.at

Abstract. The amount of people using online platforms to book a travel accommodation has grown tremendously. Hence, tour operators implement recommender systems to offer most suitable hotels to their customers. In this paper, a method of using hotel descriptions for recommendation is introduced. Different natural language processing methods were applied to pre-process a corpus of hotel descriptions. Further, three machine learning approaches for the allocation of hotel descriptions to travel behavioural patterns were implemented: clustering, classification and a dictionary-based approach. The main results show that clustering cannot be used in this context since the algorithm mostly relies on the operator-dependent structure of the descriptions. Supervised classification achieves the highest precision for six travel patterns, whereas the dictionary approach works best for one pattern. In general, the results for the different travel patterns vary due to the unequally distributed data sets as well as various characteristics of the patterns.

Keywords: User modelling · Personality-based recommender systems
Hotel descriptions · Text mining · Machine learning · Seven-factor-model

1 Introduction

In contrast to most human beings' computational machines often face huge difficulties to analyse and understand text. However, the amount of unstructured text data is rising constantly which makes it inevitable to use automatic analysis instead of a manual one. The approach of text mining is dealing with this problem. It is used to automatically obtain new and beneficial knowledge from text documents. In comparison to data mining, where structured and irreducible data is examined, text mining deals with unstructured data. Typical fields of application are text classification and clustering, the position and sentiment analysis, the extraction of concepts as well as information retrieval. Since the understanding of natural languages is a crucial part of text mining, methods like natural language processing play a major role for the evaluation of textual data (Hippner & Rentzmann, 2006).

During the last years data mining has become popular in many different information sectors including the tourism industry. In Europe, the majority of accommodations for vacations are booked via internet booking platforms (http://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_ICT_use_in_tourism [Apr. 9, 2017]). To

arouse the potential customer's interest, it is important to present accommodations that the user is likely to book. Therefore, many travel operators want to provide automatic online recommendations for their customers. Some of them save data of visited hotels of their clients and on behalf of this recommend hotels in the same country or with a similar price. This collected information can easily be compared and analysed but might not be the only indicator for a useful recommendation.

The focus of this paper lies in the analysis of hotel descriptions generated by travel operators. The approach was to assess hotel descriptions qualitatively in order to detect the most suitable text mining methods to pre-process them. Finally, machine learning algorithms were applied in order to allocate a hotel to one or more of the seven travel behavioural pattern, a combination of tourist roles and the big five, based on the results described in Neidhardt et al. (2014, 2015). The main aim is to identify, to what extent hotel descriptions can be allocated to different travel behavioural patterns in order to enable hotel recommendations on a large-scale.

The benefits of this new form of recommendation would be the assignment of hotels beyond comparable facts such as price, location and size of the hotel by considering information such as descriptions of the ambience in a hotel (exciting, relaxing, friendly, architecturally appealing...) and its characteristics (modern, historical, glamorous, elegant...). When achieving this, the quality of hotel recommendations will be improved in general and the system can help both travel operators to maximize their potential and also tourists to spend a more pleasant time on vacations.

The rest of the paper is organised as follows: In Sect. 2 the state-of-the-art is presented. Section 3 describes the data sample in detail and gives an overview about the qualitative assessment. In Sect. 4 the implemented machine learning models are demonstrated and evaluated. The main results and conclusions are discussed in Sect. 5.

2 State-of-the-Art

2.1 Tourist Roles

Already in the 1970s tourism as well as the idea of tourist roles became more popular. One of the pioneers in tourism research was Cohen (1972) who sociologically studied the motives and reasons for people to travel. In his understanding, travelling was always a combination between getting to know new cultures and landscapes but still wanting to keep familiar parts, which remind them of home. Cohen (1972) describes this as the "environmental bubble", which many people are not willing to leave during their travels. Therefore, tourism can be seen as a trade-off between novelty and familiarity. Based on this research he established four different tourist roles and described their behavioural pattern.

During their scientific research in the tourism domains Yiannakis & Gibson (1992) and Gibson & Yiannakis (2002) studied the correlation between age, sex, education and family backgrounds and touristic preferences. They conducted a questionnaire with over 1200 participants from the United States. Finally, they came up with 17 different tourist roles which reflect diverse touristic behaviours. The authors could identify three different trends in tourist role patterns: The interest for certain roles decreases, increases

or varies over lifetime. For example, the Active Sports Tourist is among the roles which are not common anymore after a certain age. They are merely interesting for younger people who have better physical abilities than older ones.

The seven tourist behavioural patterns (“The Seven Factors”) presented in Neidhardt et al. (2014, 2015) form the basis for the presented work since they represent the user groups who the hotels were recommended to. The Seven Factors reflect different travel needs and characteristics of tourists. As previous work shows it is somehow difficult for many people to clearly express their travelling expectations and desires. Therefore, Neidhardt et al. (2014, 2015) created a picture based recommender system, where users have to select pictures to identify their travel profile. A profile could be either one of the Seven Factors or a combination of some of them. The algorithm has been integrated into www.pixmeaway.com [Feb. 6, 2017]. For identifying the patterns Neidhardt et al. (2014, 2015) established a questionnaire where the characteristics of the big five personality traits by Goldberg (1999) as well as the 17 tourist roles by Gibson & Yiannakis (2002) have been taken into account. Based on the results, the number of travel behavioural patterns could be reduced to seven:

Sunlover: This factor is fond of sunbathing and warm weather whereas he/she avoids museums and crowded places.

Educational: During his/her vacation, this factor wants to broaden his/her knowledge by travelling with groups or organised tours.

Independent: This factor is on a search for inspiration and the sense of life.

Cultural: The main interests are the history of ancient civilisations, arts and culture. Further, he/she prefers first class hotels and premium restaurants.

Sportive: The sportive traveller is very active and wants to get to know the country and its traditions and meet local people during his/her journeys.

Riskseeker: The main preferences of this factor are action, fun and adventures. He/She likes parties and wants to enjoy the night-life.

Escapist: This factor highly enjoys silence and the peace of nature. His/Her main aim during holidays is to escape the everyday life and clear his/her thoughts.

Within the seven-factor model, different groups of users (e.g. demographic groups) can be distinguished in a clear and effective way (Neidhardt & Werthner, 2017).

2.2 Text Mining Based Recommender Systems in the Tourism Domain

A recommender system is a software which aims to predict the interest of a user in a certain item. This helps the user to select the most relevant item out of a large quantity of offered items. In the tourism domain, this can be related to travel, hotel or destination recommendation (Ricci et al., 2011).

Burke & Ramezani (2011) discuss different domains where recommender systems are applied and present main characteristics. They point out that recommendation in the tourism sector is extremely difficult since the user preferences are very unstable. A traveller could go on a city trip and two weeks later he/she could prefer to go skiing. This sudden change in preferences cannot be detected by an automated system. Therefore, many travel recommender systems request an explicit input of the user, which is required to understand his motives. Moreover, booking a trip is often

expensive which means that the risk of a user to rely on recommendation is also higher than in other domains.

The research of Lahlou et al. (2013) investigates text mining methods in order to extract contextual features from hotel reviews created by users. The main aim is to enable context aware recommendation. The used data source were online reviews of different hotels collected from the platform TripAdvisor. Each of the reviews was assigned to one out of five different trip types. The goal was to automatically identify the trip type by establishing a model for processing and classifying the reviews. All applied classifiers did not achieve satisfying results since many reviews do not refer explicitly to the trip type but often are created because the user wants to share his opinion about the hotel.

Cosh (2013) discusses an application of statistical natural language processing algorithms to a set of articles from Wikipedia about top tourist destinations. He wants to automatically detect key features of destinations and then compare and cluster those destinations. For achieving this, standardised methods for natural language processing were implemented. The keywords of a destination were calculated and used to form a content cloud for each destination. For grouping the content clouds, a bottom-up clustering approach was implemented. The main results were that the destinations were mainly clustered by country, which was often a high ranked word in the content cloud for each article. The main limitations were the size of the data set and the different authors and their individual writing styles present on Wikipedia.

The research of Schmunk et al. (2014) deals with the information extraction of online reviews with focus on the polarity of opinions. Hence, they collected online reviews from Booking.com and TripAdvisor and pre-processed them. The results of different text classification techniques as well as a dictionary approach were compared. The three main goals were to predict the property, the sentiment and the subjectivity of the review. They point out that the performance was satisfying for both machine learning as well as the dictionary approach for all three tasks.

In the study of Xiang et al. (2017), the focus lies on predicting the travel purpose (leisure or business) of online reviews of TripAdvisor. The authors evaluated six machine learning algorithms whereas the Multinomial Naïve Bayes performed best. Although the prediction of leisure trips was greater 90%, a big amount of business travel reviews was misclassified (prediction < 45%). By reducing the “noise” in the data using polarisation and enlarging the training set the performance of the classifier could be slightly increased.

3 Data Analysis and Pre-processing

3.1 Description of the Data Source

The data source used for the establishment of algorithms and models are textual descriptions of hotels. The hotel descriptions are written by different tour operators e.g. TUI and FTI and are mainly collected from websites or catalogues. The data set was collected from the Global Distribution System of GIATA GmbH (www.giata.com [May 8, 2015]). The database of GIATA provides more than 364,000 hotel entries and

booking codes from more than 392 suppliers. Figure 1 shows a simple representation of the main entities in tourism and travel industry based on the descriptions in Werthner & Klein (1999): Tourists, intermediaries and suppliers. Among the suppliers are companies which offer “products” like hotels or restaurants as well as airlines. Although consumers directly communicate with the suppliers to an increasing degree, intermediaries still play an important role in the tourism network. Among them are e.g. travel agencies or tour operators which combine products of suppliers to a new offer for the consumers.

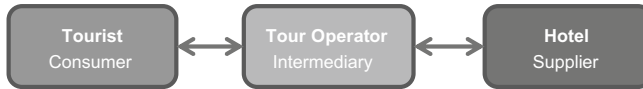


Fig. 1. Overview of the relationships in the tourism industry focusing on hotels

Based on the information provided by GIATA, a database was set up with three entities: hotel, provider (tour operator) and description.

For the further use of machine learning algorithms, a labelled set was provided by experts from an Austrian travel operator and incoming agency.¹ It consists of 551 hotels that are part of the GIATA data set. All entries contain their unique GIATA ID, the name of the hotel and additionally a matching value for each factor expressed as a score between 0 and 100. The higher the score, the more interesting a hotel is for a factor. To enable an independent training and testing of the established models the data set is split in two parts: The training set includes 371 hotel descriptions, the test set 180 hotels, which is a ratio of about 70/30.

Table 1. Overview of the hotels included into test and training set and their relation to the Seven Factors

Entity	Training set	Test set
Overall hotels	371 (100%)	180 (100%)
Sunlover	124 (33%)	59 (33%)
Educational	79 (21%)	34 (19%)
Independent	114 (31%)	70 (39%)
Cultural	102 (27%)	70 (39%)
Sportive	192 (52%)	108 (60%)
Riskseeker	57 (15%)	25 (14%)
Escapist	181 (49%)	97 (54%)

Most classification or clustering methods require distinct labels for evaluation or training of the data. A threshold had to be defined that indicates at which point a hotel is allocated to a factor. The binary factor-labels for the data set were established with

¹ Details will be provided upon request.

the arithmetic means calculated for each factor. Table 1 summarizes the results for the hotels corresponding to the established training and test set.

3.2 Qualitative Analysis of Hotel Descriptions

A manually performed analysis is an important step leading to a better understanding of the text data. A random sample of ten hotels was selected for the qualitative evaluation. One hotel is often described by different hotel operators, therefore is related to more than one hotel description. The ten analysed hotels had an average of 19.7 hotel descriptions each. The hotel descriptions were evaluated regarding facilities, atmosphere and characteristics of the hotel. The qualitative analysis is helpful in terms of getting an insight of the hotel descriptions, their structure, syntax and the content. Further it helps to find ways to pick the most suitable hotel descriptions for further processing steps.

The following conclusions could be drawn based on the outcome of the qualitative analysis:

More than one hotel description per tour operator. All of the selected hotel data sets involved more than one description of the same hotel operator. This is the case since the textual data is published via different media channels or in different travel catalogues. The longest texts were in all cases those which contained the most information since they included all the information of the shorter texts as well as additional one.

Several tour providers offer equal/similar descriptions. Not only descriptions of one hotel operator were equal to each other but also those of some operators were identical. For example, in all cases the descriptions of operator *Jahn Reisen* were equal to tour provider *ITS*.

Serious differences in text quality. Many of the evaluated descriptions included only enumerations of attributes of a hotel and did not contain coherent sentences. Not even half of the analysed hotel operators offer texts with higher literary quality.

Usage of templates. A majority of the evaluated tour operators uses predefined headline structures in their hotel descriptions. Every description follows a certain format. Beneath the headlines of these “templates” they embed some information gathered from a database or manually written text. The predefined structure makes it easier for readers to compare different hotels especially if they are only interested in one special feature of a hotel.

Considering the outcome of this qualitative analysis, further automated evaluation methods are implemented under the constraint that *a hotel is represented by its longest hotel description*. A more detailed analysis of the relation between lexical diversity (Johansson, 2008) and text length performed on a larger data set has substantiated this constraint.

3.3 Natural Language Processing and Vector Transformation

In order to enhance the results for algorithms grouping text documents, the raw texts have to go through certain natural language processing steps (Bird et al., 2009).

Most of the raw hotel descriptions were collected from websites, which means they are stored in html format. Therefore, all the html tags had to be removed so that the textual content is extracted and can be processed further. Additionally, the words were all transformed to lower case.

Tokenization is the base for the extraction of higher level information of a document as described in Weiss et al. (2010). The whole text is divided into individual units, in this case single words. A simple tokenizer where all non-letters represent separators was used. Words, whose semantic content does not matter in case of classification or selection of a certain document are called stop words. The removing of those tokens enables a more efficient evaluation in terms of frequency of word occurrences.

The next step was to reduce the number of different tokens by grouping them semantically. Many tokens, which are syntactically written in a different way, belong together in a semantic way. *Stemming* decreases the number of overall tokens in the data set of about 20%. This reduction will enhance a faster execution of the machine learning algorithms.

Additionally, *Pruning* was applied in order to remove words that do not have semantic value from the document set. It can be assumed that words which only occur in very few of the hotel descriptions do not have a high value for grouping data samples. Therefore, all tokens that are included in less than 5% of all the documents were being removed. Table 2 shows the impact of the pre-processing steps on an extract of a hotel description.

Table 2. Data pre-processing steps applied on an extract of a hotel description

Preprocessing	Extract of hotel description
Raw text	<![CDATA[Lage: Das Hotel liegt in der Nähe der Geschäfte und Restaurants von Yaletown.]]>
Content extraction	lage: das hotel liegt in der nähe der geschäfte und restaurants von yaletown
Tokenization	lage das hotel liegt in der nähe der geschäfte und restaurants von yaletown
Stop words removal	lage das hotel liegt in der nähe der geschäfte und restaurants von yaletown
Stemming	lag hotel lieg nah geschaf restaura yaletown
Pruning	lag hotel lieg nah geschaf restaura yaletown

Most machine learning algorithms need to calculate distances between entities of the data set. They cannot handle nominal data as an input. Therefore, the pre-processed text had to be transformed to a numerical vector. Every hotel description was transformed into a vector containing a numerical value for each attribute (token). The word vector has been generated by using the Term Frequency-Inverse Document Frequency (TF-IDF) method described in Leskovec et al. (2014).

4 Hotel Assignment—Three Machine Learning Approaches

For allocating a hotel description to one of the seven travel behavioural pattern, three different methods were selected: Clustering, classification and a dictionary-based approach. The individual result for each factor was evaluated and compared to each other.

4.1 Unsupervised Cluster Analysis

Unsupervised Clustering was implemented with the k-means algorithm and the cosine similarity measure (Aggarwal & Zhai, 2012). The main limitation of this method was that it could capture if a hotel is related to more than one factor, since only an exclusive assignment to a cluster was possible. However, the goal was to identify some cluster which would represent one or more travel behavioural pattern.

In order to determine the optimal number of clusters for the given data set, quality measures for different values of k (number of clusters) were evaluated. According to the results of these measures it was assumed that six clusters were most appropriate.

The evaluation of the cluster analysis pointed out that the algorithm did not detect clusters representing a factor but representing a tour operator (Fig. 2). The main reason was the previously described template structure of the descriptions. Hence, unsupervised clustering could not be used to identify hotels for travel behavioural patterns but for getting an input on which operators offer similar descriptions for their hotels.

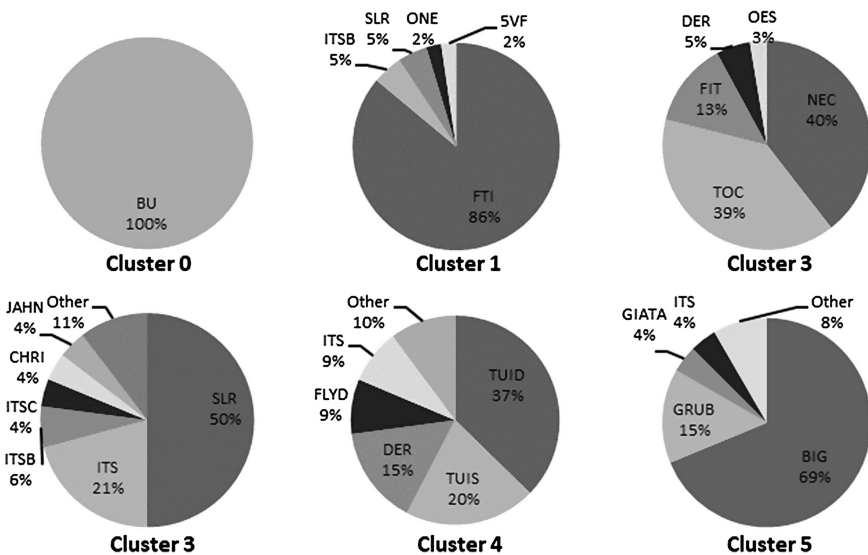


Fig. 2. Distribution of tour operators to clusters

4.2 Supervised Classification

For supervised learning three classifiers were implemented and compared: Naïve Bayes, k-NN and Decision Tree (Gupta, 2006). For each factor, a model was established to classify the factor related hotels versus the residual hotels. Hence, for each factor the individually best working classifier could be selected. The validation of the seven models were done with 10-fold cross validation of the training set. The precision value was seen as significant to evaluate since it measures how many of the selected hotels are relevant for the user.

The outcome of this approach indicated that the allocation of hotels to the seven factors strongly depends on the factor itself. It wasn't even possible to identify a most suitable classifier for all travel behavioural patterns, since each of them performed best for at least one of them. For Sunlover, Cultural and Escapist, the Decision Tree algorithm performed best, whereas for Educational, Independent and Riskseeker k-NN was the best solution. The Naïve Bayes classifier had highest scores only for the Sportive factor. The models for Sunlover and Escapist were the most promising ones regarding their training validation, whereas the related hotels of Independent and Riskseeker had turned out as very difficult to classify.

4.3 Dictionary-Based Approach

To enhance the simple classification models, a dictionary based approach was implemented. Experts in the tourism domain identified words which should describe the characteristics of hotels related to the seven factors. Based on this input, seven dictionaries were created and only their content was used with the three mentioned classifier. However, the input of the dictionary could enhance only the Sunlover's model. All others had lower precision values using the dictionary than with simple classification. Thus, overall the words introduced by the experts did not help to differentiate between the different factors but introduced more noise. In Fig. 3, the training results for simple classification and the dictionary approach are compared.

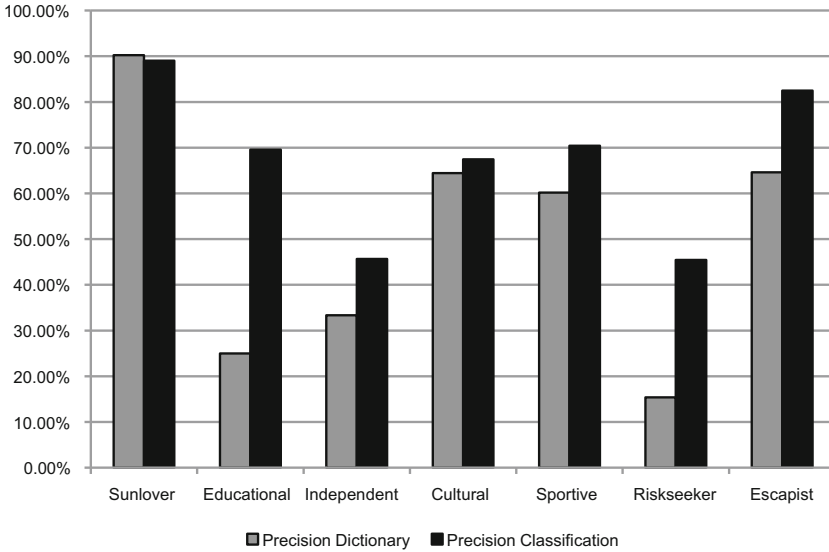


Fig. 3. Comparison of precision of dictionaries and simple classification on the training set

4.4 Evaluation of Test Set

To enable a final evaluation, the best model for each travel behavioural pattern was applied to the test set provided by an Austrian travel operator and incoming agency. For the Sunlover the dictionary based method was chosen, for all others the simple classification was evaluated. The test set covers a scope of 180 hotels which have already been allocated to one or more factors. The test set validation is important to ensure that the previously established models can be applied on data that was not used during their training phase.

The final result is introduced in Fig. 4. It shows the comparison of the precision of the training and the test set. For most of the seven factors the outcome for both data sets strongly correlates. Considering Sunlover and Independent the precision of the test set even improved about 5% which indicates that the models can handle new data very well. The same holds for Cultural and Sportive, where the precision slightly increased, as well as for Escapist, where the precision went down for about 5%, but still the second-best result could be achieved. The three outliers are the factors Educational, Independent and Riskseeker. For the latter, a precision value of only 11.11% could be accomplished.

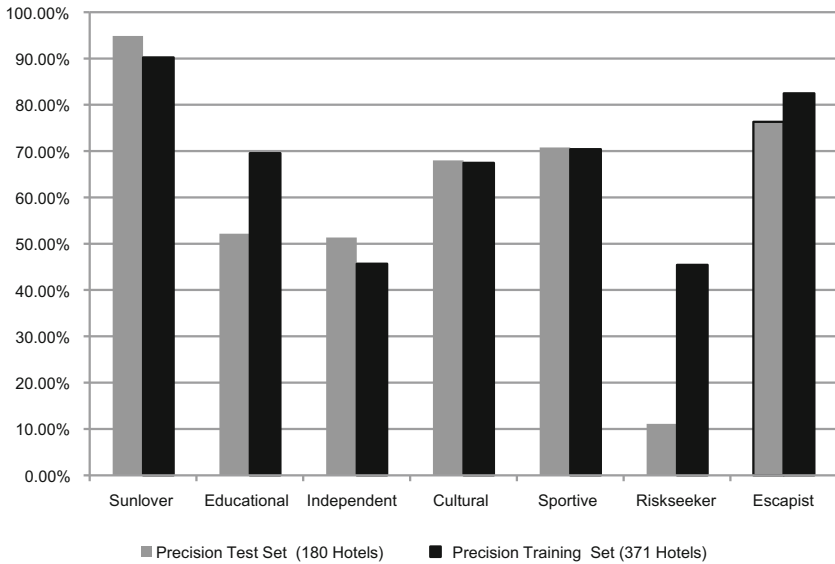


Fig. 4. Comparison of precision of test set and training set

5 Conclusions

In this paper, different concepts and models to enable an automated allocation of hotel descriptions, and further hotels, to the seven factors defined by Neidhardt et al. (2014, 2015) were discussed. Therefore, state of the art literature focusing on tourism patterns, text mining and tourism recommender systems was studied. Further a qualitative analysis was applied which pointed out that longer hotel descriptions provide in general more information. In order to pre-process the text documents, several natural language processing steps were applied e.g. tokenization, pruning and stemming. Three machine learning algorithms (clustering, classification and a dictionary-based approach) for text grouping were designed, implemented and evaluated. The outcome was expected to be a contribution for future recommender systems in the tourism domain.

The final result indicated that most of the previously defined models were capable of dealing with new hotel data. The Sunlover achieved the best precision value of over 90%, followed by the Escapist, Sportive and Cultural tourists with a precision around 70%. This states that a hotel recommendation based on hotel descriptions can be a promising approach for recommender systems, however, it depends on the targeted user group. For the three factors Educational, Independent and Riskseeker the precision value was below 55% which means that hardly every second proposed hotel is interesting for respective tourists. The proposed data set is not suitable for all of the factors since some of them are underrepresented and therefore, the model building was more challenging. However, if we consider the Independent, the number of related hotels is similar to the Sunlover. Still the precision of the Sunlover is almost 45% better. Hence, the distribution of the data set cannot be considered as the only dependency of the

diverse results of the travel behavioural patterns and it is not sure that a larger data set enables a more precise modelling for the underrepresented factors.

Another reason for the unsatisfactory performance of some tourist factors can be the characteristics of the factors themselves. The Riskseeker, for example, likes adventures and experiencing crazy activities, therefore the “standard” hotels one can find in a catalogue might not be the ones he/she is interested in. The Independent intends to go on a journey to inspiration and discover the sense of life. Therefore, it was a complex task to identify hotel features which would match this type of traveller. Even experts in this field found it difficult to state the characteristics of a suitable hotel during the dictionary creation, since there is no general understanding on how a hotel should inspire somebody. Concentrating on the Educational, a drastic decrease of more than 15% precision can be observed between training and test set although the distribution for the factor in the two data sets is similar. The Educational likes travelling in groups and broadening his knowledge. There are many travel operators like TUI or GRUBER-Reisen which offer guided trips for groups. However, an advertisement for a guided tour in a catalogue mostly focusses on the country and attractions, the hotels visited during the travel play a minor role. Hence it can be discussed if it makes sense to recommend single hotels to this factor. A better solution would be the recommendation of a guided tour in a specific region.

However, considering the promising results of Sunlover, Cultural, Sportive and Escapist, the analysis of textual hotel descriptions can be a good solution for online recommender systems. Moreover, the Sunlover proves that the dictionary approach is an effective method, if the most prominent words were correctly defined. The gained information about the assignment of textual description to travel behavioural pattern should be used as a valuable input to enhance online recommendation of hotels.

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Mapping of Tourism Destinations to Travel Behavioural Patterns

Mete Sertkan^(✉), Julia Neidhardt, and Hannes Werthner

E-Commerce Group, TU Wien, Vienna, Austria
{mete.sertkan, julia.neidhardt, hannes.werthner}
@ec.tuwien.ac.at

Abstract. Tourism is an information intensive domain, where recommender systems have become an essential tool to guide customers to the right products. However, they are facing major challenges, since tourism products are considered as complex and emotional. It has been shown that the seven-factor model is a legitimate way to counter some of these challenges. However, in order to recommend an item, it has also to be described in terms of this model. This work's aim is to find a scalable way to map tourism destinations, defined by their attributes, to the seven-factor model. Through statistical analysis and learning methods it is shown that there is a significant relationship between particular destination features and the seven-factors and that destinations can be grouped in a meaningful way using their attributes.

Keywords: User modelling · Tourism recommender systems
Tourism destinations · Statistical analysis · Cluster analysis
Seven-factor model

1 Introduction

The rapid development of Information & Communication Technologies (ICT), and especially the emergence of the World Wide Web, lead to fundamental changes in the tourism industry, both on the supply and the demand side. Consumers now have ubiquitous access to vast amounts of information at a very low cost, allowing them to compose and compare products and optimize their trips. However, increasing cognitive costs to process the amount and variety of information could lead to the problem of information overload. This shows the necessity of new techniques and tools to analyse, categorize and visualize information in a proper way (Hwang, Gretzel, Xiang, & Fesenmaier, 2006). On the other side, the Web also allows a massive “informatization” of the whole tourism value chain, resulting in many novel value-generating strategies, to satisfy new consumer needs (Werthner & Ricci, 2004; Werthner et al., 2015).

According to a recent study (Ipsos MediaCT, 2014) people rely on online sources such as social media, photo- and video-sites and search engines to get inspired where to go or how to travel. It is shown that 65% of the leisure travellers start researching online before a travel decision. Particularly in this early phase of decision making a considerable amount of people has difficulties to explicitly express their preferences and needs (Zins, 2007). Recommender Systems (RSs) are facilitating this

decision-making. Ricci, Rokach, and Shapira (2015) define RSs as “software tools and techniques providing users with suggestions for items a user may wish to utilize”. Particularly, profiling and personalization might help in such cases, where preferences and needs are unknown or hard to express. Especially in tourism this is a big challenge, since tourism products are considered as very complex (i.e., they typically combine accommodation, transportation, activities, food, etc.), mostly intangible and highly associated with emotional experiences (Werthner & Ricci, 2004).

Neidhardt, Seyfang, Schuster and Werthner (2014, 2015) introduced a picture based approach to elicit the preferences of a user and a seven-factor model to capture the respective user’s profile within a travel recommender system. These factors form the basis of a seven-dimensional vector space and are referring to travel behavioural patterns summarized as *Sun & Chill-Out*, *Knowledge & Travel*, *Independence & History*, *Culture & Indulgence*, *Social & Sport*, *Action & Fun*, and *Nature & Recreation*. Based on a picture-selection process, a user’s profile is determined. This profile comprises a score for each of the factors and thus can be seen as a point in the seven-dimensional vector space. In order to provide recommendations to a user, those items have to be determined that are closest to him/her. Thus, also the items have to be mapped into the vector space, i.e., represented with respect to the travel behavioural patterns. In order to build up a reasonable recommendation base more than 10,000 tourism products were initially mapped manually by experts. Obviously, this approach does not scale.

The aim of this work is to find an automated way of relating tourism products to travel behavioural patterns. In particular, the relationships between the seven-factors and attributes of destinations will be examined in order to map the destinations onto the seven-factors and to group similar destinations for a better understanding and generalization.

The rest of the paper is organized as follows. In Sect. 2 the state of the art is presented, focusing on tourist roles, the seven-factor model, and tourism recommender systems. In Sect. 3, the data sample is described. In Sect. 4 regression analyses based on expert mappings are conducted and discussed. In Sect. 5 a cluster analysis is conducted and presented. In Sect. 6 the main insights are summarized and conclusions are drawn.

2 State-of-the-Art

2.1 Tourist Roles & The Seven-Factor Model

Much research has been conducted in order to identify and categorize tourist roles, describing the relation between a person’s travel behaviour and his or her preferences, interest, and needs. In this context, Gibson and Yiannakis (2002) introduced a well-established classification framework, distinguishing 17 different tourist roles, capturing short-term behaviour. Gretzel, Mitsche, Hwang, and Fesenmaier (2006) demonstrated that tourist roles can be used in order to recommend touristic activities and, in turn, destinations. It has also been shown that tourist roles can be related to personality traits. Delić, Neidhardt and Werthner (2016) are providing significant evidence to the relation between the well-established Big-Five personality traits

(Goldberg, 1990) and the 17 tourist roles (Gibson & Yiannakis, 2002). Personality traits tend to be stable over time and can be considered as long-term preferences of a person (Woszczyński, Roth, & Segars, 2002). Taking into account both the Big-Five personality traits (long-term behaviour) and 17 tourist roles (short-term behaviour) Neidhardt et al. (2014, 2015) developed a seven-factor model by conducting factor analysis. Each factor is referring to a travel behavioural pattern, which are summarized in Table 1. These factors are easier to process computationally as well as cognitively compared to the original 22 dimensions. Neidhardt and Werthner (2017) showed that based on different demographic characteristics different user groups can be well distinguished within this model.

Table 1. Seven-factor model

Factor	Description
<i>Sun & Chill-Out</i>	A neurotic sun lover, who likes warm weather and sun bathing and does not like cold, rainy or crowded places
<i>Knowledge & Travel</i>	An open minded, educational and well-organized mass tourist, who likes traveling in groups and gaining knowledge, rather than being lazy
<i>Independence & History</i>	An independent mass tourist, who is searching for the meaning of life, is interested in history and tradition, and likes to travel independently, rather than organized tours and travels
<i>Culture & Indulgence</i>	An extroverted, culture and history loving high-class tourist, who is also a connoisseur of good food and wine
<i>Social & Sports</i>	An open minded sportive traveller, who loves to socialize with locals and does not likes areas of intense tourism
<i>Action & Fun</i>	A jet setting thrill seeker, who loves action, party, and exclusiveness and avoids quiet and peaceful places
<i>Nature & Recreation</i>	A nature and silence lover, who wants to escape from everyday life and avoids crowded places and large cities

2.2 Tourism Recommender Systems

The relationship between tourism and ICT is described as a symbiosis by Gretzel (2011) and travel & tourism have always been major application domains for Web-related services (Werthner & Klein, 1999). As the amount of information on the Web started to rise the call for techniques to cope with information overload began to grow. One answer to that are RSs. There are different types of recommendation techniques and hybrid solutions, but according to Burke and Ramezani (2011) the most appropriate ones in the matter of tourism are either content-based (recommending items similar to the ones the user already liked in the past) and/or knowledge-based (recommending items using domain knowledge about user preferences and needs and utility of items to the user). This work is based on a picture-based approach to RSs (Neidhardt et al. 2014, 2015), which can be considered as a content- and knowledge-based approach. Preferences and needs of a user are determined via a simple picture selection process. In this way, the so-called cold-start problem of learning-based techniques (collaborative, content-based, and demographic) (Burke, 2007) as well as

tedious questionnaires for preference elicitation are avoided. Thus, the users are addressed on an emotional, implicit level and do not have to state their preferences explicitly. According to Garcia, Sebastia, and Onaindia (2011) tourism RSs can be distinguished into two types: one focusing on destination selection the other on activities that can be performed at a certain destination. This work belongs to the first mentioned group, in contrast to Neidhardt et al., (2014, 2015), where the focus lies on the Point of Interests (POIs), e.g., activities, events, restaurants, sights. Much research has already been conducted targeting destination recommender systems (Fesenmaier, Werthner, & Wöber, 2006; Borràs, Moreno, & Valls, 2014), but most of them are mainly focused on a distinct region or POIs in a destination. There are few that are focussed on personality traits and motifs of a user (see for example Braunhofer, Elahi, & Ricci, 2014).

3 The Data Sample

The data is provided as a SQL-dump by a German eTourism company¹ and consists of more than 30,000 destinations all around the world. Almost all countries are represented in the database, but the majority of destinations are located in the USA, Germany, France, Italy, Spain, Great Britain, Austria, Greece, Switzerland, and Sweden (65%). Beirman (2003) defines tourism destinations as “a country, state, region, city or town which is marketed or markets itself as a place for tourists to visit”. In this work destinations are defined in a similar way, except the range goes from a hamlet (population <100) to a metropolis (population >1M). Destinations are described via destination features, which can be separated into two groups:

1. **Motivational ratings** in an interval of 0–1, describing the degree of appropriation for a particular motif. Following 27 motivational ratings are listed: *nightlife, wellness, shopping, nature & landscape, image & flair, culture, sightseeing, entertainment, mobility, price level, accommodations, gastronomy, beach & swimming, golf, scuba diving, kite & windsurfing, hiking, cycling, horseback riding, winter sports, sports, family, quietness, surfing, sailing, gays, and mountain biking*. The motivational ratings are determined considering factors such as infrastructure, climate, geographical nature, user opinions, number of services, image, and marketing.
2. **Geographical attributes** are presented in binary format, describing the presence or absence of a particular attribute. Following 14 attributes are listed: *sea, mountain, lake, island, sandy beach, metropolis, forest, river, desert, old town, pebble beach, sand & pebble beach, hill, swamp, volcano, fjord, flat decaying sand beach, beach promenade, wine-growing, heath, health resort, and winter sports resort*.

For this study, 561 destinations were chosen randomly and mapped manually by experts by assigning a score for each factor using the scale 0–0.25–0.50–0.75–1. The higher the score the more suitable the destination for that specific factor. The consulted

¹ More details and the data are provided upon request.

experts are members of an Austrian eTourism company that has already been using an implementation of the picture based approach introduced by Neidhardt et al. (2014, 2015). Hence, they have expertise in both the seven-factor model and the travel destinations. Three experts analyzed 561 destinations first individually and then determined a final mapping in a joint-discussion. Table 2 shows the resulting distributions.

Table 2. Factor distribution of the expert mapping

	% of destinations scored with				
	0	0.25	0.50	0.75	1
<i>Sun & Chill-Out</i>	39.93	19.07	13.90	8.74	18.36
<i>Knowledge & Travel</i>	36.72	29.41	17.65	9.63	6.59
<i>Independence & History</i>	13.90	24.60	35.29	18.90	7.31
<i>Culture & Indulgence</i>	28.70	21.75	23.53	13.19	12.83
<i>Social & Sport</i>	1.78	8.20	53.83	32.09	4.10
<i>Action & Travel</i>	50.09	21.03	12.66	6.77	9.45
<i>Nature & Recreation</i>	16.58	15.15	22.82	25.85	19.61

For example, in case of the factor *Sun & Chill-Out* 39.93% of the destinations scores were with 0, 19.07% with 0.25, 13.9% with 0.5, 8.74% with 0.75, and 18.36% with 1. A similar distribution can also be observed for factors *Knowledge & Travel*, *Culture & Indulgence*, and *Action & Fun*, where the majority of destinations either score with 0 or 0.25. On the other hand, for the factors *Independence & History* and *Social & Sports* most of the destinations score with 0.5 and only very few with 0 or 1. The only factor where the differences are not that pronounced is *Nature & Recreation*.

4 Mapping of Destination Features to Seven Factors

The aim of the work is not only to project destinations into the seven-dimensional vector space of travel behavioural patterns using their features, but more importantly to understand the relationship between the seven-factors and destination features. In James, Witten, Hastie, and Tibshirani (2013a) it is suggested to choose linear models over more complex ones if inference and interpretability is the goal. Taking this into account, a multiple linear regression model (James, Witten, Hastie, & Tibshirani, 2013b) with step-wise variable selection (James, Witten, Hastie, & Tibshirani, 2013c) is applied. All seven factors are considered as independent from each other, since they are obtained from factor analysis. Therefore, they can be treated separately by fitting a model for each travel behavioural pattern, which takes the features of a destination as input and returns the factor score (0–1) as output. The data sample is split into a training and test set in a ratio of 80/20. Model performance is assessed by R^2 (proportion of variance explained) and root mean square error (standard deviation of the residuals/prediction errors) of training ($RMSE_{train}$) and test set ($RMSE_{test}$).

Table 3. Performance of the resulting multiple linear regression models

	R ²	RMSE _{train}	RMSE _{test}	F-statistic	Signif.
<i>Sun & Chill-Out</i>	0.70	0.21	0.25	148.6	***
<i>Knowledge & Travel</i>	0.66	0.18	0.20	145.6	***
<i>Independence & History</i>	0.56	0.19	0.20	98.7	***
<i>Culture & Indulgence</i>	0.58	0.22	0.25	108.1	***
<i>Social & Sports</i>	0.19	0.16	0.18	23.1	***
<i>Action & Fun</i>	0.76	0.16	0.19	121.7	***
<i>Nature & Recreation</i>	0.52	0.20	0.23	105.0	***

Table 3 shows the performance of each model. There is a statistically significant relationship between each travel behavioural pattern and destination features (used in the corresponding models), with $p < 0.001$ (***). RMSE_{train} and RMSE_{test} are close, indicating that the resulting models will perform similar out of sample. Overall, all travel behavioural patterns are well described by the resulting models, except *Social & Sports*, where only 19% of the variance is explained. This is caused by the uneven distribution of the expert mapping of *Social & Sports*, where 53.83% of the destination scored with 0.5 and only 1.78% scored with 0 and 4.10% with 1 respectively. Nevertheless, there is significant evidence of a relation between destination features and the factor *Social & Sports*. *Sun & Chill-Out* and *Action-Fun* have the best fitted models, where 70 and 76% of the variance can be explained.

The resulting multiple linear regression models comprise both motivational ratings and geographical attributes. After the variable selection 18 out of 27 motivational ratings and 7 out of 14 geographical attributes in total are used. Table 4 summarizes the outcomes of the regression analysis. Motivational ratings *sightseeing*, *culture*, *entertainment*, *family*, *quietness*, *gastronomy*, and *image & flair* appear in more than one model. Also, geographical attributes *sea*, *health resort*, and *winter sports resort* are in several models.

Model A—*Sun & Chill-Out*. The geographical attributes *sea*, *health resort*, and

Table 4. Results of the regression analysis

Coefficients	Model A	Model B	Model C	Model D	Model E	Model F	Model G
(Intercept)	0.23***	0.07***	0.27***	0.11***	0.46***	-0.03*	0.72***
<i>Sightseeing</i>	-0.23***	0.43***	0.18***	0.20***	-0.14***	0.12***	-0.17***
<i>Sea</i>	0.43***	-0.09***	-0.12***	-0.07**	-	0.14***	-
<i>Culture</i>	-	0.28***	0.45***	0.38***	-	-	-
<i>Entertainment</i>	-	0.33***	-	-	-0.21*	0.63***	-
<i>Family</i>	-	-0.16***	-	-0.14**	-	-0.36***	-
<i>Quietness</i>	-	-	-0.09***	-	-	-0.11***	0.44***
<i>Gastronomy</i>	-	-	0.14**	0.28***	-	-	-0.35***
<i>Image & flair</i>	-	-	-	0.17***	-	-	-0.09**
<i>Health resort</i>	0.27***	-	-	-	-	-	0.14**
<i>Winter sports resort</i>	-	-	-0.14**	-	-	0.14*	-
<i>Beach & swim</i>	0.30***	-	-	-	-	-	-
<i>Nature & landscape</i>	0.15***	-	-	-	-	-	-
<i>Nightlife</i>	-0.25***	-	-	-	-	-	-
<i>Sports</i>	-	-	-	-	0.43***	-	-
<i>Hiking</i>	-	-	-	-	0.08***	-	-
<i>Winter sports</i>	-	-	-	-	-	0.35***	-
<i>Sailing</i>	-	-	-	-	-	0.18***	-
<i>Mobility</i>	-	-	-	-	-	0.16**	-
<i>Mountain biking</i>	-	-	-	-	-	0.08**	-
<i>Golf</i>	-	-	-	-	-	0.11**	-
<i>Shopping</i>	-	-	-	-	-	-	-0.34***
<i>Lake</i>	0.18***	-	-	-	-	-	-
<i>Old town</i>	-	-	-	-	-0.09*	-	-
<i>Metropolis</i>	-	-	-	-	-	0.17***	-
<i>Mountains</i>	-	-	-	-	-	-	0.14***

Note Significance level is coded as follows: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

lake and motivational ratings *beach & swim* and *nature & landscape* are significantly, positively related to this factor. Those features can be interpreted as indicators for relaxation and indirectly also for sun. On the other side, motivational ratings *sightseeing* and *nightlife* have a significant negative impact, which can be associated with crowded places and mass tourism.

Model B—Knowledge & Travel. The motivational ratings *sightseeing*, *culture*, and *entertainment* are significantly, positively related to this factor. Those features can be seen as the main motivation of travellers with the ambition to learn something on their trip. On the contrary, motivational rating *family* and geographical attribute *sea* are significantly, negatively associated with this factor. The negative impact of motivational rating *family* can be explained by the fact that most destinations in the data sample, which have an increased motivational rating *family* (>0.5), show typical characteristics of recreational travel destinations. Namely, they are quietly situated and

in the nature. The majority of destinations in the data sample, which are located at the *sea*, have sea resort characteristics, where cultural and educational interests are short comings. This explains the negative sign of the geographical attribute *sea*.

Model C—Independence & History. The motivational ratings *culture*, *sightseeing*, and *gastronomy* are significantly, positively related to this factor. Those features can be seen as the main motivation of travellers with interests in history and tradition. Whereas motivational rating *quietness* and geographical attributes *sea* and *winter sports resort* are significantly, negatively related. The negative impact of the geographical attribute *winter sports resort* is not surprising. The majority of destinations in the database, which are located in a *winter sport resort*, are mostly dedicated to winter sports and après-ski only. Thus, interests of an independent traveller with passion for history and tradition is short coming. The negative impact of the geographical attribute *sea* can be interpreted in the same way as for the factor *Knowledge & Travel* (see Model B—*Knowledge & Travel*). The motivational rating *quietness* is an indicator for low population and tourism density, where high rated places are considered more appropriate for recreational travellers than for people with interest in history and tradition. By this means, the negative sign can be explained.

Model D—Culture & Indulgence. The motivational ratings *culture*, *sightseeing*, *gastronomy* and *image & flair* are significantly, positively related to this factor. Those ratings can be interpreted as the main motivation of a culture and history interested high class tourist, who is also a connoisseur of good food and wine. On the other hand, the motivational rating *family* and the geographical attribute *sea* have a significant negative impact on the factor, which has the same cause as in *Knowledge & Travel* (see Model B—*Knowledge & Travel*).

Model E—Social & Sports. The motivational ratings *sports* and *hiking* are significantly, positively related to this factor, which is obvious. Whereas, the motivational ratings *entertainment* and *sightseeing* and the geographical attribute *old town* are significantly, negatively related to the factor. Those features can be seen as indicators for crowded places and mass tourism.

Model F—Action & Fun. The geographical attributes *metropolis*, *sea*, and *winter sports resort* and motivational ratings *winter sports*, *sailing*, *entertainment*, *mobility*, *sightseeing*, *mountain biking*, and *golf* are significantly, positively related to this factor. *Metropolis*, *sea*, *entertainment*, *mobility*, and *sightseeing* can be seen as indicators for vibrant places with party and fun. Whereas *winter sports*, *mountain biking*, and *winter sports resort* can be interpreted as motivators for thrill seeking and après-ski loving tourists. Finally, *golf* and *sailing* can be interpreted as indicators for exclusiveness and VIP. On the other hand, the motivational ratings *family* and *quietness* have a negative impact on the factor *Action & Fun*, which is not surprising and self-explanatory.

Model G—Nature & Recreation. The motivational rating *quietness* and geographical attributes *mountains* and *health resort* are significantly, positively related to this factor. Those features can be seen as the main interests of tourist, whose goal is recreation, finding silence and peace, and escaping from everyday life. On the other hand, the motivational ratings *gastronomy*, *sightseeing*, *shopping*, and *image & flair* have a significant negative impact on this factor. Those features can be interpreted as indicators for crowded places and city life.

5 Clustering

Identifying conceptually meaningful groups of destinations with shared common characteristics will help to further understand the data and its structure, which may contribute to a more generalized solution. Prototype-based, partitional clustering techniques are considered, where the most prominent ones are k-means and k-medoids. Since the data comprises binary attributes, centroids are not meaningful. Therefore, k-medoids is applied. A medoid corresponds per definition to an actual data point, which is considered as the most representative point for the cluster (Pang-Ning, Steinbach, & Kumar, 2006). Specifically, Partitioning Around Medoids (PAM) (Kaufman & Rousseeuw, 1990), the most common k-medoids algorithm, is used. Since the data consists of two different data types, i.e., binary (geographical attributes) and continuous (motivational ratings), the Gower distance (appropriate for mixed data types) (Gower, 1971) is used as distance metric. In order to find an appropriate number of clusters, the internal evaluation metric silhouette width (Rousseeuw, 1987) is used for assessment. Based on the silhouette width 4, 6 and 8 cluster solutions are considered, but for the sake of interpretability a 6-cluster solution is chosen. In Table 5 average factor scores and corresponding standard deviations (SD) for each cluster are listed.

Table 5. Average factor scores (and SD) in different clusters

	C1	C2	C3	C4	C5	C6
<i>Sun & Chill-Out</i>	0.17 (0.26)	0.15 (0.19)	0.28 (0.31)	0.29 (0.33)	0.76 (0.27)	0.90 (0.20)
<i>Knowledge & Travel</i>	0.19 (0.24)	0.88 (0.19)	0.17 (0.21)	0.41 (0.27)	0.43 (0.24)	0.25 (0.23)
<i>Independence & History</i>	0.38 (0.26)	0.88 (0.13)	0.34 (0.25)	0.57 (0.24)	0.54 (0.19)	0.43 (0.22)
<i>Culture & Indulgence</i>	0.27 (0.30)	0.93 (0.17)	0.25 (0.27)	0.57 (0.29)	0.56 (0.27)	0.41 (0.25)
<i>Social & Sport</i>	0.52 (0.20)	0.52 (0.17)	0.60 (0.17)	0.62 (0.19)	0.64 (0.18)	0.56 (0.18)
<i>Action & Fun</i>	0.10 (0.21)	0.84 (0.28)	0.08 (0.16)	0.31 (0.24)	0.62 (0.31)	0.31 (0.24)
<i>Nature & Recreation</i>	0.48 (0.34)	0.06 (0.16)	0.80 (0.19)	0.57 (0.27)	0.36 (0.27)	0.65 (0.22)
Cluster Size	184	47	141	57	60	72

Destinations in C1 are more or less suitable for *Social & Sports* and *Nature & Recreation*. All other factors have a low average score. Liederbach (Hessen, Germany) is in the centre of C1 and the most representative observation. It is a small, calm suburb with almost no tourism destination characteristics, but just a few offers of sport activities.

Destinations in C2 are very well suited for *Knowledge & Travel, Independence & History, Culture & Indulgence* and *Action & Fun*. However, tourists with high *Sun & Chill-Out* or *Nature & Recreation* score will avoid destinations in C2. The most representative data point of C2 is Brussels, the capital of Belgium. The centre of C2 is a vibrant metropole, with many opportunities for nightlife, party, culture, sightseeing, and gastronomy. Recreation, relaxation and peace are alien to the medoid of C2.

Destinations in C3 are very well suited for *Nature & Recreation* and they also show an increased average score in factor *Social & Sports*. Also noteworthy is that people with high *Action & Fun* score, will avoid destinations in C3 at all. The centre of the cluster is Schönberg am Kamp (Lower Austria). It is a small, peaceful town in the nature good for hiking, cycling, escaping from everyday life, and recreational tourism.

Destinations in C4 are more or less suitable for *Knowledge & Travel, Independence & History, Social & Sports*, and *Nature & Recreation*. Overall, there is no dominant factor. The medoid of C4 is Todtnau (Baden-Württemberg, Germany). It is a rural town, where 60% is covered with forest. Todtnau is good for hiking, cycling, mountain biking, and other sports, but also for recreational tourism. Nevertheless, it also offers cultural activities, gastronomy, nightlife and entertainment in a moderate level. Noteworthy to mention is that the effect of both recreation and sports indicators and culture, history, tradition and entertainment indicators are dampening each other. Hence, there is no pronounced differences in the factor scores and none of them are either satisfied or unsatisfied.

Destination in C5 have on average a high score in *Sun & Chill-Out*, an increased score in *Social & Sports* and *Action & Fun*, and a moderate level of *Knowledge & Travel, Independence & History*, and *Culture & Indulgence*. *Nature & Recreation* is the only factor, which can be considered as low. The centre of C5 is Grand Baie on the island of Mauritius. It is considered as a centre of beach tourism on the northern coast of the island. Besides beach tourism there are plenty of opportunities for nightlife, entertainment, gastronomy, shopping, and water sports.

Destinations in C6 are a perfect match for *Sun & Chill-Out*. Additionally, *Nature & Recreation* and *Social & Sports* have an increased score on average. The medoid of C6 is Anaxos, a small, intimate, and tranquil seaside resort, which is located on the island of Lesbos (Greece). Beside sun, beach, and recreation there are opportunities for (water) sports and get-together with locals.

In summary, it can be said that there is an underlying natural structure of the data. Thus, six conceptually meaningful groups of destinations could be identified. For a better understanding, these groups or clusters can be simplified and summarized as follows: C1—*passionless suburb*, C2—*energetic city*, C3—*peaceful village*, C4—*ordinary town*, C5—*vibrant beach resort*, C6—*tranquil seaside resort*. The identified groups can help to better understand the (dis)similarities among the destinations and may also contribute to a more generalized solution of mapping without the need of prior information in contrast to the supervised method in the previous section. Nevertheless, considering the outcomes of the regression analysis one can clearly see relationships between the used destination features and the most determinant features of the cluster solution. Especially, destination features that appear in more than one regression model are the most decisive characteristics of cluster cohesion (separation) in the presented model.

6 Conclusions

Primarily, this work's aim is to identify and explain associations between destination attributes and the seven-factor model to enable an automated mapping of destinations onto the seven factors. To do so, a multiple linear regression analysis with step wise variable selection was conducted. Seven models were established, one for each of the seven factors. The resulting models are providing strong evidence that there is a significant relation between selected destination features and the factors. Overall, all travel behavioural patterns are well described (52–76% of the variance) by the resulting models, except *Social & Sports*, where only 19% of the variance can be explained. This is caused by an uneven distribution of the sample. A statically sounder sample will be targeted in future work. A linear model has the benefit of interpretability, but might suffer in performance. Additionally, the chosen variable selection model reveals core attributes, but is greedy (relevant information might get lost). In this case a performance evaluation of different methods (principal component regression, ridge regression etc.) is planned. Furthermore, a cluster analysis was conducted in order to determine if there is an underlying natural structure of the data sample. Six conceptually meaningful groups were identified (*passionless suburb, energetic city, peaceful village, ordinary town, vibrant beach resort, tranquil seaside resort*). Those clusters can foster a better understanding of the (dis)similarities among destinations and also of the relation between destination features and the seven-factor model. Further, these clusters can be used for more accurate recommendations or can be targeted directly by a RSs. In future work, it is also planned to recommend accommodations in a second step. Thus, an analysis revealing the relation between hotel features and the seven factors is needed. However, this aim immediately shows a disadvantage of the followed approach, namely data source dependency. To counter this problem there is an ongoing study, which aims to build up a comprehensive data model of tourism products. This data model will serve as an “intermediary” layer between the respective data source and the seven-factor model and can therefore be used to harmonize heterogeneous sources of data (e.g., by mapping different sources of destination data onto this layer).

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Part IX
Education and Learning

Smart Tourism Destinations and Higher Tourism Education in Spain. Are We Ready for This New Management Approach?

Francisco Femenia-Serra^(✉)

University Institute of Tourism Research, University of Alicante, Alicante, Spain
paco.femenia@ua.es

Abstract. ‘Smart tourism’ and ‘smart tourism destinations’ (STDs) have become commonplace in the research of the interrelationship between tourism, destinations and the latest Information and Communication Technologies (ICTs). However, research has failed hitherto to identify if this evolution towards smartness of tourism is accompanied by a similar process in tourism education to provide the system with prepared human resources once the transformation has been fully completed. This paper aims to fulfil this gap, by taking the case of Spanish public superior education in tourism, to analyse in which degree ICTs, as critical knowledge and skills required within STDs, are included in tourism curricula and how students assess the formation they receive in this regard. The analysis offers several valuable implications for governments in charge of public education design and opens discussion over the possibility to strengthen the technological side of tourism curricula.

Keywords: Smart tourism · Smart tourism destinations · ICTs
Tourism education

1 Introduction

Research on smart tourism has flourished as a novel approach to tackle some of the emerging realities in tourism due to the impact of the most recent ICTs over destinations, tourists and businesses (Koo, Park, & Lee, 2017). Smart tourism however is still under construction, and it’s deemed as a ‘buzzword’ being used without much consideration by multiple interested agents from a rather uncritical perspective (Gretzel, Reino, Kopera, & Koo, 2015a; Gretzel, Werthner, Koo, & Lamsfus, 2015c). Within research on this field, destinations have received most of the attention partly because of their parallelism to the successful smart city discourse (Boes, Buhalis, & Inversini, 2016; Del Chiappa & Baggio, 2015). This recent ‘smart tourism destination’ (STD) concept can be understood as a relevant contribution to the very concept of tourism destination (Jovicic, 2017), and even as a possible new framework to manage destinations (Ivars, Celdrán, Mazón, & Perles, 2017) within the paradigm of smart tourism (Koo, Yoo, Lee, & Zanker, 2016).

On one side, in the era of smart tourism it seems clear that ICTs have already provoked a tremendous transformation for tourism, and that this change has even been

accelerated by the advent of smartphones, artificial intelligence, cloud computing or the Internet of Things (IoT) (Xiang & Fesenmaier, 2017). These have opened the possibility to generate great amounts of data and have given rise to a ‘quantified traveller’ (Choe & Fesenmaier, 2017). On the other side, being tourism under a transition towards smartness, prepared human resources with considerable mastery of ICTs will be needed to manage this scenario from both a public and private perspective. However, while education in tourism has attracted great attention, with a clear emphasis on the need to find a balance between vocational and academic/theoretical requirements (Airey, Dredge, & Gross, 2015), less focus has been put on the place ICTs have on the tourism curriculum (Munar & Bødker, 2015). The specific skills and knowledge managers will need within smart destinations haven’t been specified to date. Thus, apart from the need for identifying these, an important question arises in this context: Is current tourism education providing the needed theoretical foundations and practical skills for future smart tourism destinations managers?

As a result of this gap, this research intends to discern in which degree current superior tourism education is providing the required formation for this new approach to destinations management, by taking the case of Spain and the ICTs position in the country’s tourism public education. Spain is argued to be an especially interesting case due to the strong institutional support to STD initiatives. In order to accomplish with the objective, first we discuss relevant literature on smart tourism destinations on one side, and tourism education and ICTs on the other side, which is followed in the second place by the explanation of the employed methods. In the third place the results, which are derived from a survey to both tourism graduate and postgraduate students and an exhaustive content analysis of the official tourism programmes in Spain, are presented. Finally, the results are framed within the broader discussion on smart tourism and tourism education, and the implications of the findings for education designers are highlighted.

2 Theoretical Background

2.1 Smart Tourism Destinations as a New Destination Management Approach

STDs are characterised by their ability to transform large amounts of data into enhanced tourist experiences and increased destination competitiveness thanks to the interconnection of the different stakeholders through latest ICT advancements, which would all together allow a better decision-making (Buhalis & Amaranggana, 2014; Wang, Li, Zhen, & Zhang, 2016). Their ability to collect and use massive data in order to deliver more personalised tourist experiences allows to understand and respond to tourists’ needs in a real-time and context-aware manner (Choe & Fesenmaier, 2017; Xiang & Fesenmaier, 2017). This aggregation and distribution to stakeholders of the data generated by tourists in their many interactions with different agents and elements within the system is dependent on the capacity of technologies such as IoT, end-user services and cloud computing combined with mobile technology and artificial intelligence (Wang, Li, & Li, 2013; Wang et al., 2016). Hence, the STD proposes a new way

of managing destinations based on the technological infrastructure and an intelligent decision-making. This way of ‘running’ a destination has attracted attention from governments around the world, within which Spain constitutes a remarkable example (SEGITTUR, 2015).

The smart destinations strategy was included in the Spanish National Plan for Tourism 2012–2015 (Ministerio de Industria, Energía y Turismo, 2013), and has been assigned to SEGITTUR (The national agency for fostering innovation and technologies in tourism). Nevertheless, STDs are a complex, multifaceted concept that encompasses diverse scopes such as sustainability, innovation and business opportunities creation or accessibility, as noted by SEGITTUR project. STDs are furthermore part of the global smart ecosystem depicted by Gretzel, Werthner et al. (2015c), who also emphasise the need for a more critical approach towards the concept and its implications. According to these authors, smart tourism is characterised by the intricate relationship between their players (articulated through ICTs) and the common goal of providing better experiences. But smart tourism also represents a challenge for all stakeholders and their traditional roles, and it entails some risks which have been neglected hitherto. Despite this need to examine the concept and its holistic character critically, Spanish institutions have embraced this approach and continue fostering its spread among other decision-makers (local DMOs, businesses owners, etc.). The number of conferences, seminars, congresses and projects in the field is booming, although this is not accompanied for the moment by formal education. This would be on the other side hard to articulate as the concept itself and its applicability are still under construction (Del Chiappa & Baggio, 2015; Gretzel, Sigala, Xiang, & Koo, 2015b). However, formation and training in several ICT-related fields can become useful frameworks to develop a consistent education for facing the advent of smartness in tourism. According to the just provided description literature makes of STDs functioning, some relevant knowledge and skills can be identified as crucial for their management: social media managing, big data analytics and database management, spatial analysis and visualisation tools, advanced web design or online marketing, seem to be relevant in this context apart from the more classical office software or transaction systems.

2.2 Higher Tourism Education and ICTs

Within academia, there is a growing debate around the curriculum design of tourism and/or hospitality and/or events programmes (also known as T&H or TH&E education) and the necessity to include different standpoints towards learning in them, which has crystallised in several initiatives. Among these, the ‘Tourism Education Futures Initiative’ (TEFI) advocates for adapting tourism education to a changing world in which new knowledge, values and skills are needed (Sheldon, Fesenmaier, Woeber, Cooper, & Antonioli, 2008).

In this changing world and tourism education context, ICTs marked a turning point and their influence over businesses operations and organisational performance was first seen as the capital reason to include them in tourism curriculum (Buhalis, 1998). Technologies in tourism education were progressively approached from an ‘operational’ point of view, understanding ICTs as a tool to enhance pedagogic methods and to adapt education to the needs of the informational society (Sigala & Baum, 2003).

This would be part of the ‘e-Learning’ concept, which is the technology-facilitated education and training and results especially appropriate for distant or mixed courses (Buhalis & Law, 2008). E-Learning courses in tourism are provided by academia, corporate organisations, destination management organisations and independents (Cantoni, Kalbaska, & Inversini, 2009).

Some monographies have been dedicated to education in tourism in the last years (e.g. Airey & Tribe, 2005; Dredge, Airey, & Gross, 2015b), in which technology is acknowledged as an influential driver of change. Nevertheless, as Munar & Bødker (2015) argue, limited attention has been paid to the specific topic of curriculum design and ICTs. These authors stress the limited position of technologies in tourism curriculum, and how they are only taught from an operational, applied or technical perspective, focussing on management and business operations and leaving the critical approach aside, neglecting this way the wider implications IT has on tourism and societies. Hence, while ICTs have become commonplace in tourist experiences and decisions with the advent of smartphones (Wang, Park, & Fesenmaier, 2012), the use of social media (Leung, Law, van Hoof, & Buhalis, 2013), or more recently, smart technologies (Neuhofer, Buhalis, & Ladkin, 2015), tourism education isn’t providing students with knowledge and tools to understand and leverage this opportunity and think innovative (Munar & Bødker, 2015).

A review of research regarding tourism students’ perspective reveals that most works are devoted to gaining knowledge around their expectation in developing a career in tourism and hospitality (e.g. Barron, Maxwell, Broadbridge, & Ogden, 2007; Jiang & Tribe, 2009; Richardson, 2009; Richardson & Thomas, 2012). However, few efforts have been dedicated to analysing their opinion on their education or their perception of the degree of adequacy of their curriculum for the future tourism situation and career opportunities. A good exception is the study by Benckendorff & Moscardo (2015), who performed an interesting importance-performance analysis (IPA).

This issue is framed in the broader ongoing debate about the divide between liberal and vocational education, which can and should co-exist (Dredge et al., 2012). Therefore, education in tourism has to pursue a delicate equilibrium between the vocational/technical and liberal/academic sides of formation (Tribe, 2002). In finding this balance, curriculum designers are failing to include the vision of students regarding the most important trends on the tourism and their assessment of their ongoing formation adequacy to the identified challenges. This takes a further relevance in the era of smartness, where technology has come to play a critical role and education seems to be losing track. Spain constitutes a good example of this phenomenon.

2.3 ICTs in Tourism Higher Education in Spain

Tourism education in Spain has been traditionally separated from the university spectrum, and it was only in 1996 when the first official three years degree was introduced in public universities (Vera & Ivars, 2001). According to these authors, in this moment much of formative offer was already being provided by private agents and greatly divided because of the educational competencies belonging to autonomous regions, with different types of regulations.

Regarding the inclusion of formation on ICTs in these recently established educational programmes, three studies have provided evidences on this matter in Spain over the last years. In Majó's (2004) analysis, the inclusion of 'informatics' or 'ICTs' in the curriculum was already deemed as deficient, with 67% of the universities teaching the degree in tourism including only one compulsory subject related to this field, and 6% including two subjects. Some years later, Medina & González (2010) presented in their study how the companies in which students developed their practicum also noticed a need for a better formation in some technological tools. In a more recent study of Morais, Cunha, & Gomes (2013) for both Portugal and Spain, the authors emphasised how in Spain the majority of tourism programmes offered only 6 ECTS in ICT-related subjects (same as in Majó's, 2004), but in some cases no courses at all were dedicated to this matter, and only in very limited cases two or three courses were included in the programme. Apart from the contribution of these studies, no systematic analysis of curricula has been performed so far lately, ignoring possible new needs and adaptations to the current situation and the emergence of new realities pushed by technologies. Additionally, the opinion of the students regarding this fact has been systematically neglected.

3 Methods

This research acknowledges the multifaceted reality of smart destinations, but stresses the special relevance of ICTs for their management, examining this way if public education is preparing future tourism practitioners in ICTs adequately. With this aim, the followed methodology consists of a mixed one, explained as follows.

3.1 Survey

Based on the literature review on smart destinations and their management, requirements in the formation of managers of this future scenario were detected and included in a specific section within a broader survey devoted to analysing the behaviour as tourists of university tourism students. This part of the questionnaire asked students to assess their level of satisfaction regarding the received formation hitherto in several ICT-related scopes critical for smart destinations:

- Big data
- Social media management
- Online marketing
- Geographical Information Systems (GIS)
- Web management
- Informatics for business management
- Word processors
- Database management
- GDSs.

Students also ranked the importance of the factors influencing tourism in the future according to their opinion. Moreover, one question gathered their awareness about the very existence of the concept ‘smart destination’, which was followed by a second open answer question for them to express which concepts they would relate to STD, even if they weren’t aware of its meaning. This questionnaire was distributed to four different public universities in Spain which were offering tourism programmes (specified in Sect. 3.2.) and a total of 407 valid responses were collected and analysed through the software *Qualtrics* ©.

3.2 Content Analysis

A content analysis was performed to contrast the results of the questionnaire. In the first phase, in order to limit the research units, the selection criteria for the programmes to be examined were defined: (a) official degrees in ‘Tourism’ or ‘Tourism & Business Administration’ plus official masters in ‘Tourism (or Tourism Destinations) Management and/or Planning’, which are (b) provided by Spanish public universities (Table 1). Specific programmes dedicated to events were discarded together with programmes entitled with ‘Hospitality’, which in Spanish has a different meaning.

Table 1. Selection process

	<i>n</i>
Spanish universities	85
Spanish public universities	50
Offering tourism programmes	38
<i>Degree</i>	
‘Tourism’	38
‘Tourism & Business Administration’	11
<i>Master</i>	
‘Tourism Management and/or Planning’	15
Programmes with 1 or more ICT-related courses	59
Programmes without any formation in ICTs	5
Compulsory ICT courses by programme (mean)	1.08
Optional ICT courses by programme (mean)	0.7
Total offered ICT courses by programme (mean)	1.78

The primary information source was the census of the National Official Register of Universities, Centres and Degrees. Departing from this extensive list, the indicated criteria (a, b) were employed and the official websites of the selected universities were accessed individually. Then the educative offer subpage was checked manually to find their meeting with criteria a.

In the second phase, the syllabus of each of these programmes was queried through keywords to detect the courses with any ICT and smartness related content. The selected keywords for the search are shown in Table 2. The keywords were grouped afterwards to develop categories. The definition of these categories followed the criteria defined by Holsti (1969) as cited by Dwyer, Gill, & Seetaram (2012): they are exhaustive, mutually exclusive and independent. Categories are grounded in the review of the courses and observed patterns. The courses with at least one of the keywords (in Spanish, here translated in English) were classified into an excel file. These data were processed and the courses grouped according to the defined categories (see Table 2). The coding scheme was developed partially based on the previously detected formation requirements for STDs (bullet points in Sect. 3.1.), but was broadened to include more possible aspects of formation related to technology that weren't evaluated in the first place. The codes were tested to check their reliability, adjust and refine them. When ambiguous or generalist terms appeared (e.g. 'system' or 'information'), the author reviewed the content of the specific course to discriminate if it was actually related to ICTs or smartness and classified it accordingly.

4 Results

4.1 Students' Assessment of Formation in ICTs and Awareness of Smart Tourism Destinations

Through an aggregation of the responses regarding their formation on ICTs in their programme, the results reveal a quite pessimistic scenario, with most of the students qualifying their formation in ICTs as 'very bad', 'bad' or 'fair', while only a 25% say it has been 'good' or 'very good' (Fig. 1).

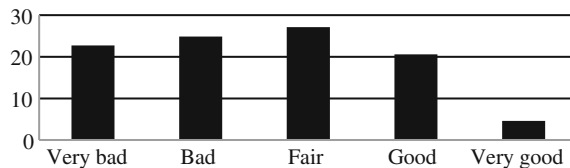


Fig. 1. Students' assessment of the received formation on ICTs (global, in %)

Only when specific aspects of the formation on ICTs were examined by students, some slight differences emerged. These reveal students are more satisfied with their formation on the management of word processors and databases (mostly word and excel from Microsoft Office), together with online marketing (Fig. 2).

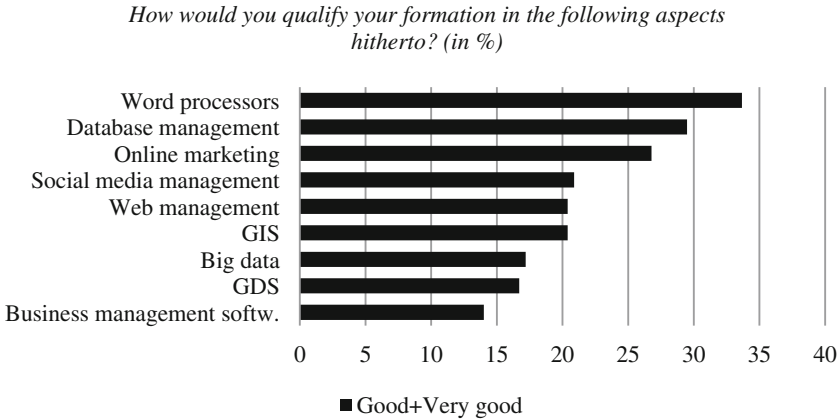


Fig. 2. Students’ assessment of the received formation on specific ICT skills

However, despite this poor perception of their undergoing formation on ICTs, the surveyed students are well-aware of the importance of ICTs and their impact on tourism. ‘ICTs and the digital revolution’ were ranked first in a list of nine factors which they evaluated according to their opinion on their future impact on tourism. Furthermore, there is a notable awareness among the tourism students of the ‘smart tourism destination’ concept: a total of 287 of the respondents (70.52%) declare to ‘know it’ or ‘having heard about it’. The most associated terms to this concept, even if it’s unknown to a certain part of the sample, are: ‘technology’ or ‘technological’ (356 counts), ‘innovation’ or ‘innovator’ (196), ‘personalised’ or ‘personalisation’ (78), ‘sustainability’ or ‘sustainable’ (72), ‘internet’ (42), ‘information’ (42), ‘novelty’ or ‘novel’ (22), ‘smart city’ (20) or ‘smartphone’ (18). This indicates that students correctly associate this concept with some other related ones and are conscious of this trend within tourism research and planning. However, a clear gap has been detected between the expectations of tourism students regarding the future importance of ICTs and their recognition of emergent concepts such as the STD, and their formation in these matters, which they qualify as bad.

4.2 ICT Courses in the Spanish Tourism Curricula

The content analysis reveals several critical facts in relation to the inclusion of ICT courses in the public Spanish tourism curricula (see Table 2). First, there is a notable lack of courses devoted to ‘smartness’, as only one university offered a course which could be classified in this category. Second, the most usual courses within ICT formation are dedicated to informatics applied to the management of businesses and operations, and in a lesser degree, to destinations. These courses (category ‘informatics’) are generalist in content and usually focus on basic office software. General courses about information technologies (category ‘ICTs’) also occupy a significant space in the curriculum together with the data analysis courses, which develop the skills to explore information sources for tourism to inform decisions.

Table 2. Inclusion of ICT courses in the Spanish tourism curricula by type

Categories (types of courses)	Keywords	Frequency	Compulsory
			Optional
Smartness	‘Smart’, ‘smartness’ ‘intelligent’, ‘intelligence’, ‘system’ ^a	1	1 .
Digital marketing and electronic intermediation	‘Digital’, ‘electronic’, ‘e-’, ‘internet’ ‘online’, ‘web’	9	1 8
Social media	‘Social media’, ‘social network, ‘2.0’, ‘networks’	3	1 2
ICTs	‘ICTs’, ‘Information and Communication technologies’, ‘Information and Communication technology’, ‘Technology’, ‘Technological’, ‘Technologies’, ‘new technologies’, ‘information’ ^b	26	19 7
Informatics	‘Informatics’, ‘office’, ‘software’, ‘computerised’, ‘computer’, ‘programme’, ‘processor’	36	28 8
Data analysis and big data	‘Database’, ‘big data’, ‘data’, ‘analytics’, ‘information’ ^a , ‘system’ ^a , ‘Information system’	25	15 10
Geographic systems	‘GIS’, ‘Geographic information systems’, ‘system’ ^a , ‘Remote sensing’, ‘GPS’, ‘geo’	9	2 7
GDS	‘GDS’, ‘global distribution systems’	5	4 1

^aSystem and ^bInformation keywords were included in two categories (ambiguous meaning) and the final classification of the course was based on the review of the course content

Many relevant formation requirements for the management of future smart destinations are lagging behind: few efforts are dedicated to social media, digital marketing or geographic information systems, and, more importantly, no specific courses are dedicated to ‘smartness’ in tourism and destinations, which could elaborate on intelligent systems, real time or data-based decision making. Apart from the limited existence of courses dedicated to GIS, digital marketing and social media, most of them are optional, while formation in basic informatics is usually compulsory (77.78% of times). The results of the content analysis are in concordance with the answers obtained through the questionnaire, as the bigger offer in ‘informatics’ and general ‘ICTs’ courses is matched with a better position of the text processing and database management within the assessment of the students. More advanced technologies do not have almost any space in the tourism curricula and limit the preparation of these students for the smartness era.

Hence, according to these findings, and answering the research question, current tourism higher education isn't preparing future managers of smart destinations properly from a theoretical and applied perspective, at least in Spain.

5 Discussion and Conclusions

Smart destinations have emerged as a new approach to managing destinations according to the fundamental shift cutting-edge ICTs have meant for all the stakeholders (Gretzel, Reino, et al., 2015a; Gretzel, Werthner et al., 2015c). Countries like Spain are dedicating huge efforts and funds to develop and try to implement the philosophy of smartness in tourism. At the same time, ICTs are changing the way we understand curricula and disciplines, breaking the 'rules' until now established as they transform society and culture (Dredge, Airey, & Gross, 2015a).

The findings have revealed a gap between the relevance of ICTs for tourism and the evolution towards smartness of destinations, which the own students recognise, and the precarious position the formation on technology occupies in the Spanish curricula. Several key insights are provided by the results of the Spanish case:

- Tourism students believe ICTs will be the biggest driver of change in tourism in the forthcoming years
- Students recognise the concept of STDs and adequately relate several other concepts to it
- They perceive they aren't receiving an appropriate education in ICTs, in general, and in all the established requirements necessary for facing the smart destination approach as future managers
- The inclusion of ICT courses in the Spanish tourism curricula is minimal
- Most of these ICT courses are outdated and based on overcome tools and concepts
- No specific effort has been made to approach the advent of smartness in tourism and smart destinations. Education does not prepare students for this shift
- No progress has been made in the tourism curriculum design over the last years to cope with the latest advancements of ICTs and their impact on tourism.

On another front, the content analysis has revealed an implicit lack of addressing technologies from a wider perspective, which situates the results within the broader debate around educational needs in tourism. Tourism education is becoming more and more complex in response to the challenges the world faces, and the design of curriculum allows to adapt to these evolving needs of the societies to which graduates can contribute with their work (Dredge et al., 2012).

Therefore, acknowledging the prominent role ICTs are taking in current societies and economies and according to the findings posed here, more space should be dedicated in curricula to technological practical skills. This could be articulated through complementary education both in curricular and extra-curricular space: short courses, technology-based, applied and flexible topics and skills applied to real situations (Benckendorff & Moscardo, 2015). Our findings also implicate a clear need for reorienting this tourism-ICT relationship in the Spanish curriculum towards a more critical approach. Technologies need to be taught both from a practical perspective

(which in the case of Spain is clearly lacking), but also from a reflective standpoint. As part of the ‘Philosophical practitioner’ for which he advocates for, Tribe (2002) believes tourism students not only need to develop practical skills but also a critical view and action towards the effects of tourism on societies and spaces in which it is embedded. This is even more paramount in the case of ICTs, which are capable of breaking time and space barriers, but can also generate potential threats to the way societies have traditionally organised social and economic life. Technologies aren’t ideology or consequence free, and education needs to recognise it.

We need to rethink formation constantly to build future professionals and citizens who are critical, creative, innovative but also problem-solving and practical (Dredge et al., 2015a). In this regard, Munar & Bødker (2015) argue that a different approach towards complex realities like technology and tourism could be taught breaking the traditional constraints of disciplines and embracing innovative perspectives. Listening to the needs expressed by students and their view on their undergoing formation, as done in this research, introduces a novel way of reorienting studies. Thus, grounded on the results, we advocate for a reconstruction of the education in tourism and ICTs in Spain and in other countries that may face with the same problematic. Some good practices detected during the content analysis can serve as inspiration. For instance, the University of Málaga has created the first official master in Tourism and ICTs, and the University of Girona is including many innovative and ICT courses in its programmes. Using the umbrella of ‘smart tourism’ and the ‘smart destination’, education designers should canalise this change and include in tourism curriculum a new way of seeing the relationship between technology and tourism.

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Evaluating the Development and Impact of an eLearning Platform: The Case of the Switzerland Travel Academy

Elide Garbani-Nerini^(✉), Nadzeya Kalbaska, and Lorenzo Cantoni

Faculty of Communication Sciences, Università della Svizzera italiana, Lugano,
Switzerland

{elide.garbani.nerini,nadzeya.kalbaska,
lorenzo.cantoni}@usi.ch

Abstract. Despite the increasing popularity of eLearning courses about tourism destinations, research on how they should be designed and what makes them usable in the eyes of the travel trade remains scarce. Trying to fill this gap, the main aim of this research is to find a suitable framework for evaluating online courses about tourism destinations. To do so, the creation process of the Switzerland Travel Academy by Switzerland Tourism is presented with a focus on evaluating not only the platform's usability, but also its impact on travel agents' knowledge about, and involvement with the tourism destination after the completion of the course. The proposed framework enhances the theoretical foundation in the eLearning domain, as well as might be used within practical developments of eLearning courses not only by tourism destinations, but also by other eLearning product developers.

Keywords: Usability evaluation · Tourism training · eLearning
ADDIE model · Travel agents · DMOs

1 Introduction

In the last 20 years, the tourism industry has been deeply affected in all its main activities and experiences by the rapid development of Information and Communication Technologies (ICTs). To explain and study this phenomenon, a new tourism online environment has been developed called eTourism. This new term refers to all the ICT tools used in the tourism industry which help processes such as planning, development, marketing and management (Buhalis & Law, 2008). In this new environment, both the role of the travel agent (TA) and that of destination management/marketing organisations (DMOs) have changed (Kalbaska, 2012), as with opportunities new challenges have been arisen.

TAs have mainly found themselves struggling with increasing competition caused by online booking sites (Cheyne, Downes, & Legg, 2006) and the risk of disintermediation. In fact, consumers, empowered by the increasing availability of information and offers on the Internet, have started to personally book their travels online. However, despite this apparent tendency, there are still many travellers who rely on TAs to

book their holidays (Gollan, 2015; Lam, 2016) because the latter have the knowledge to make tourists' experiences unforgettable (Gollan, 2015) by building a relationship of trust and understanding with their clients (Jeong, Lee, & Kim, 2017). TAs have been changing their role, becoming valuable advisors to increasingly demanding clients rather than being dispensers of information and processers of transactions (Dilts & Prough, 2003). In their new role, TAs must keep their knowledge updated to maintain their competitive advantage not only over other TAs but also over online travel agencies (OTAs) and online booking systems in general.

In the eTourism era, also DMOs have changed their role, strengthening their position of destination marketers (Bornhorst, Ritchie, & Sheehan, 2010; Gretzel, Fesenmaier, Formica, & O'Leary, 2006) and using ICTs for organising, managing and supporting the partners and industries involved in the production and delivery of the tourism experiences connected with the destination (Kalbaska, 2012). Among the new challenges for DMOs, increasing competition and information overload are to be mentioned, and this makes providing quality online information both to direct customers and trade partners such as TAs crucial (Choi, Lehto, & O'Leary, 2007). To do so, DMOs have, on the one hand, increased their presence online and on the other hand, have started to offer online learning experiences (eLearning) in the form of online training courses to better prepare travel professionals worldwide, so that they increase their knowledge on the destination and improve their performance in sales. Creating courses that are effective in satisfying TAs' needs by ensuring high usability becomes then essential for DMOs (Gollan, 2015). Despite the increasing popularity of such courses in the past decade, literature on how they should be designed and what makes them usable in the eyes of the TAs remains scarce. Trying to fill this gap, the main aim of this research is to find a suitable framework for evaluating eLearning courses about destinations. To do so, the creation process of the Switzerland Travel Academy (STA), the course by Switzerland Tourism (ST), is presented with a focus on evaluating the platform's usability and impact on TAs' knowledge about, and involvement with the destination Switzerland.

2 Literature Review

The diffusion of ICTs and the Internet has had a great impact on the tourism field. New opportunities and challenges have been raised for both DMOs and TAs: the latter need updated and exclusive information to satisfy increasingly demanding clients, while the former are presented with the necessity of reaching potential tourists through intermediaries and improving their destination's image. For this, DMOs should support TAs and provide them with the relevant information to properly sell the destination. eLearning, and destination training programmes in particular, have been considered as a good strategy with which DMOs can support intermediaries (Kalbaska, Lee, Cantoni, & Law, 2013; UNWTO, 2008), bridging the gap between the market requirements and the qualification strategies in the tourism industry (Cantoni, Kalbaska, & Inversini, 2009; Kalbaska, 2012). Because of the increasing popularity of eLearning, the necessity to better understand what the important elements that make an eLearning application good for the learner are has been recognised by many researchers (Althobaiti & Mayhew, 2015; Kakasevski, Mihajlov, Arsenovski, & Chungurski, 2008; Lin & Cantoni, Forth.), as low usability usually implies dropout rates (Zaharias, 2009).

A definition of usability that is widely accepted by scholars was given by the International Organization for Standardization (1998), according to which usability is the “extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (International Organization for Standardization, 1998). However, the definition of usability of eLearning programmes needs to be expanded by including more aspects and connotations than for other information systems (Zaharias, 2009). According to researchers, usable, effective, and efficient eLearning systems should:

- be more user-centred rather than technology-centred (Srivastava, Chandra, & Lam, 2009), focus on learners’ needs and aims (Theofanos & Redish, 2003), and allow them to complete their learning tasks (Venkatesh, Morris, Davis, & Davis, 2003);
- achieve “learnability, rememberability, efficiency in use, reliability in use, and user satisfaction” (Srivastava, Chandra, & Lam, 2009, p. 3898);
- be attractive, interactive and engaging, provide feedback, trigger curiosity, motivate, be challenging, and avoid anything that might interrupt the learning flow (Ardito, et al., 2004; Srivastava, Chandra, & Lam, 2009);
- consider the “affective domain of learning” (Zaharias, 2009, p. 75) (e.g. motivation to learn and engagement with the system);
- have a simple user interface to provide learners with the smoothest possible experience, while hiding the complexity of sophisticated and advanced functions (Triacca, Bolchini, Botturi, & Inversini, 2004).

In addition to new definitions, scholars have also proposed new frameworks for analysing and evaluating Learning Management Systems (LMSs) from a pedagogical and institutional perspective (Lanzilotti, Ardito, Costabile, & De Angeli, 2006). Reeves et al. (2002) developed a protocol for eLearning heuristic evaluation, expanding Nielsen’s heuristics (1995) and ensuring their suitability for the evaluation of eLearning programmes. The protocol includes fifteen usability and instructional design (ID) heuristics (Reeves, et al., 2002), which were also used as theoretical background for designing certain aspects of the Switzerland Travel Academy.

Guidelines for usability were also proposed by Ardito et al. (2004), who adapted the SUE inspection (Systematic Usability Evaluation) to the eLearning domain, deriving four dimensions of evaluation: presentation, hypermediality, application proactivity, and user’s activity. Another adaptation was proposed by Triacca et al. (2004), who presented how MiLE methodology (Milano-Lugano Evaluation Method), widely used for usability evaluation of web applications, could be applied to eLearning systems. With a combination of scenario-based and heuristic-driven evaluations, this methodology considers “user requirements, their goals and scenarios of use” (p. 4405).

Furthermore, Lanzilotti et al. (2006) created a framework for designing and evaluating eLearning systems called TICS (Technology, Interaction, Content, Services), which integrates interactive dimensions with quality dimensions. Moreover, the authors developed the e-Learning Systematic Evaluation (eLSE) methodology, which merges inspection activities conducted by evaluators with user-testing. According to eLSE, the TICS dimensions should be used for the analysis of the system together with what the authors call Abstract Tasks (ATs) that outline which actions must be performed by evaluators to analyse specific objects.

Finally, Zaharias (2009) validated the efficiency of questionnaire-based usability evaluation, proposing a method that “extends conventional web usability criteria and integrates them with criteria derived from instructional design” (p. 8), addressing both users and learners and assessing users’ affective engagement, by suggesting users’ motivation as a new type of usability measurement.

Ehlers (2004) took a different path, analysing the learner’s perspective in the quality debate by conducting a survey with users with experience in eLearning. He investigated their preferences and idea of quality eLearning based on seven fields: tutor support, collaboration, technology, costs-expectations-benefits, information transparency of provider/course, course structure/presence courses, didactics (Ehlers, 2004).

Regarding the specific case of eLearning courses in tourism, at the regional level, the Ticino Switzerland Travel Specialist (TSTS) course was analysed both by Kalbaska et al. (2012) and Adukaite et al. (2014), who suggested that the “key elements of a usable eLearning course are: structure and content of the didactic materials, quality of the content (images, videos, maps), interactivity, and duration of the course, well designed testing activities and clear navigational paths” (Kalbaska, Jovic, & Cantoni, 2012, p. 34). At the national level, O’Donnell (2012) evaluated the effectiveness of New Zealand’s eLearning programme from the users’ perspective in terms of usability, access, design, navigation, instructions, completion time, recovery from mistakes, content, and provision, by analysing data collected through surveys and interviews with UK TAs (O’Donnell, 2012). Participants expressed a positive feedback regarding their eLearning experience, which helped them improve self-confidence, “motivation, product knowledge and awareness of the destination” (p. 103), which consequently led to better customer service.

In general, despite their scarcity, studies conducted so far show positive attitudes towards these courses both from DMOs’ and TAs’ perspectives, and this surely encourages further research on the topic. This research intends to fill the gap in, and contribute to the literature about eLearning in tourism by presenting a framework for evaluating eLearning courses and practically applying it to the Switzerland Travel Academy.

3 The Switzerland Travel Academy

The Switzerland Travel Academy is the new version of Switzerland Tourism’s eLearning course, whose creation was commissioned in March 2016 to a Swiss eLearning research and development lab, because of their expertise in eLearning in tourism, ID, and IT. The course is accessible at www.myswitzerland.com/academy.

4 Methodology

In order to give structure to the platform creation and development process, the ADDIE model was used as main guideline to organise the workflow and coordinate the different stakeholders. ADDIE is a five-phase model to create educational, instructive, and training tools and materials (Danver, 2016), and consists of analysis, design,

development, implementation, and evaluation (hence, ADDIE). First conceived as a linear model presenting the five phases consecutively (Fig. 1), ADDIE has evolved throughout the years to become more dynamic and iterative.



Fig. 1. Linear ADDIE model, adapted from Piskurich (2006)

For the Switzerland Travel Academy project, a version of the model was sketched, adapting several models taken from the literature (Clark, 2015; Czaja & Sharit, 2013; Forest, 2014; Piskurich, 2006), to try to represent the platform’s creation and evaluation process in the best possible way. It is presented in Fig. 2.

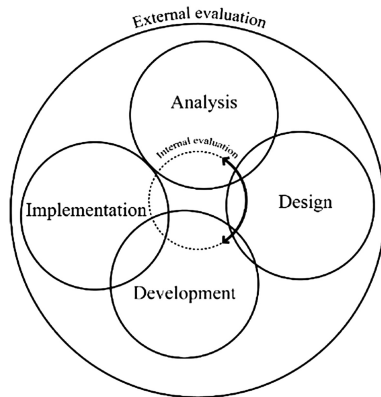


Fig. 2. Proposed version of the ADDIE model

Instead of presenting five consecutive phases, the model is circularly structured to represent the non-linearity of the creation process. Differently from the currently used ADDIE models, in this new model, the first four phases (analysis, design, development, and implementation) overlap to different extents, depending on how clearly the line between the phases can be drawn. Furthermore, the evaluation phase is divided into two types: external and internal, and includes all the other phases, instead of being presented as a fifth and last phase separated from the others.

4.1 Internal Evaluation

According to the proposed model, internal evaluation should be conducted during and/or after every phase of the model by the development team. The aim of internal

evaluation is to identify quality/usability issues during the platform's creation process. This allows for an instant recovery from errors, which, if left unspotted and unsolved until the end of the project, might even become greater and cause delay in its delivery. Solving an issue could mean re-analysing, re-designing, re-developing, and/or re-implementing some of the elements on the platform; hence, the two-sided arrow, indicating that the project flow must go both forward and backwards.

4.2 External Evaluation

Differently from internal evaluation, external evaluation should be conducted by people not familiar with the project once the alpha version of the platform is ready, to identify possible quality issues, inconsistencies, and aspects to improve that were not identified internally. In the case of the Switzerland Travel Academy, three types of external evaluation were conducted: expert reviews, usability testing, and impact analysis.

Expert reviews. In expert reviews, the product or system is evaluated by usability specialists and experts in the topic, who apply usability principles (heuristics) and professional experience to discover potential usability issues, at the same time considering the point of view of the end users (Rubin & Chisnell, 2008; U.S. Department of Health & Human Services, 2017). The traditional framework of expert reviews (Rubin & Chisnell, 2008) was adapted to the scope of the project, taking into consideration specific usability needs that were of greatest concern for the development team. The result was a two-part 30-minute test: for the first part, a validation test was designed with five specific tasks to be completed, while in the second part, experts were left free to navigate the platform using the think-aloud method (Nielsen, 2012). Participants were recruited via email; in total, nine experts (six females, three males) in the fields of tourism training, usability, ICTs, and instructional design, coming from Italy, Japan, Kosovo, Mozambique, and Switzerland, took part in the reviews at the end of January 2017.

Usability testing. The main purpose of this test was to complement the more technical results obtained from the expert reviews with content- and experience-related data. For this second study, international travel professionals were recruited via email, LinkedIn and FB in February 2017. Considering participants' different locations and time zones, their busy schedules as travel professionals, and the study's length and complexity, two online questionnaires were prepared using a web survey tool: one to be taken before navigating the modules on the platform and one afterwards, in order to compare the answers of the two questionnaires to see whether a change occurred after the participants studied on the Switzerland Travel Academy. Participants were asked, after filling in the first questionnaire, to access the course, to study its five core modules—"Welcome to Switzerland"; "Basic and practical knowledge"; "How to travel to and within Switzerland"; "Switzerland in 3, 5 or 10 days"; "News from Switzerland 2017"—and to take the final exam.

Impact analysis. As theoretical background, the first two levels of the four-level Kirkpatrick model (Kirkpatrick & Kirkpatrick, 2006) were mainly addressed in this

platform evaluation: *reaction* (1st level, users' satisfaction with the course), to measure usability; and *learning* (2nd level, the extent to which users "change attitudes, improve knowledge, and/or increase skill[s]" (p. 22) after the course), to analyse the platform's impact. The remaining levels are concerned with users' behaviour after the course (3rd level), namely the extent to which knowledge acquired during the course is applied, and the results brought by it (4th) in terms of impact on activities and business outcomes.

In total, 8 international TAs—females (5) and males (3), aged 30–45 (3) and 45–60 (5), coming from Chile, China, Ghana, Peru, Poland, Serbia, Turkey, and the USA—took part in the usability testing and impact analysis.

5 Results

5.1 Expert Reviews

During the first part of the expert reviews, no critical issues were found. On the other hand, non-critical issues arose during the testing, highlighting some usability issues, together with suggestions for improvement. When possible, solutions were found and suggestions implemented. The most important ones are summarised in the following Table 1.

Table 1. Recommendations for the creation of an online course about a destination

Topic	Issue/Comment	Solution/Implementation
Welcome page (before log-in)	Too much text on the page, important information should be more visible	Text reduced and formatted to increase visibility of important information (i.e. using bold font, bullet lists, and shorter sentences)
	Important information missing (costs, completion time, contact email)	Information added
	Mentioning how many people have received the certification might make the course more appealing for others	A counter that automatically shows the number of certified travel professionals was added to the welcome page (before log-in)
Instructions and requirements	Clarity in the course' requirements (modules, exams, etc.) missing	More exhaustive and clear explanations (less text but more pertinent) added
Media and interactions	Add more quizzes (especially in the specialisation modules)	Suggestion implemented
	Add more maps with reference points	Suggestion implemented
Progress of the user	User's progress not always visually clear	Visual and textual elements added to ensure the traceability of a user's progress

5.2 Usability Testing and Impact Analysis

Eleven usability issues and suggestions for improvement resulted from the usability part of the evaluation questionnaire. Issues were fixed and suggestions were taken into consideration and implemented as much as possible.

Table 2 illustrates users' reaction to several elements of the platform (1st level of Kirkpatrick's model).

In general, the average scores provided for both usefulness and engagement were high, ranging from 4.4 to 5. An explanation for the usefulness of quizzes and exams/test your knowledge can be found in the fact that evaluation activities give users

Table 2. Participants' evaluation of the usefulness of and engagement with the learning and evaluation materials, and instructions

Learning and evaluation materials/Instructions	Usefulness (1–5)	Engagement (1–5)
Quizzes (multiple choice, image choice, drag and drop)	5.0	5.0
Eval. act. after modules (“Test your knowledge”) and exams	5.0	4.9
Downloadable material	5.0	4.8
Texts	4.9	4.9
Instructions provided before each module and exam	4.9	4.9
Images with mouse over description	4.8	4.9
Links to external websites such as mySwitzerland.com	4.9	4.6
Interactive images with hotspots	4.8	4.8
Video	4.6	4.5
Key take-home messages	4.6	4.4

a good idea of where they stand in the learning process, helping them assess whether the relevant knowledge has been acquired. Furthermore, this result could also be read as an endorsement for the validity of the claim that active learning, in other words learning by doing, is very effective and should be integrated in eLearning platforms. When looking at the third column of the table, only quizzes received the highest score in terms of engagement from the user. This is an interesting result, which supports the idea that users are looking for interactivity and shows appreciation for the types of interactions designed and developed for the Switzerland Travel Academy. Videos and key take-home messages were considered less useful (4.6) and they were also rated as the least engaging, scoring an average of 4.5 and 4.4 respectively. To make the former more useful and engaging, some ad hoc videos could be created for the platform and, taking the success of the quizzes and hotspots, some interactivity could be added into these videos. The key take-home messages, on the other hand, might have been perceived as less engaging because of their format. To improve their attractiveness, some images and graphic elements could be inserted.

In Table 3, participant's knowledge on Switzerland before and after the Switzerland Travel Academy is compared (2nd level of Kirkpatrick's model).

Table 3. Average level of knowledge on different topics expressed by travel professionals before and after the Switzerland Travel Academy

Topic	Before (1–5)	After (1–5)	Difference
Switzerland’s top events	2.1	4.3	2.1
Switzerland’s accommodation options	2.8	4.3	1.5
Switzerland’s transportation system	3.3	4.6	1.3
Switzerland’s must-sees and attractions	3.0	4.4	1.4
Switzerland’s traditions and culture	2.6	3.8	1.2
Switzerland’s top activities	3.4	4.4	1.0

The average level of knowledge indicated in the preliminary questionnaire has increased for every topic in the evaluation questionnaire, which indicates that in any case, some knowledge must have been acquired thanks to the Switzerland Travel Academy. It is also interesting to note that the highest increase in knowledge occurred for the topic with which participants expressed the least familiarity in the preliminary questionnaire, namely Switzerland’s top events. This result can prove the usefulness of the “News from Switzerland” module, which informs users about the newest events and openings happening in the country.

Remaining on Kirkpatrick’s second level, but looking at possible future applications of what acquired thanks to the course, Table 4 presents participants’ average willingness to recommend Switzerland to their clients and their confidence in selling it before and after the Switzerland Travel Academy.

Table 4. Average level of agreement on two statements before and after the Switzerland Travel Academy

Statement (before)	Before (1–5)	After (1–5)	Statement (after)
I would recommend Switzerland to my clients as a holiday destination	5.0	5.0	After having studied at the Academy, I would recommend Switzerland to my clients as a holiday destination
I would feel confident in selling Switzerland to my clients	4.5	4.8	After having studied at the Academy, I feel confident about selling Switzerland to my clients

In this case, travel professionals’ willingness to recommend Switzerland did not change after having completed the core modules on the Switzerland Travel Academy (in fact, it could not even change, unless decreasing from the maximum initial level). Regarding TAs’ confidence in selling the country, there was only a slight improvement in the average level, which was already very high before their learning experience on the platform.

Regarding participants’ opinion about Switzerland, no particular difference, if not for a slight increase, could be observed before and after the Switzerland Travel Academy (Table 5).

Table 5. Participants' average opinion about Switzerland before and after having studied on the platform

Opinion before the STA (1–5)	Opinion after the STA (1–5)
4.9	5.0

The results of the last two tables might be a consequence of the fact that, being the usability test quite demanding, people who took part in it had very good attitudes towards Switzerland and a good image of the destination already before taking the course, which is what has probably motivated them to join the study.

6 Conclusion

The aim of this research was to find a suitable framework for evaluating online courses about destinations, and to understand the impact that such tools can have on users' involvement with a destination in terms of knowledge and image. To achieve this aim, the project of the Switzerland Travel Academy, an online destination course at the national level, was used as a case study. A new evaluation framework was proposed combining and adapting the ADDIE model with Kirkpatrick's model, according to which evaluation of an eLearning platform should occur on two levels: internally and externally. In the case of the Switzerland Travel Academy, the platform was internally evaluated by the development team. Externally, first, expert reviews were conducted on the alpha version. Second, a usability test with TAs was performed to evaluate the platform from the end users' perspective, and third, its impact on their involvement with the destination, in terms of changes in knowledge and opinion was investigated. For this study, participants had to fill in a preliminary questionnaire, study the core modules on the platform, and complete an evaluation questionnaire.

Data collected from the internal and external evaluations provided insights on the most important aspects to ensure high platform usability and a good experience to the users, which are: simple and intuitive structure, straightforward and frequent instructions, clear requirements, and available contact/help function. Regarding the content, learning material should most importantly meet users' expectations, taking into consideration their needs and requirements, be exclusive, updated, varied, and interactive. By comparing the results of the preliminary and evaluation questionnaires, it was found that TAs' knowledge about Switzerland improved by studying the course, as well as their confidence in selling the country. Furthermore, the type of information provided proved to have an impact on users' image of the destination.

In general, results align with recent studies on what eLearning tools and programmes in other sectors should provide in order to be usable and effective and support researchers' beliefs that conventional web usability criteria should be extended, including user-related factors such as their needs and requirements. This paper contributed to the theoretical framework on eLearning in tourism by providing for the first time, according to the authors' knowledge, insights and inputs derived from actual experience of creating a destination eLearning course for a national DMO, and analysing its usability and impact on users. Nonetheless, as this study has just begun to

scratch the surface of the vast research possibilities that can be conducted in this field, some suggestions are presented in the following chapter together with the limitations encountered.

7 Limitations and Future Research

A first limitation that has to be mentioned is that the authors are aware that the conclusions drawn from the case study and the results of the questionnaires might not apply to all tourism destinations. A second limitation regards the time available to conduct the usability test, which was rather short to allow for the integration of the questionnaires' results before the platform's launch. For future research, in-depth interviews should be considered to complement the questionnaires' results to ask the participants for more details on certain answers. Third, being the usability testing quite demanding, people who agreed on taking part in the study had already a good opinion of and attitude towards the topic of eLearning and Switzerland, thus the results should be carefully interpreted.

Future studies could focus on the following aspects. First, a similar study should be repeated on a larger scale, so to include people with a lower opinion about Switzerland. Furthermore, it could be investigated whether a relationship does exist between variables such as users' opinion of the destination, perceived usefulness of eLearning tools, willingness to update their knowledge, satisfaction of the learning experience, and course completion rates. Second, the ADDIE model proposed in this paper should be tested on other eLearning platforms. In terms of usage, it could be of interest to understand users' behaviour on the platform through web analytics. Furthermore, eye tracking testing could be performed to understand, for example, how TAs study and on what they focus their attention, with the aim of improving the platform's usability and users' experience. Additionally, data on platform usage could be compared with the timing of holiday bookings (when clients start thinking about holidays, when they go to a TAs to book their holidays, etc.) to understand whether there is a correlation between clients' willingness to book holidays and TAs' study practices in order to increase their knowledge.

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The Role of Digital Technologies in Facilitating Intergenerational Learning in Heritage Tourism

Pierre Benckendorff¹, Iis P. Tussyadiah²(✉), and Caroline Scarles²

¹ UQ Business School, University of Queensland, St Lucia, Australia
p.benckendorff@uq.edu.au

² School of Hospitality and Tourism Management, University of Surrey,
Guildford, UK
{i.tussyadiah, c.scarles}@surrey.ac.uk

Abstract. This research proposes a framework of intergenerational learning (IGL) that supports child-to-parent influence in the context of heritage learning using augmented reality (AR) and serious game applications. Positioning children as the behavioural catalysts in the learning process, the framework is developed based on several considerations and requirements. First, the technologies are designed to play a role in attracting and engaging children in learning and providing an intergenerational participation structure to allow children to influence parents' attitudes and behaviour. Second, using the mechanics, dynamics, and aesthetics framework of game design, the game elements are designed to provide realistic context for experiential learning, informative guiding and player interactions to increase engagement, as well as clear and measurable success indicators to increase motivation. The outcome of this framework is attitude and behaviour change in children and parents with regards to heritage preservation and appreciation, which is one of the main goals of heritage tourism managers.

Keywords: Intergenerational learning · Child-to-parent influence
Attitude change · Behavioural catalyst · Augmented reality · Serious game

1 Introduction

Intergenerational learning (IGL) is an important mechanism for the transfer of knowledge, skills, competencies, norms and values between different generations. The concept of IGL is not new. The traditional role of elders passing on their wisdom to younger generations is enshrined in the familial and patriarchal relationships of many different cultures (Newman & Hatton-Yeo, 2008). The biblical concept of 'respect for elders' is a core moral principle in Christianity and Judaism, while the Confucian concept of familial piety is regarded as an important virtue in Eastern cultures. Respect for the wisdom of elders is also evident in the oral histories of many ancient and indigenous cultures, including Indo-Iranians, Native Americans, and Australian Aboriginals. However, modern interpretations of IGL has extended well beyond these traditional contexts.

Brown and Ohsako (2003, p. 154) propose that IGL involves three key aspects:

1. at least two generations learning about each other;
2. at least two generations learning together about the world, people and the historical and social events relevant and important to them; and
3. at least two different age groups sharing learning experiences which are designed to develop and prepare their social service skills.

In the academic literature, IGL has primarily received attention from researchers working in sociology, marketing, organisational behaviour and environmental education. Drawing on the anthropological themes discussed above, sociologists have tended to emphasise the transfer of knowledge, attitudes and values from adults to children and the importance of elders as role models for younger generations (Kenner, Ruby, Jessel, Gregory & Arju, 2007; Roksa & Potter, 2011; Newman & Hatton-Yeo, 2008). In the organisational behaviour literature, researchers have also primarily focussed on the transfer of knowledge from older to younger employees (Tempest, 2003; Ropes, 2013). However, there is considerable evidence that the transfer of knowledge and skills between generations is not unidirectional (Uzzell, 1999; Ho, 2010; Istead & Shapiro, 2014). For example, the marketing and consumer behaviour literature has long acknowledged the role of children as influencers in household purchase decisions (Berey & Pollay, 1968; Ward & Wackman, 1972; Foxman, Tansuhai & Ekstrom, 1989). More recently, researchers in environmental education have explored the influence of children on parents' knowledge, attitudes and behaviours.

Environmental education researchers have proposed that educational programs or interventions can facilitate IGL between children and parents (Istead & Shapiro, 2014). Various teaching and learning interventions have been explored in the literature, including story books and storytelling, in class discussions, workbooks, small group research, assignments, presentations, role plays, volunteer activities, industry/site visits, family and community events, shared protocols and homework tasks, and monitoring of waste, recycling or energy use at school, home or local community (Maddox, Doran, Williams & Kus, 2011; Ballantyne, Fien & Packer, 2001; D'amore, 2016; Duvall & Zint, 2007; Öllerer, 2017; Vaughan, Gack, Solorazano & Ray, 2003; Andersen, 2016). Most studies have reported that these interventions do result in knowledge transfer from children to parents, but that this knowledge may not lead to changes in the attitudes or behaviours of parents (Boudet et al., 2016; Duvall & Zint, 2007).

Factors such as a child's enjoyment of the learning intervention and their communication relationship with their parents can facilitate or constrain the sharing of information between children and their parents (Ballantyne, Connell & Fien, 1998a, b). The type of intervention and the tasks that need to be completed as part of the learning process are also important factors. Hands-on activities focussed on local settings, such as monitoring or testing the environment are conducive to positive IGL and behavioural change (Ballantyne, Fien & Packer, 2001). Parents are generally motivated to be good role models for their children, so interventions that provide opportunities for parents to set a good example may also result in behavioural change for both children and adults.

Travel provides many opportunities for learning and personal development is often regarded as a core motive for visiting places (Pearce & Foster, 2007; Falk, Ballantyne,

Packer & Benckendorff, 2012; Stone & Petrick, 2013). While visitor settings such as museums, galleries, zoos, aquariums, national parks and heritage sites offer structured educational activities that can be embedded in study tours or field trips, they also provide opportunities for informal IGL between family members. Despite the growing body of literature on visitor learning and interpretation, only a handful of studies have examined informal IGL in tourism settings. These studies have been limited to family learning in museums (Hike, 1989; Borun, Cleghom & Garfield, 1995; Borun, Chambers & Cleghorn, 1996; Larsen & Svabo, 2014), art galleries (Adams, Luke & Ancelet, 2010), national parks (Bourque, Houseal, Welsh & Wenger, 2014), aquariums (Kopczak, Kisiel & Rowe, 2015), and nature centres (Zimmerman & McClain, 2014a, b), and none of these studies have examined whether learning resulted in changes to attitudes or behaviours.

Recent studies have proposed that information and communication technologies can play a key role in supporting IGL (Facer, 2011; Kenner et al., 2008; Sung & Siraj-Blatchford, 2015; Stom & Strom, 2011; Gamliel & Gabay, 2014). The role of children in helping older generations to learn about new technologies is well reported in the literature (Correa, 2014). However, the technology itself can become a medium for IGL. Several recent studies have examined the effectiveness of computer games (Räsänen et al., 2014; Ypsilanti et al., 2014), mobile devices (Zimmerman et al., 2015) and augmented reality (Cheng & Tsai, 2016) in facilitating IGL, although these studies were not focussed on tourism settings. This paper conceptualizes the framework for the applications of digital technologies to facilitate IGL in a heritage tourism setting.

2 Engaging the Behavioural Catalysts

Key to facilitating IGL and behaviour change is identifying the one generation that would play a role as a behavioural catalyst and designing experiences that allow them to be effective not only in building their own competence, but also in communicating their knowledge to influence the attitudes and behaviours of others. A considerable amount of research has been done on how to integrate technologies in experiences with cultural heritage (Anderson et al., 2010), specifically to support heritage learning (Dindler et al., 2010). Previous studies have focused on designing technologies that allow young people to become more motivated and actively engaged in heritage learning (e.g., Ardito et al., 2010; Dindler et al., 2010; Huizenga et al., 2009). This is due to the fact that visitors to historic sites are in a large part school children (Ardito et al., 2010) and the pressure to identify new ways to raise the interest of children in their cultural heritage as they are next in line to carry out preservation efforts (Froschauer et al., 2012). Computer games have proved to be effective in attracting and engaging younger generations and thus considered useful as learning tools (Dieleman & Huisinsh, 2006). Therefore, there has been a trend to develop various forms of serious games (informed by both pedagogical and game-like elements) played in immersive learning environments, often supported by two interconnected physical and virtual spaces, for heritage learning (e.g., Anderson et al., 2010; Kiefer, Matyas, & Schlieder, 2006; Xu et al., 2016).

Most of the serious games address the acquisition of heritage knowledge amongst children, but only a few provide a platform enabling child-to-parent influence, which extends beyond child-parent interactions, as an outcome of learning (e.g., Siyahhan, Barab, & Downton, 2010). As identified in previous studies, the effectiveness of children as behavioural catalysts depends largely on parents' perception of the children's status within the family as well as parents' involvement in children's activities (Duvall & Zint, 2007; Istead & Shapiro, 2014). Indeed, Istead and Shapiro (2014) suggest that children's decisions to share information with parents are influenced by factors relating to the children's self-confidence and whether their knowledge will be accepted or appreciated. To address the issues of family microstructure in IGL, Zimmerman and McClain (2014a, b) advocate the importance of participation frameworks to build social organisations in informal educational settings. These participation frameworks should provide access to meaning-making conversations where parents or grandparents are not always the intellectual leaders, but where children have an equal footing to negotiate ideas about the subjects (Kanhadilok & Watts, 2016; Zimmerman & McClain, 2014a, b). Therefore, it is important to think of serious heritage games as a framework for IGL, where both the parent and the child bring their expertise to a shared learning experience about cultural heritage (Siyahhan, Barab, & Downton, 2010). Further, as identified by Chiong (2009), children are more likely to be the "authority" in intergenerational play with digital games. As such, children can take the mentoring role further by not only helping parents to play (by explaining the game mechanics), but also by assisting parents in increasing awareness and sense of responsibility for heritage preservation. In summary, in order to facilitate IGL, digital technologies can be designed to play a role in (a) attracting and engaging children in learning and (b) providing intergenerational participation structure that allows children to influence their parents through collaborative learning.

3 A Technological Framework for Intergenerational Learning

Researchers and developers have utilized various methods and techniques to create serious games to be deployed in cultural heritage contexts, specifically to make heritage sites more accessible. Anderson et al. (2010) analysed the state-of-the-art in serious games for heritage and identified three approaches to presenting cultural heritage in learning games integrating the physical and virtual spaces: (1) prototypes and demonstrators, (2) interactive virtual museums, and (3) commercial games with a cultural heritage theme. An example of virtual reconstruction of heritage to educate users is *Roma Nova*, a serious game designed to allow archaeologists to test past and current hypotheses surrounding aspects of social life in ancient Rome, such as analysing impacts of major events. *Total War* is a representative of historical games enriching historical settings with information about important events in the timeframe experienced by players, allowing them to change the course of history and partake in moments of historical significance. Similarly, Weber (2014) presents an example of the 'Ghost Game' at Wartburg Castle, an immersive experience for visitors to connect through missions and quests with the past history.

Developing effective serious games for IGL requires the integration of several technological components. Interactive games are implemented using game engines, which provide the generic infrastructure for game creation. These may include rendering, audio, physics, and animation engines. To allow players to interact with virtual worlds, a user interface can be designed using virtual reality (VR), augmented reality (AR), or mixed reality (MR) technologies. AR games, typically developed by combining AR technologies with existing game engine subsystems, has been implemented in heritage institutions such as museums as well as outdoor heritage sites (Angelopoulou et al., 2011; Hammady, Ma, & Temple, 2016). Another important component is rendering, the creation of visual representation of the environments and objects within the virtual worlds, including their graphical features and effects (e.g., mirrored background reflections). Finally, artificial intelligence (AI) techniques are necessary to create (the illusion of) intelligent behaviour for the inhabitants of the virtual worlds in order to immerse players. In serious heritage games, AI is important in the construction of intelligent interfaces, such as virtual guiding or tutoring systems, which, when combined with MR or AR interface that allow players to interact with their immediate surroundings, require advanced spatiotemporal reasoning (Anderson et al., 2010).

In addition to designing the game space, it is important to integrate game mechanics, dynamics and narrative elements prevailing in game activities that support learning and knowledge transfer processes. To be able to support IGL, serious heritage games should support experiential learning, being accessible enough to enable the acquisition of a range of new skills and competence based on a holistic adaptation to the environment (Ypsilanti et al., 2014). These may include activities such as: investigation of (physical or virtual) objects of learning potentials, active search of information, development of new skills, physical and virtual interaction between players, and engagement in meaning-making activities (Pishtari, n.d.), all of which serve as the games' participation framework. Hunicke et al. (2004) propose a game design framework consisting of mechanics, dynamics and aesthetics (MDA). Mechanics describe the goals, rules and components of the game, at the level of data representation and algorithms. Dynamics refer to the types of behaviours and interactions that emerge as players partake in the experience. Aesthetics describe the mental affective states and reactions evoked among individual players when they participate in a gamified experience.

Further, Ypsilanti et al. (2014) developed a list of key issues to be considered when developing serious games for IGL, consisting of personal relevance to enhance learning associations, realistic context to facilitate learning, vivid graphics and bottom-up features to increase engagement, easy access and minimal requirements for installation and play, basic instructions (a tutorial), an informative aspect to entail knowledge transfer, specific goals and outcomes for effective impact, clear and measurable success indicators, feedback for players to increase motivation and maximize engagement, and adjustment of attentional demands to the age of players.

Figure 1 illustrates the technological framework of AR games supporting child-to-parent IGL in heritage sites. First, by enhancing the natural environment with virtual objects of historic relevance presented in vivid graphics, AR should serve as realistic context to immerse players in the environment and facilitate experiential learning. Second, the participation framework contains meaning-making activities,

such as investigation of (physical and virtual) objects, and informative guiding or a tutorial system to allow for engagement and interactions among players. Finally, by presenting feedback to players and adjusting attentional demands (i.e., making the child the leader in the game experience), acquisition of new skills and child-to-parent knowledge transfer can be induced. Taking into consideration that parents can be motivated to be good role models for their children, the game mechanics should provide opportunities for parents to set a good example of heritage preservation efforts while playing the game. Ultimately, the main outcome of the game is attitude and behavioural change in both the child and parent with regards to heritage preservation and appreciation.

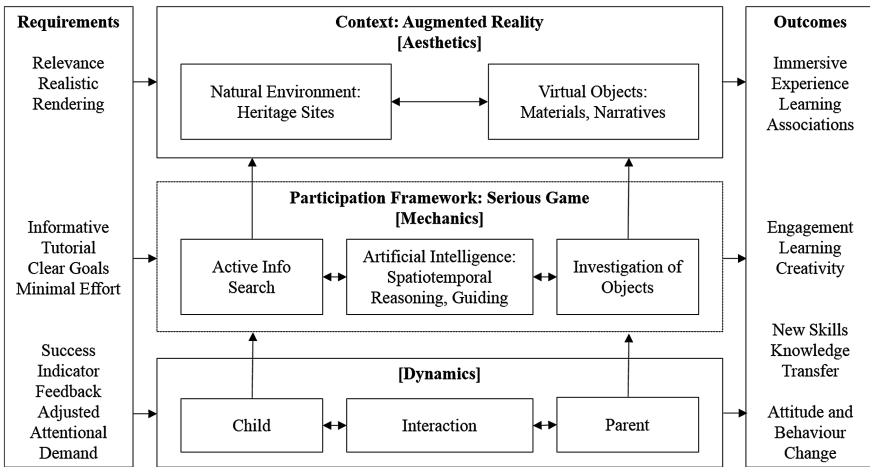


Fig. 1. Framework: AR Games for IGL

4 Concluding Remark

As children can play a significant role in family decision making, it is important to explore opportunities to induce child-to-parent influence in IGL that results in attitude and behaviour change in both the child and the parent. This research offers a framework to integrate digital technologies to induce child-to-parent influence in informal learning environments involving heritage sites. Specifically, an AR serious game for IGL is designed to attract and engage children, the behavioural catalysts, in learning and facilitate children to influence parents’ knowledge, attitudes, and behaviour through intergenerational participation structure allowing for enjoyable communication relationship between them. The AR game design follows the MDA framework (Hunicke et al., 2004) and addresses the key issues suggested by Ypsilanti et al. (2014) as design requirements. It is designed to provide immersive learning experience, maximize engagement, facilitate the acquisition and transfer of a wide range of knowledge

and skills, and, ultimately, induce changes in attitudes and behaviour toward natural and cultural heritage sites.

This research contributes to the conceptualization of the roles of digital technologies in supporting heritage preservation by supporting child-to-parent influence in IGL where heritage sites function as an informal learning environment. The theory-driven framework of AR serious game for child-to-parent IGL can be useful for heritage tourism managers and operators to enhance experience in heritage sites and educate visitors about the heritage itself as well as the importance of heritage preservation. While parent-to-child knowledge transfer has been the focus of many IGL interventions, heritage managers can add this new approach to their management toolbox for effective behavioural interventions in heritage sites.

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Mobile Eyetracking of Museum Learning Experiences

Mattia Rainoldi^(✉), Barbara Neuhofer, and Mario Jooss

Innovation and Management in Tourism, Salzburg University of Applied Sciences, Salzburg, Austria

{mattia.rainoldi, barbara.neuhofer, mario.jooss}
@fh-salzburg.ac.at

Abstract. Eyetracking research has gained traction in a wide range of contexts and finds increasing application in the travel and tourism domain. Whilst there exists some empirical evidence of eyetracking in tourism, most research to date is restricted to lab environments and desktop computers, or occurs on a small scale. This paper presents a first large-scale mobile eyetracking study through a multiple-stage research design that focuses on the visitor's interactive learning experience in a real-life museum context. Based on an emic visitor perspective, the findings unlock insights into a range of factors that shape the physical context of the museum learning experience. This study makes a theoretical contribution and offers methodological advances to eyetracking research and museum interactive learning experiences. Strategic implications for research and practical recommendations for experience design in a museum are offered.

Keywords: Mobile eyetracking · Museum · Interactive learning experience
Experience design

1 Introduction

How do visitors experience museum environments, where do they look, where do they spend their time, and how are experiences created? These questions have been at the core of tourism and visitor attraction research for decades, whilst research designs to explore these areas of interest have been largely conventional and have offered us relatively little insights into the visitors' actual behavioural patterns and experiences. In recent years, eyetracking research has gained increasing attention and has evolved at a very dynamic pace, ranging from desktop-based research and user experience tracking of the early days to more advanced mobile eyetracking endeavours recently (Rakoczi, 2012; Bojko, 2013; Bergstrom & Schall, 2014). The ability to follow eye movements of individuals makes eyetracking a valuable methodology applicable in a wide range of research and industry contexts.

Eyetracking has received some consideration in consumer behaviour, psychology, marketing and the user experience design field (Bojko, 2013; Gidlöf et al., 2013). Yet, in tourism research, it is still not widely used and only a few studies have adopted eyetracking to date. For instance, Pan and Zhang (2010) conducted an eyetracking study in the context of hotel decision making, Marchiori and Cantoni (2015) compared

the application of eyetracking and self-reported investigation techniques of tourism online content, while Aicher et al. (2016) used eyetracking to assess online hotel reviews. Despite these exploratory studies, the real potential of eyetracking in tourism on a larger scale is still to be explored (Marchiori and Cantoni, 2015). Most importantly, *mobile eyetracking*, implying mobile-technology supported eyetracking on the move, is still in its infancy and currently represents both, a major research gap and an area with potential for ground-breaking research, as we start tapping into uncharted territory of tracking eye movements of people on the go.

This study thus aims to address a timely gap in the literature by offering a large-scale mobile eyetracking study that examines visitors' museum learning experiences on the go. Our research adopts an emic visitor's perspective to reveal unique insights relevant to museum experience design. Based on the theoretical framework of Falk & Dierking (2013), this paper identifies a distinct set of factors that shape the physical context, and potentially facilitate or hinder effective museum learning experiences. This study is divided into four main sections. First, mobile eyetracking research in tourism and museum learning experiences is discussed, followed by an outline of the three-stage research design. The findings visualise eyetracking insights into the physical museum context, while the conclusions offer implications for mobile eyetracking research and avenues for further study as well as practical recommendations explaining how mobile eyetracking can help us learn more about effective museum learning and experience design.

2 Theoretical Background

2.1 Mobile Eyetracking in the Museum Context

Museums have a key role in society as places of collection, preservation and learning (Falk & Dierking, 2013). This means that museum curators dedicate an abundance of resources to designing rooms and exhibitions, arranging and presenting artefacts, and effectively planning visitor flows that allow visitors to meet their prior expectations and have a satisfactory learning experience (Hein, 1998; Falk & Dierking, 2013). Whilst the design of museums and exhibition spaces dates back several centuries, it has never been more important to understand museum experiences and with that, individual learning experiences embedded in a visit. A deeper understanding of individual museum experiences remains however elusive, or is gathered through conventional methods, such as quantitative visitor surveys (Sheng & Chen, 2012).

With the advent of eyetracking research, a distinct methodology became available, offering first-hand insights into an experience from an individual's perspective (Duchowski, 2007; Bojko, 2013). In particular, mobile eyetracking represents a method that, often used in combination with other qualitative and quantitative methods for triangulation, offers the ability to open a 'visual window' into a person's experiences and learning processes through the visitor's eyes. In the museum context, the idea of using eyetracking research is not new, and its early steps date back to the 1980s (Buquet et al., 1988). However, the technical possibilities at the time only provided

very static experimental arrangements, which surprisingly have not changed considerably in the more than 25 years to follow.

Today, eyetracking research is more sophisticated and finds increasing application. Due to the observation of the eye movement, real insights into visual attention and attention processes of learners can be assessed (Knight et al., 2014). Despite its high potential, only a limited number of eyetracking studies have recently been carried out in the arts, history and museum contexts (Mayr, Knipfer and Wessel, 2009; Batcha, Stein, Filippini-Fantoni & Leason, 2012; Filippini-Fantoni, Jaebker, Bauer & Stofer, 2013). A large proportion of these eyetracking research designs require laboratory conditions. However, there is a recent advocacy that visitors must be observed in more natural settings. This is the underlying rationale for this study, which seeks to use mobile eyetracking in a real life, rather than a laboratory, environment. In fact, mobile eyetracking takes us a step closer to “strolling and viewing” an exhibition from the viewpoint of the visitors (Eghbal and Widlok, 2012). Unlike any other method, mobile eyetracking thus offers a non-invasive means to gather a window into what visitors see and what they do at a museum. Most importantly, Mayr et al. (2009) note that mobile eyetracking shows cognitive processing of visual information as a visitor is learning and moving through a real-life space.

Due to the fact that the visitor’s gaze is recorded, tracking eye movements can give us an understanding of the ‘unconscious exhibition visitor scripts’, insights that can hardly be verbalised by visitors themselves (Eghbal and Widlok, 2012). Cognitive processes of humans have been described as a ‘black box’, because they are not measurable. Eyetracking technology has the potential to address these shortcomings and to approach these processes via eye movements for the analysis of visual behaviour patterns, attention focus, selection decisions, learning processes and contingent responses (Duchowski, 2007; Rakoczi, 2012; Marchiori and Cantoni, 2015). This study uses mobile eyetracking to examine the visitor’s museum learning experience, for which purpose the ‘Contextual Model of Learning’ by Falk & Dierking (2013) is adopted as the theoretical framework underpinning this study.

2.2 Contextual Model of Learning: The Museum Context

A museum visitor experience encompasses the before, during and after visit stages, and is embedded within the wider socio-cultural and personal context of the visitor, and occurs within the defined spatial boundaries of a physical museum context. In this wider contextual framework, it is the physical context of an exhibition that is considered to have the biggest influence on the visitor’s overall museum experience (Falk & Dierking, 2013). As a result, research on the interaction between visitors and viewed materials and objects in an exhibition space represents a critical area of scientific query (Falk & Dierking, 2013).

In the early 2000s, Falk & Dierking developed the Contextual Model of Learning, a framework that captures the complexities of the museum visitor experience and compartmentalises it into an (a) socio-cultural, (b) personal and (c) physical context. Socio-cultural and personal influences are critical to an individual’s holistic experience. From a museum experience design perspective, it is however the physical context that is at the centre stage of what exhibits are shown, how these are arranged and displayed,

how visitor flows are designed around these, and how the overall museum learning experience is planned. Based on this rationale, our study adopts a three-stage research design, tackling all contextual factors, with the mobile eyetracking part focusing predominantly on the immediate interaction of the visitor with the surrounding physical museum context. This paper presents the results of the mobile eyetracking part, which sheds light on the physical context as a key indicator of the museum learning experience. The methodological approach is explained next.

3 Research Design

This section outlines the three-stage research design of the wider study, and the mobile eyetracking approach of particular relevance for this paper. This study aimed to analyse the visitor's learning experience in a museum context from an emic visitor's perspective. The enquiry was driven by six main research questions, trying to unlock an in-depth understanding of learning experiences on-site through mobile eyetracking. The research question driving the data collection presented in this paper is: *How is the museum learning experience contextually influenced by the surrounding physical context of the visitors?*

3.1 Data Collection

The data collection period took place over a three-month period, between June and August 2016 in the Salzburg Museum in the special exhibition 'Bischof. Kaiser. Jedermann.' Exhibition area 'Erzähl mir Salzburg!'. This exhibition was divided into six rooms, highlighting various aspects of Salzburg's historic eras of development. A three-stage data collection process was implemented, including (1) a pre-experience survey, (2) on-site experience mobile eyetracking, and (3) a post-experience survey. Several technological solutions supported each phase. For the surveys, pre-experience (at the museum's entrance) and post-experience (at the museum's exit), an iPad Air 2 device and the SurveyMonkey software were used, enabling a convenient survey completion by the visitors through a tablet. The mobile eyetracking of the on-site experience was conducted with the Tobii Pro Glasses 2 gear. This solution was chosen because it provides a flexible and mobile tool to capture a museum experience first-hand. The gear enables visitors to move freely and experience the museum in an unrestricted manner and in a natural environment, which was critical for the ecological validity of the study (Bojko, 2013).

The Tobii Pro Glasses 2 eyetracking glasses are equipped with a scene camera, a microphone, eyetracking sensors and infrared illuminators, which combined simultaneously record the audio-visual data of the visitor (the spectator) and their associated eye movements. Through a synchronisation process of the data, the visitor's eye movements and the fixation of the gaze can be captured accurately. A fixation is thereby defined as a pause and focus of the eye movement to a certain area of the visual field (Duchowski, 2007). The length of a fixation generally varies from 150 to 600 ms (Irwin, 1992). Fixation times are of particular interest, because a short fixation time is an indicator of implicit processing, whilst during an extended fixation time and pause,

the brain begins to receive and process the visual information from the eyes (Glockner and Herbold, 2011; Bergstrom & Schall, 2014). Thus, the length of a fixation is indicative of the information processing and cognitive activity that occurs at a particular moment (Bojko, 2013). Table 1 offers an overview of the overall research design, with this paper presenting the findings of Phase 2, the mobile eyetracking study.

Table 1. Multi-phase research design

Data collection phase	1. Pre-experience survey	2. On-site experience eyetracking	3. Post-experience survey
Method	Survey	Mobile Eyetracking	Survey
Focus and theme	Background to museum learning experience	Process of museum learning experience	Evaluation of museum learning experience
Items	Visitor motivation Visitor prior experiences (<i>Erfahrung</i>), knowledge and interests	Analysis of behaviour, social interaction, interaction with the physical environment Analysis of eye movements and fixation times	Analysis of behaviour, social interaction, interaction with the physical environment Triangulation of the collected data Socio-demographic factors
Learning context	Personal context	Personal context Socio-cultural context Physical context	Personal context Socio-cultural context Physical context

3.2 Sampling and Data Collection Process

A purposive sampling strategy was employed to select participants based on a set of pre-defined criteria. Prerequisites for participation in the study were (a) knowledge of the German language, (b) no visual impairment (for example wearing reading glasses) and (c) being a first-time museum visitor. Visitors were pre-selected at the entrance of the museum. An incentive for participation was offered in form of a free ticket to the museum's special exhibition. The purpose of the pre-survey was to select first-time visitors of the special exhibition, and to develop an understanding about their motivation and background of the visit. A further goal was to determine the personal context of the visitor and their desire for learning. The pre-experience survey was followed by an eyetracking briefing session, in which participants were explained the task and the use of the glasses. Particular attention was paid to inform participants that their visit is both video and sound recorded, and that knowledge acquisition will not be tested at the end. A calibration of the eyetracking glasses followed to ensure high quality recordings. Participants were instructed to independently walk through the museum, unaccompanied by a researcher, at their own natural pace, and according to

their own personal interests and learning needs to guarantee a natural visit behaviour. Upon completion of the visit, participants filled out a post-experience survey, focusing on the personal, socio-cultural and physical learning context and the evaluation of their learning experience.

3.3 Data Cleaning and Analysis

The mobile eyetracking study collected data from 41 participants. In the data cleaning process, seven inadequate recordings were excluded, due to incompleteness of the recordings or calibration errors, leading to a total of 34 valid eyetracking recordings. The average duration of these 34 recordings was 45 min and 23 s, amounting to over 25 h of mobile eyetracking data. The eye movement recordings were analysed with the software ‘Tobii Pro Glasses Analyzer’. Every single fixation of all visitors was mapped against the floor plan of the six rooms to develop heatmaps demonstrating areas of major attention and visual patterns across exhibits. The visual data, notes from the mapping process, the visitor pre-survey and post-survey were triangulated for a holistic understanding of the learning experience.

4 Findings: Mobile Eyetracking of a Museum Learning Experience

In order to design museum learning experiences, it is critical to understand the factors that potentially *make* or *break* the physical context of an exhibition. The analysis presents heatmaps of cross-participant fixation times that offer an emic perspective of the visitors’ museum learning experiences. The mapping of the visual eyetracking data was structured according to the museum’s floor plan, room by room, allowing for clear tracking and identification of visual patterns and areas of interest. For the presentation of the findings, Falk & Dierking’s (2013) model of contextual learning was followed, which divides the physical museum context into (a) objects and interactives, (b) exhibition labels and (c) digital media.

4.1 Socio-Demographic Participant Profile

The mobile eyetracking study includes data from a total of 34 visitors (see Table 2). The sample consisted of 58.8% ($n = 20$) women and 41.2% ($n = 14$) men, with an average age of 39.09 years. The age range covered a wide span, from 17 to 80 years. 67.6% ($n = 23$) of the respondents were employed and 11.8% ($n = 4$) were retired at the time of the study. The remaining participants indicated to currently be “in education” (20.6%, $n = 7$). Looking more closely at the level of education, it can be seen that the majority of the participants had an academic degree: Bachelor (11.8%, $n = 4$), Master (34.1%, $n = 15$) and Ph.D. (8.8%, $n = 3$).

Table 2. Socio-demographic sample profile

Factor	Item	Frequency	Percentage (%)
Gender	Male	14	41.2
	Female	20	58.8
Age	Age range	17–80	39.09
Employment	Employed	23	67.6
	In Education	7	20.6
	Retired	4	11.8
Education	Mid-High School	3	8.8
	A-Levels	9	26.5
	Bachelors Levels	4	11.8
	Diploma/Masters Level	15	34.1
	Ph.D. Level	3	8.8
Nationality	Austria	25	73.5
	Germany	5	14.7
	Other ^a	3	11.7
Residence	City of Salzburg	12	35.3
	Region of Salzburg	10	29.4
	Other national regions	8	23.5
	Abroad	4	11.8

^aItaly: 1; France: 1; Sweden: 1; Slovenia: 1

In terms of nationalities, the sample is concentrated on Austrians (73.5%, $n = 25$) and Germans (14.7%, $n = 5$). In total, people from eight different countries participated, of which 64.7% ($n = 22$) had their place of residence in the city or the surrounding region of Salzburg. The sample is contextual in terms of nationality and it can be considered as transferable to general museum visitors.

4.2 Time Dimension of the Museum Learning Experience

Falk & Dierking (2013) suggest that time is a key dimension of the museum learning experience. No matter what size the museum, visitors usually take about the same amount of time, due to gradual saturation and fatigue. The study measured the attention duration of participants in each of the six exhibition rooms (see Fig. 1). The findings confirm that the visitors' attention was highest in Rooms 1 and 2, with decreasing attention levels towards the final rooms. Thereby, Room 2 records the highest attention of a visitor (36' 25"), while Room 4 has the shortest attention of a visitor (11"). For museum experience design, the findings suggest that time is an important contextual factor to be taken into account in the design of the museum environment and the artefacts placed within it. An interesting finding revealed through mobile eyetracking is that despite a longer period of attention in Room 5 (4' 12"), visitors showed a decrease of fixation times. The observation times of interactive and video elements are reduced compared to similar elements positioned in Rooms 2, 3 and 4. This could be an indicator for motivational disengagement or mental fatigue (Hopstaken et al., 2016).

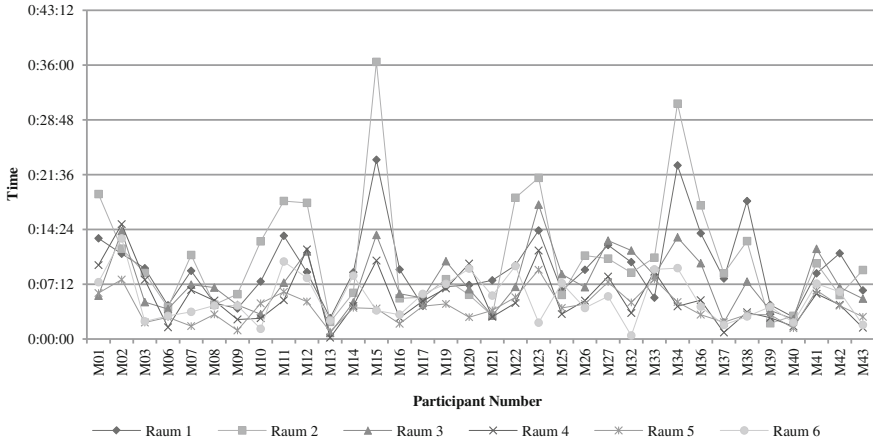


Fig. 1. Visual Attention Span per Exhibition Room

4.3 Objects and Interactives

The findings indicate that the positioning of objects and interactives strongly determine the visitor’s engagement in and learning experience of an exhibition. The heatmap in Fig. 2 shows a room with a dominance of four stories (through digital media), while other artefacts received comparably less fixation time. The four video stories have an average fixation time of around 1’ 25” (total length of each video 8’ 40”). This means that videos were only partially seen and participants did not follow the full story narrated in the video. Based on eyetracking data alone, non-visual tracking of the narrated stories cannot be ruled out. The eye tracking data shows a dominance of fixation times on the four video-supported stories on each wall. Major criticism was raised in the post-experience survey, namely that videos were auto-playing and causing a distraction to learning of the remaining artefacts in the room.

Participants highlighted a sense of confusion arising from the combination of audio-visual, written and physical materials in the same room. Falk & Dierking (2013) state that digital media artefacts are rarely the reason people visit a museum, but it is surprising that within an exhibition, it is digital media objects that in many cases attract most attention and engagement time, as confirmed in this study. To address the dilemma of ‘attention competition’ (Falk & Dierking, 2013), museum designers may need to find ways to avoid the combination of different types of media that could cause a competition and cross-interference. The eyetracking data revealed a second major issue. Due to the use of four video walls in Room 1, the room was dark, causing additional barriers to the visibility and experience of other artefacts, which visitors had difficulty seeing. Figure 2 demonstrates a problem area of an artefact, with a participant using their mobile phone flashlight to read the content of a book. Overall, the eyetracking data pointed to the biggest issue in relation to the visitor’s learning

experience, namely that the displayed videos were too dominant in relation to other artefacts, which were only briefly looked at or skipped altogether, bearing critical consequences on knowledge acquisition and learning in this room.

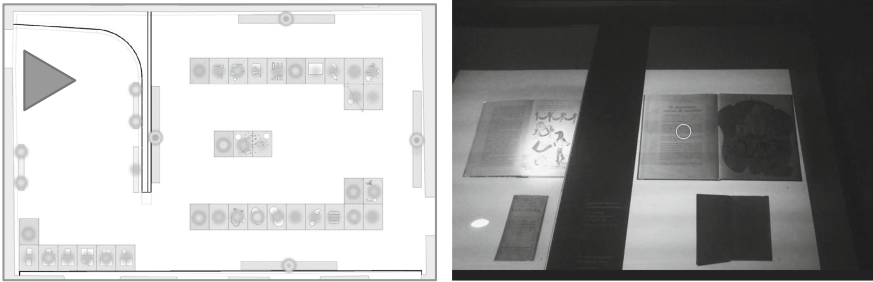


Fig. 2. Exhibition Room 1—Room Heatmap and Artefact Issues

The eyetracking data further revealed that some of the exhibition objects receiving most fixation times are people, pictures of faces, sculptures and descriptions thereof, as seen in Fig. 3. The second picture demonstrates an interesting gaze pattern of the information of two historical figures. A high concentration of fixation can be observed on the portrait and the description label of the portrait. The analysis shows that 54.61% of the fixation times focus on the text about Franz Xaver Gruber, 28.31% focus on the text about Joseph Mohr and only 9.84% on the description labels. The eyetracking data revealed that this unequal attention primarily exists due to a non-intuitive placement of language labels. The heatmap visualises that participants start reading a text in German about person 1 in the left column, followed by the English description of the same below, while the German description of Person 2 is in the right column. This non-intuitive gaze pattern of the English language ‘interfered’ with the reading flow and caused several participants to re-direct their gaze, leaving them with decreased attention of the description of Person 2 on the right. For museum experience design, a careful combination of multiple language presentation is needed.



Fig. 3. Exhibition Room 2—Artefacts and Historical Figures

4.4 Exhibition Labels

Museum research shows that exhibition labels are generally sparingly read, with some visitors only engaging a few seconds (10 s on average or less), and few visitors reading several labels within an exhibition (Falk & Dierking, 2013). The eyetracking data revealed interesting insights about overview maps and labels, positioned at the entrance of each room. Figure 4 visualises the entrance of the room at the bottom left, while the room description label is above the entrance (circle). Most participants' first gaze however landed in the area of the exhibits to the right of the entrance (long circle). Only two participants (out of 34) did see the overview label at first sight, and seven participants did not notice the label at all during their visit of Room 2. For museum experience design, the eyetracking data revealed natural gaze patterns of visitors that in several cases stand in contrast to the museum's planned visitor flow, requiring adjustment for a more intuitive guiding of an exhibition area.

4.5 Digital Media

The heatmap analysis (see Fig. 4) shows a long fixation time on a touchscreen (top right corner). In a more detailed analysis of the fixation patterns of a touchscreen area (Fig. 4, second picture), it becomes clear that the touchscreen in the centre attracts most attention, whilst the description labels on the side have a shorter fixation time and were primarily used as a 'gap filler' during the observation of the video. Similar to Room 1, an object competition occurs here, with digital media taking dominance over non-media displays. The eyetracking data also uncovered a further interesting usability issue of digital media. Whilst three further touchscreen stations were available in this room, the one displayed in Fig. 4 (second picture) received most attention. This is due to its positioning on a wall, which enables visitors to stand up and watch the video at an ideal angle of view. In contrast, touchscreens in a horizontal position (Fig. 4, third picture) were in a less favourable position for interaction, and additionally, caused a reflection of the lights from the ceiling of the room.

The eyetracking data revealed important usability issues around the use of digital media. Numerous visitors are used to perform tasks with a touching and swiping technique, as they perform on their smartphones and tablets. However, in the museum's provided digital technologies, these functionalities were not given, and as such, the displayed digital media did not conform with the visitor's technology use habits. In several instances, visitors thus had problems with the use of multi-media artefacts. It is recommended that museums may use interactive media that follow the same principles as standard devices to ensure a smooth museum experience.

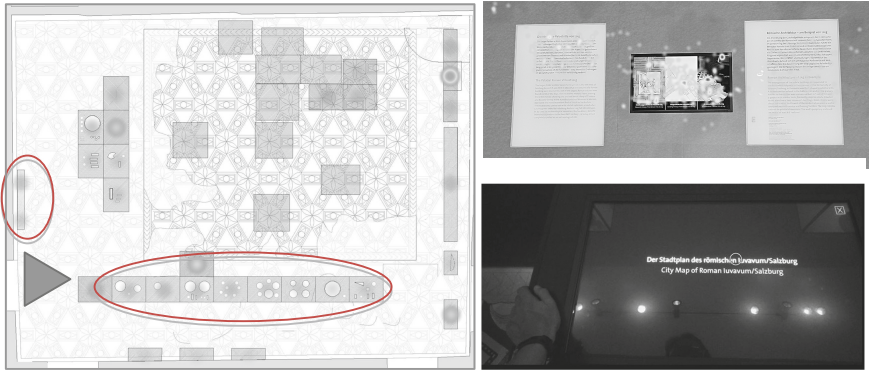


Fig. 4. Exhibition Room 2—Overview Labels and Digital Media

5 Conclusions and Implications

The learning experience in a museum is of central importance when planning and designing exhibition spaces (Hein 1998). Through a mobile eyetracking research design, this study offers a visitor perspective of the learning experience in a real-life museum context. The study's findings suggest that learning within museums is an interactive process, shaped by the personal and socio-cultural context of the visitors and particularly, the physical museum context. The mobile eyetracking study revealed fixation times and heatmaps of an exhibition area and demonstrated the positive and negative factors that arise in relation to time, objects and interactives, exhibition labels and digital media, and how these shape the physical context of an individual's learning experience. Fixation time can be associated with visual attention and cognitive processes, which can be an indicator for learning.

5.1 Theoretical and Methodological Implications

This study contributes to eyetracking research in that it shows the value of using mobile eyetracking when real-life insights need to be gathered to truly understand an experience from a visitor's perspective. Whilst visitor cognitive processing patterns usually remain elusive, mobile eyetracking can offer critical lessons on what artefacts are looked at or overlooked. Instead of simulating eyetracking in lab environments, mobile eyetracking allows exploring a natural context, while minimising the impact of the study situation through unobtrusive wearable glasses. It is hoped that this study encourages further fieldwork through mobile eyetracking in tourism, leisure and visitor attraction environments. Grounded in the theoretical framework of museum contextual learning and mobile eyetracking literature (Falk & Dierking, 2013; Hein, 1998), further research is encouraged to expand the application of mobile eyetracking research and tap into novel areas of scientific behavioural queries that take advantage of the mobility of technology and tracking of eye movements on the go.

5.2 Practical Implications

Museum design focuses on planning exhibitions in a way that invites visitors to stop, look, engage and spend time with exhibits (Falk & Dierking, 2013). A critical question for practitioners is how museum directors and designers can maximise and enhance the educational experience of their visitors (Hein, 1998). Our study holds critical implications for overall time and duration, sequence, flow as well as usability issues of artefacts, including their positioning, attention competition and cross-interference. The findings not only show that attention duration over time (and rooms) decreases, but that attention levels are negotiated between various physical objects and digital media representations, which frequently stand in competition rather than complementing each other. Mobile eyetracking can further offer an in-depth understanding for specific exhibitions as to which artefacts are processed, overlooked, or cause particular usability issues, allowing for a re-design of certain areas. Moreover, intuitive and natural sequences as well as walking paths of visitors were highlighted, that in some cases, may stand in contrast with the museum designer's intended learning paths. As a result, mobile eyetracking can offer a range of implications for museum experience design to revise existing exhibitions and facilitate well-designed, intuitive and effective learning experience for visitors.

5.3 Limitations and Further Research

Whilst the advantages of mobile eyetracking for learning experiences are apparent, we would like to elude some challenges and limitations that may be easily overlooked or underestimated. The sample size of 34 eyetracking participants may sound limited in scope, however resulted in a richness of collected data (25 h of eyetracking data with unique fixation times lasting split seconds), which requires intense manual analysis, as the technology does not yet allow the automatic mapping of data against the floor plans of a museum. Whilst eyetracking is still often confined to lab environments and indoor spaces, it is suggested that future research could explore museums and outdoor visitor attraction spaces for large impact studies on visitor behaviour, gaze patterns, cognitive processing and usability tests, as visitors move through physical spaces and interact with exhibits, such as outdoor historical sites, amusement parks or castles. Such research could have important implications and learning lessons for larger scale visitor attraction and experience design.

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Part X
Big Data

Deconstructing Visitor Experiences: Structure and Sentiment

Jason L. Stienmetz^(✉)

School of Hospitality and Tourism Management, University of Surrey,
Guildford, UK

j.stienmetz@surrey.ac.uk

Abstract. The relationship between the structure of tourists' sequence of activities within a destination trip and tourists' expressed sentiment of those activities is investigated within a moments-based paradigm of experience. A database of approximately 7 million Flickr photos is used to describe the structure of visitor movements within London (e.g. the length of stay of visitors, the volume of visitors to specific London touchpoints, and the sequence in which activity touchpoints are visited) as well as the perceived visitor experience (i.e., positive or negative sentiment) of individual London touchpoints. Results provide theoretical support for the moments-based experience paradigm, and suggest that trip characteristics and trip sequencing can influence value in terms of visitor satisfaction. Methods and findings also demonstrate big data applications that inform the optimal design and management of tourist experiences.

Keywords: Tourism experiences · Trip journey · Moments-based measurement · Big data · Tourism design

1 Introduction

In light of increasing destination competitiveness, the need to effectively manage and design optimal tourist experiences is more important than ever. Tourism research contends that travel experiences are structured, and that tourists perceive a beginning, middle, and end of their journeys (Lew & McKercher, 2006). Research also suggests that travellers summarise and organise their experiences into discrete “moments” which are the bases for an overall assessment of the value or satisfaction with the journey (Kahneman, 2000). What remains less understood, however, is the relationship between the structure of tourist experiences (i.e., their sequence within a journey) and their perceived value; and it is also unclear how the basic characteristics of tourist activities influence the connections between the moments experienced during a journey.

Using London, England as a case study, this research utilizes publicly available photo metadata from the social media service Flickr to demonstrate how big data can be used to analyse tourist experience as part of a destination information system. A database of approximately 7 million photos is used to describe the structure of visitor movements within London (e.g. the length of stay of visitors, the volume of visitors to

specific London locations, the sequence in which activities are combined during a visit) as well as the perceived visitor experience (i.e., positive or negative) of individual London activities. Importantly, the relationship between the structure of tourists' activities within a destination and tourists' perception/satisfaction with their destination experience(s) will be investigated to obtain insights that will inform the design of optimal tourist experiences.

2 Background

Experiences have long been understood as a core component of tourism (e.g., Cohen, 1979; Pearce, 2011; Ryan, 1997; Uriely, 2005) and much work has been undertaken to describe and understand tourist experiences (e.g., Ek, Larsen, Hornskov, & Mansfeldt, 2008; Volo, 2009). Through a rich history of academic study many different perspectives, definitions, and ways of examining experience have emerged through the contributions of numerous disciplines such as psychology, economics, marketing, geography, and anthropology (Kahneman, 2000; Pine & Gilmore, 1999; Prebensen, Woo, & Uysal, 2013a; Tuan, 1977; Turner & Bruner, 1986). Most recently, the moments-based perspective has emerged as a popular paradigm for which to understand experience. The moments-based perspective of experience posits that rather than continuously evaluating the unending stream of environmental stimuli (which the human mind is limited in doing), the human mind instead uses heuristics to create 'segments of time' which are used to represent entire scenes or episodes of an experience (Miron-Shatz, 2009; Zacks, Speer, Swallow, Braver, & Reynolds, 2007). These 'segments' or 'moments' become the remembered experiences that are then used to form overall evaluations and assessments of satisfaction and value (Kahneman, 2003, 2011).

Importantly, the overall evaluation of experience has been found to be based on a few key experiences (such as the beginning, peak, and end experiences) rather than a sum or average of all experiences (Ariely & Carmon, 2000). That is, research suggests that it is the overall linear trend of intensity of these experience "moments" that will be used to create an overall assessment of a tourist journey consisting of multiple experience episodes (Ariely & Zauberman, 2003; Loewenstein & Sicherman, 1991). Thus, while the human mind continuously senses the environment, experience "moments" are created which are perceived to have a beginning and an end (Zacks & Tversky, 2001) and these "moments" can be organized and sequenced (Blau, Petrusz, & Carello, 2013). These "moments," therefore, can serve as a basic unit for understanding and deconstructing the structure and outcomes of tourist experiences, and this paradigm may be particularly useful in understanding the nature of tourist journeys with the ultimate goal of improving the design and management of tourism experiences.

The moments-based approach to understanding experience is consistent with the customer journey paradigm found in the marketing and management literature which emphasises customer experience (Lemon & Verhoef, 2016; O'Neal, 2016; Schmitt, 2003). Within the services marketing literature, the customer journey is defined as the sequence of "touchpoint" interactions between consumer and producer, where touchpoints represent an episode of value co-creation (Prebensen, Vittersø, & Dahl, 2013b;

Stienmetz & Fesenmaier, 2013; Zach & Gretzel, 2011). Similarly, within the tourism literature, the tourism value chain has been defined as the series of activities undertaken before, during, and after travel (Brathwaite, 1992; Poon, 1993), and these tourist activities (such as information search and travel through a destination) have been found to have clear structure (Hwang, Xiang, Gretzel, & Fesenmaier, 2009; Lew & McKercher, 2006). Importantly, the structure of traveller activities and customer journeys has also been described using a network paradigm (Baggio & Scaglione, 2017; Gretzel, 2010; Stienmetz & Fesenmaier, 2013) where destination touchpoints are linked together through the sharing of visitors. Studies have demonstrated a relationship between the structure of destination activity networks and the economic value generated by visitors (Stienmetz & Fesenmaier, 2015, 2017). What remains unclear, however, is the relationship between the structure of visitor activities experienced during a tourist's journey and his/her assessment (i.e., satisfaction) of those experiences.

Previous research related to tourist experiences, mobility, and movement has relied primarily on survey-based data (e.g., Shih, 2006; Zach & Gretzel, 2011), specialised tracking equipment (e.g., Shoval & Isaacson, 2010; Shoval, Schvimer, & Tamir, 2017, 2018), and/or qualitative interviews (e.g., Hristov, 2015; Kimbu & Ngoasong, 2013). However, these techniques have inherent disadvantages such as recall and other forms of measurement bias, high costs in terms of both time and financial resources, and the challenge of defining destination boundaries. Travellers' near ubiquitous use of social media, however, provides new opportunities for analysing tourism-related phenomena as vast amounts of big data now describe travellers' journeys (Gonzalez, Lopez, & de la Rosa, 2003; Onder, Koerbitz, & Hubmann-Haidvogel, 2014). Much of these digital trace data are characterized as Volunteered Geographic Information (VGI) as they describe user location in both time and space, typically facilitated by GPS enabled mobile devices. Some popular sources of VGI include photo sharing services such as Instagram and Flickr. Indeed, VGI has been used by scholars to describe tourist behaviour such as their use of urban space and the flows or movement patterns of visitors within a destination (e.g., Kádár & Gede, 2013; Miah, Vu, Gammack, & McGrath, 2017; Stienmetz & Fesenmaier, 2017; Wood, Guerry, Silver, & Lacayo, 2013).

Not only can shared photos be used to determine the structure of visitor trips through the tracing of digital footprints (Stienmetz & Fesenmaier, 2016), they can also be used to measure visitors' assessments/perceptions of their experiences at specific touchpoints. In addition to VGI, many social media services allow users to share unstructured textual descriptions of their photos in the form of titles, "tags" or keywords used to describe the photos, and open ended written descriptions of the photos (Flickr, 2016). These textual data can then be examined using sentiment analysis tools to extract attitudes and opinions based on the linguistic characteristics of the words found in the unstructured texts (García, Gaines, & Linaza, 2012). Thus, sentiment analysis tools can be used to determine if a traveller's expressed attitude towards a particular place or activity is positive, negative, or neutral (Gkritzali, Gritzalis, & Stavrou; Magnini, Crotts, & Zehrer, 2011; Stepchenkova, Kirilenko, & Morrison, 2009).

Importantly, the continuing development of big data collection and analysis methodologies is creating new opportunities to investigate the relationship between the structure of tourism moments and tourists’ evaluations of those moments. Using London, England as a case study, the following research questions are investigated: (1) Can VGI and unstructured textual social media data be used to measure visitor experience and detect spatial and temporal variation in experience? (2) Based upon the moments-based paradigm, does the structure of visitor activities (choice and sequence of activities visited within the destination) influence the way a visitor experiences a destination activity?

3 Methods

The username, photo id, latitude, longitude, time taken, title, keyword tag(s), and description of each photo geocoded with a street-level accuracy (Flickr, 2016) and taken in the greater London area between 1 January, 2005, and 30 June, 2017, were downloaded using the Flickr API in July 2017. The resulting database included metadata for 6994,166 unique photos. Photos taken by London visitors were next identified following Girardin, Fiore, Ratti, and Blat (2008) by calculating the number of days between a user’s first photo and last photo taken during each year. If the number of days was 31 or less the user was considered a visitor. Table 1 reports the total number of photos, users, and visitors found in the London dataset. Consistent with other destinations, there are approximately twice as many visitors as residents in the London database, but residents have uploaded considerably more photos. Next, following Vrotsou, Andrienko, Andrienko, and Jankowski (2011) specific activities (i.e., touchpoints) visited in the greater London area were identified by aggregating all photos using a grid layout consisting of blocks approximately 2.5 acres in size. Through this process a total of 48,459 different photographed touchpoints were identified within the dataset, each representing a discrete destination experience. To reduce the data noise and identify only touchpoints of touristic significance, this study focuses on the 912 touchpoints which were visited by at least 100 different non-residents during the 12-year period of photo data. This operationalization of tourist touchpoints is slightly more conservative than the threshold of five non-resident visits per year recommended by Vrotsou et al. (2011).

Table 1. London area photos and visits based on Flickr VGI, 2005–2017

	User count	Photo count	Touchpoint visit count	Photos/user	Touchpoint visits/user	Photos/visit
Residents	34,206	5,153,815	1,116,917	150.7	32.7	4.6
Visitors	114,460	1,840,351	567,234	16.1	5.0	3.2

Following Stienmetz and Fesenmaier (2017), traveller activity networks for the London area were then created from the Flickr VGI data. The set of photos taken by each unique user was identified and sequenced according to time taken (as reflected in

the metadata of the photo). This generated a list of times and places that a single Flickr user was in the destination and that list was segmented into weekly blocks. Those blocks were then used to create an adjacency matrix representing each traveller's path/journey through the destination. Next, all user adjacency matrices for visitors and residents for each quarterly period were summed, which resulted in a weighted adjacency matrix where each cell value represented the weight of the tie (i.e. how many travellers took the path) connecting two touchpoints nodes. Each weighted adjacency matrix was then used as the input to perform traditional network analyses and generate quarterly network metrics. An overall network for all visitors and residents was also created by summing all the quarterly adjacency matrices (50) that were created. Table 2 reports the basic characteristics of both resident and visitor activity networks, with the resident network having a higher density of connections. While both networks have otherwise similar network metrics for average degree, average clustering coefficient, modularity, and number of subcommunities. A Quadratic Assignment Procedure (QAP) correlation test for comparing structural equivalency found only a weak ($r = 0.367, p < 0.001$) correlation between the visitor and resident networks, providing evidence that experiences/activities between these two groups are structurally different.

Table 2. Comparison of overall resident and visitor activity network structure

	Resident network	Visitor network
Density	0.145	0.119
Average degree	131.683	108.141
Average clustering coefficient	0.302	0.306
Modularity	0.454	0.402
Subcommunity detected	10	10
QAP correlation for structural equivalence	$r = 0.367, p < 0.001$	

Next, the SentiStrength program was used to classify the unstructured title, tag, and description text of each photo in the database. SentiStrength was developed using words found on the MySpace social network, making this program particularly suitable for rating the short and informal text associated with photos shared on social media (Thelwall, Buckley, Paltoglou, Cai, & Kappas, 2010). A separate score for positive and negative sentiment (1 = low, 5 = high) was derived for each title, set of tags, and description of the photos. A net sentiment score was also calculated as the difference between positive and negative sentiment scores. Overall sentiment scores for each photo were calculated as the average of the title, tag, and description sentiment scores. In total, 95% of all photos included a title, 79% included tags, and 45% included descriptions. Based on these available data, a net overall sentiment score was calculated for over 97% of all photos in the database. Table 3 reports the descriptive statistics for the positive and negative sentiment of the 912 London touchpoints evaluated, broken down by visitor and resident groups. Interestingly, both positive and negative sentiment was slightly stronger for residents than for visitors, but the net sentiment of visitors was slightly higher than that of residents.

Table 3. Sentiment scores descriptive statistics (n = 912 touchpoints)

	Averaged positive sentiment		Averaged negative sentiment		Averaged net sentiment	
	Mean	SD	Mean	SD	Mean	SD
Visitors	1.12	0.05	-1.07	0.06	0.05	0.08
Residents	1.16	0.08	-1.11	0.10	0.04	0.11

4 Results

To begin addressing this study’s research questions, the activity and sentiment data for each destination touchpoint (n = 912) were compared over the 50 quarterly time periods within the dataset. As depicted in Fig. 1, where black crosses represent positive net sentiment and white circles represent negative net sentiment, the sentiment experiences varied throughout the set of London area touchpoints. Overall, 19.9% of London touchpoints had a negative average net sentiment score for residents, compared to only 13.2% of touchpoints having a negative average net sentiment score for visitors. While sentiment scores for each touchpoint fluctuated over time, there were also consistent overall patterns detected in the data. For example, the Imperial War Museum had some of the strongest negative sentiment scores for both residents and visitors, with means scores of -1.84 and -1.85 respectively. Likewise, the St. Ethelburga Centre for Reconciliation and Peace had some of the strongest positive sentiment for both residents and visitors with mean scores of 1.68 and 1.47 respectively.

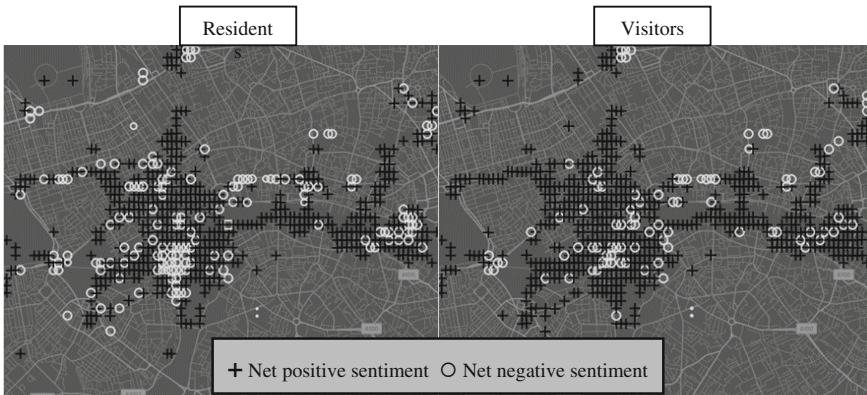


Fig. 1. Visualization of touchpoint experience sentiment in London area

To test the hypothesis that visitor experience is influenced by trip structure (i.e. sequence of touchpoints visited) a series of correlation analyses were conducted between the quarterly nodal degree centrality metrics of the London area touchpoints and the corresponding average overall net sentiment scores. Results are reported in Table 4 for both the resident and visitor group. With statistically significant correlation values ranging from $r = 0.017$ to $r = 0.026$ there is indication that the structure of trips has a miniscule positive effect on experience sentiment. Stronger effects are observed for the out-degree metric (the measure of the number of connections made to other touchpoints immediately *after* visiting the touchpoint of interest) compared to the in-degree metric (the measure of the number of connections made to other touchpoints immediately *before* visiting the touchpoint of interest) for both residents and visitors.

Table 4. Correlation between touchpoint net sentiment and network structure

	Frequency	In degree	Out degree
Residents (n = 42,089)	0.021**	0.025**	0.026**
Visitors (n = 40,520)	0.008	0.017**	0.018**

Note ** $p < 0.01$

This suggests that a touchpoint may be perceived more positively if it is visited earlier in the sequence of activities during a trip. The popularity of touchpoints (as measured by the frequency or volume with which they are visited) is also found to have a significant positive effect on sentiment for residents, but not for visitors, which suggests that touchpoint popularity is not useful for predicting visitors' experience sentiment.

A series of ANOVA analyses were then conducted to test the relationship between certain trip characteristics (day of the week of the experience and total number of days for the trip) and touchpoint experience sentiment. As shown in Table 5, significant differences were found in net sentiment scores according to the day of the week. Specifically, the lowest mean net sentiment scores are observed on Wednesdays, with a clear pattern of increasing sentiment scores beginning on Thursdays and peaking on Saturdays. The effect of trip length on experience sentiment was also examined and reported in Table 5. Results indicate that trip length does influence experience, with lowest sentiment occurring on one-day trips and the highest sentiment occurring on three-day trip and six-day trips. ANOVA was also used to test how experience sentiment varies according to the sequence in which touchpoints were visited. As seen in Table 5, results indicate that visit sequence has a statistically significant effect on touchpoint experience sentiment.

Table 5. Touchpoint net sentiment by day of week, trip length & visit sequence

		n	Mean	SD
	<i>Day of week</i>			
ANOVA F = 173.085 p < 0.001	Sunday	1,352,917	0.041	0.413
	Monday	710,170	0.043	0.401
	Tuesday	738,384	0.043	0.398
	Wednesday	714,834	0.035	0.416
	Thursday	775,273	0.043	0.416
	Friday	880,517	0.047	0.409
	Saturday	1,664,087	0.052	0.422
	Total	6,836,182	0.044	0.412
	<i>Trip length</i>			
ANOVA F = 5.842 p < 0.001	1 day	102,494	0.036	0.366
	2 days	12,617	0.042	0.260
	3 days	8335	0.055	0.259
	4 days	5307	0.053	0.245
	5 days	3346	0.051	0.246
	6 days	2304	0.055	0.250
	7 days	1913	0.046	0.246
	8–14 days	6738	0.043	0.257
	15–21 days	4104	0.045	0.268
	22–31 days	4476	0.042	0.267
	Total	102,494	0.036	0.366
	<i>Visit sequence</i>			
ANOVA F = 11.724 p < 0.001	1st	24,706	0.048	0.354
	2nd	7215	0.046	0.330
	3rd	5148	0.052	0.317
	4th	3661	0.055	0.308
	5th	2973	0.056	0.299
	6th	2232	0.065	0.316
	7th	1955	0.063	0.313
	8th	1613	0.061	0.295
	9th	1374	0.057	0.301
	10th or later	14,091	0.081	0.319
	Total	64,968	0.058	0.331

Results of the ANOVA analysis for visit sequence reveal an overall linear pattern of increasing sentiment as the visit sequence increases (see Fig. 2). However, it is also observed that sentiment dips slightly after the first activity and then climbs to a high point at the sixth activity. Sentiment then gradually decreases with each subsequent activity. Interestingly, the descriptions of activities occurring much later in the trip sequence are found to have the highest overall net sentiment.

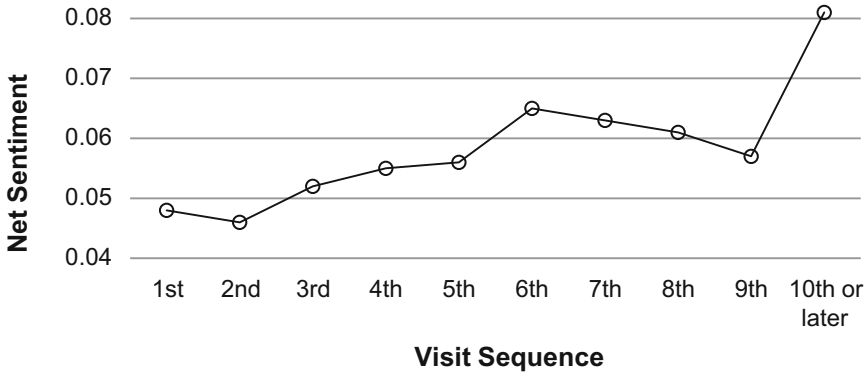


Fig. 2. Changes in touchpoint experience sentiment according to visit sequence

5 Discussion

This research has demonstrated that VGI and textual data obtained from photo sharing social media services can be effectively used to describe the structure and sentiment of visitor experiences within a destination. The network structure of traveller activities within the London area are found to be relatively stable over time, though the ways in which activities are connected and sequenced differ between residents and visitors, with residents generally making more connections between experience touchpoints. The photo data have also revealed that, as expected, there is significant variation in the sentiment of touchpoint experiences found within London.

In addition to affirming that visitors evaluate their experiences touchpoint by touchpoint (i.e., moment by moment), the results of this research also indicate that the patterns in visitor activity (i.e. the sequence of touchpoints visited) do have a statistically significant effect on how experience is assessed by visitors. While the observed effect sizes are often too small to be of practical significance, these results do provide theoretical support for the moments-based perspective of destination experience, and indicate that the experiences that comprise a tourism trip are not independent of one another. That is, the experiences of one touchpoint can and do influence the perceived value or satisfaction of subsequent experiences. In particular, based on the moments-based perspective of experience as discussed (Ariely & Zauberman, 2003; Kahneman, 2003), the overall positive linear relationship between sentiment and visit sequence observed in this study suggests that London visitors will be more likely to report positive satisfaction with their overall trip experience when they do more activities while they are in the London area. Furthermore, trip characteristics including the day of the week and trip length are also found to have significant influence on touchpoint experiences. For example, optimal trip lengths of three days and six days have been identified, and (unsurprisingly) weekends have been found to generate more positive sentiment than weekdays. The significant relationships found between network connectivity metrics and touchpoint experience sentiment further illustrate that each

individual touchpoint or activity within a destination must be considered in relation to all other touchpoints.

There are several managerial implications stemming from these results, all suggesting that destination experiences should be designed carefully. Destination management organizations must avoid treating individual attractions as independent agents, and should instead focus on designing patterns or sequences of activities that would maximize visitors' utility. Furthermore, individual attractions within a destination should consider where their visitors may be coming from and when, and how these factors will influence the perception and satisfaction of the co-created experience.

This research has also demonstrated the efficacy of using VGI and social media data in conjunction with destination information systems to monitor visitor flows and the perceived sentiment of experiences within a destination. A "smart" destination information system fuelled in part by VGI and social media data could track changes in visitor sentiment in near real-time and, therefore, manage visitor experiences by identifying trends and touchpoints with low sentiment scores that could be improved. These data could also be used as part of destination recommender systems to identify bundles or sequences of touchpoints with high probability of generating strong positive experiences.

Although these preliminary findings are promising, this research has admittedly been exploratory using London as a case study. While these initial results have significant implications, it is also clear that additional research is needed to further test these findings and also to refine the methodologies used in data collection and analysis. In particular, more work is needed to better understand the relationship between activity sequencing and the perceived value of an overall destination experience, and the degree to which the value of discrete experiences can be manipulated through strategic design and management.

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When “Last-Minute” Really Is “Last Minute”

Miriam Scaglione¹(✉), Colin Johnson², and Pascale Favre¹

¹ Institute of Tourism, University of Applied Sciences and Arts, Delémont,
Valais, Switzerland

miriam.scaglione@hevs.ch, pascal.favre@hes.ch

² San Francisco State University, San Francisco, CA, USA
cj7@sfsu.edu

Abstract. “Last-minute” deals in travel and tourism services are very appealing not only to travellers but also for service providers. Timing and pricing are central to an optimization strategy for last-minute deals for both sides. This study analyses last-minute timing behaviour for self-catering customers and proposes to the supplier an estimation of the *critical Last-Minute Momentum* (LMM) that is, the optimal moment for launching these kinds of deals. The data emanates from the largest booking of self-catering accommodation platform in the Romand Valais in Switzerland, containing more than 154,000 transactions. The results show that last minute behaviours depend not only on the origin country and season (as previously postulated) but also on the length of the stay, the composition of the party and the destination. For practitioners, the results shed some light on the timing optimization of last-minute campaigns. For scholars, the results demonstrate that last-minute behavior challenges traditional paradigms of the Planning Vacation Process (PVP).

Keywords: Last minute, big data, survival methods · Namely Kaplan-Meier survival function, logistic regression

1 Introduction

The perishable nature of travel and tourism services is one of the principal drivers for suppliers to offer last-minute deals. Broadly speaking, these deals offer lower prices than initially proposed, but for travellers there is a certain subjective dimension of perception of last-minute deals that will be discussed more fully later in this paper. For providers, as discounted prices should boost customer demand, the aim of last-minute promotions is to sell out the late-availability capacity which could remain otherwise unsold (Scaglione, Johnson, & Favre, 2017; Sirakaya & Woodside, 2005).

The present research focuses on the last-minute timing aspect in the case of self-catering accommodation in the region of the *Romand* Valais in Switzerland by exploiting a data base containing more than 154,000 transactions for 19 different destinations.

A previous study using the same data and methodology (Scaglione et al., 2017) analysed the median the booking and the actual travel date, also called the arrival date. It showed that the segmentation based solely on countries and seasons gives sound estimates. Using Kaplan-Meier (KM) survival modelling, BP yields the median estimation by looking to the corresponding life tables. Given the large amount of data, resampling techniques were used.

The present research focused on the timing aspect of last-minute promotions by seeking the optimal moment to launch such promotions. Intuitively, if a firm launches a last-minute promotion too early or too late it will lose revenues. In the former case, this could result in lower revenues from discounted prices, and, in the latter running a higher risk of not selling the rooms at all. The study aims to test the following preliminary and discretionary assumption: the optimal timing to launch last-minute deals will be at the moment when the 95% of the arrivals are on-hand-booked. Of course, the fact of 95% is an arbitrary threshold that could be changed to another value without harming the generality of the methodology. A previous research study (Scaglione et al., 2017) focused on the estimates of the median (50% percentile) of the BP sampling distribution yield by life table of the KM models, meaning the average number of days when half of the bookings-on-hand have already arrived. This research estimates instead, the 95% percentile of that distribution, namely the average number of days for which the arrival probability for a booking on-hand is 95%. The 95% estimates will be referred, from hereafter, as the *critical Last-Minute Momentum* (LMM).

The results, contrasting previous research, show that more variables characterizing the demand side need to be taken into account, besides country of origin and season, to establish sound LMM estimates. The probability of being last-minute for a transaction depends also on the party composition, the destination and the length of stay. This result was obtained using logistic regression.

The paper is organized in the following way: The literature review discusses last-minute booking from the point of view of supply and demand. The third section discusses the research question. The fourth section contains the description of the data and methodology and sampling methods used on big data. The fifth section analyses the results. The final section discusses the results in terms of scientific and management dimensions and implications for future research.

2 Literature Review

The extant literature on last minute booking has often been in relation to hotel accommodation (Chen & Schwartz, 2008, 2013; Chen, Schwartz, & Vargas, 2011) and related tourism sectors including airline reservations (Koenigsberg, Muller, & Vilcassim, 2008). Relatively little attention has been given to the self-catering accommodation sector in terms of last minute promotions.

2.1 Demand Side

Recently, last-minute promotions have grown exponentially due to advances and developments in Information Communication Technology (ICT). This has led to the

growth of an increasingly sophisticated consumer segment that, may be classified as *deal-seekers*. This segment is becoming increasingly knowledgeable to the point that they are challenging companies’ revenue management (RM) strategies (Chen & Schwartz, 2008). There is a perceived wisdom that business travellers are less price sensitive and tend to book nearer the travel date whereas leisure travellers are willing to book early if they believe that they are getting the best deal (Chen & Schwartz, 2008; Chen & Schwartz, 2008).

Deal seekers basically search and book online with low willingness to pay and invest high amount of efforts and time in comparing different brands. Their strategy is to book the travel product or service at the optimal time, when the price is lowest. The tension between the likelihood of having a better deal later and the risk of not being able to book because the accommodation is sold out characterizes deal seekers’ booking processes. Moreover, the strength of these two elements of expectation and risk change over time (Chen & Schwartz, 2013) and consumers show adaptive expectations, meaning that they not only rely on the recent revealed providers’ information but adjust new information to past experiences (Liu & van Ryzin, 2011). The perception of gaining last-minute deals by the customers and the willingness to pay may depend on subjective factors that could be “susceptible to outside manipulation” (Chen & Schwartz, 2013, p. 18). Asymmetric information situated between providers and customers is the best revenue management policy to offer last-minute deals for the firms (Koenigsberg et al., 2008).

The “culture” of deal-seekers not only challenges revenue management strategies as prices could be driven even lower, especially in low-demand periods (Webb, 2016), but also this segment is increasingly learning “to anticipate price changes, especially last minute deals, and modify their behaviour based on [...] expectations” of lower prices (Chen & Schwartz, 2013, p. 10). Some mathematical models from the operations management general literature (for example in fashion and products) tackle this learning and expectation formation aspects, but this is outside of the tourism sector, and so is beyond the scope of this literature review. For Liu and van Ryzin (2011), this customers’ learning and expectation formation process on the behaviour of the firm is carried out on the past behaviour of the firm.

Advance selling is the other side of the last-minute coin; it refers to the purchasing of the services in advance of the consumption period and the requirement is the uncertainty about the availability and future value of the product or services. For the buyer, besides the reduction level of uncertainty, he/she expects some benefit from this advance purchase (Berezina, Semrad, Stepchenkova, & Cobanoglu, 2016).

Last-minute behaviour seems to be poorly described by traditional PVP models (Dunne, Flanagan, & Buckley, 2011; Sirakaya & Woodside, 2005). As an example, the three-stages PVP models comprises need recognition, search for destination, and evaluation of destination-related choices (Moutinho, 1987). This does not explain certain kinds of vacation which are opportunist in nature, such as city break vacations that are similar to last-minute ones. In these cases, the characteristics of travel party, duration, distance and date flexibility could be more important than the destination

itself (Dunne et al., 2011; Sirakaya & Woodside, 2005). Nevertheless, late bookings should not be considered as purely impulse or emotional buying as much as early bookings also should not be considered as rational or prepared trips. They both are also influenced by practical and social constraints (Decrop & Snelders, 2004).

2.2 Supply Side

Revenue management is the application of information systems and pricing strategies to allocate the right capacity to the right customer at the right price at the right time (Kimes & Wirtz, 2003, p. 125). In airlines, last-minute deals aim to attract the more price-conscious of the tourism segment that did not purchase tickets within the regular period with deals that are often offered very close to the actual flight day (Koenigsberg et al., 2008).

Last-minute deals are part of revenue management strategies that use the lever of pricing discrimination. Technically speaking, price discrimination exists when “the same, or similar, goods or services are sold to different customers, or customer segments, at different prices”: these applications lead to the development of *fence rates* (Song, Noone, & Mattila, 2017, p. 1). The pricing discrimination could be based on a physical basis such as airline class of travel or a nonphysical basis such as the timing of reservation. Last-minute deals belong obviously to the latter case (Kimes & Wirtz, 2003; Song et al., 2017).

Specifically looking at the accommodation market, other strategies besides last-minute deals have been used based on the trade-off between prices and timing. Those techniques are flash sales (or daily deals), private sales or online coupons (Berezina et al., 2016). Timing is gaining more and more importance as online booking activities increase, as the Internet reduces the information gap between hotels and travellers allowing the travellers the opportunity to continue researching data up to the time when they perceive the best deal to be made (Chen & Schwartz, 2008; Song et al., 2017; Webb, 2016).

Cancellation policies play a role in the propensity to book. But if the cancellation policy is aggressively demanding high fees, not only does it not increase the propensity of booking but also encourages the customer to go on searching (Webb 2016). Nevertheless, in the case of last-minute booking, an aggressive policy of high fees prevents high-level costs especially when there is not enough time before the date of stay to sell the room to another customer (Chen et al., 2011).

As pointed out above, RM is the application of information systems and pricing strategies to allocate the right capacity to the right customer at the right price at the right time. This research will focus on the optimum moment to launch last-minutes deals in the case of self-catering accommodation for the C.I.T.I. platform providers.

3 Research Questions

The literature review shows, for the demand side, that last-minute behaviours are more sophisticated and in a continuous learning process, and are not simple emotional impulses. Last minute booking behaviours may also depend on other aspects such as

party composition, length of stay, or others besides just the season and origin country. Moreover, the destination could be fixed much later than described in traditional PVP models as it is a secondary aspect in the planning process.

Customers are participating in a learning process that smooth the tension between risk of scarcity—hotel sold out—and the expectation of a better deal. Customers have more and more sophisticated strategies, especially for the deal seekers segment. In this frame, for providers, a better understanding of demand in general and particularly on deals-seekers is central. One of the aspects is for the optimal moment to launch last-minute deals. The aim of this research sheds some light on the optimal moment to launch these last-minute deals by the estimation of *critical Last-Minute Momentum* (LMM). For any combination of origin country and season, LMM refers to the average number of days for which the arrival probability for a booking on-hand is 95%. LMM is relevant because it allows an accurate forecast of the possible surplus of capacity and so, therefore, the benefit of yielding it at lower price in the form of last-minute deals.

There are two research issues:

First research question: Which other variables are required, in addition to the country of origin and season, to fix the LMM; namely the optimal momentum to launch last-minute deals?

Second research question: Does the probability of last-minute behaviour depend—besides country of origin and season—on the length of stay, the party composition and the destination?

4 Data and Methodology

4.1 Data: The CITI Platform

The set of data for this research are the same as used in a previous study but updated to 7th Feb 2017 (Scaglione et al., 2017). C.I.T.I was founded in 2003 with the goal of bringing IT services to its members. C.I.T.I is comprised of 46 real estate agencies controlling more than 6000 chalets or apartments in 19 different destinations (for further information about the sources of data see Scaglione et al., 2017). The variables relevant to this study are season, number of people (namely party composition) country of origin, destination; “booking date” (*bd*), and “arrival date” (*ad*)—that is the actual travel date. BP was calculated as the difference of “arrival date” and the “booking date” measured in days. The raw data consists of 154,668 booking transactions *ad* from 1st Jan 2012 to 1st Aug 2018 and latest *bd* 7th Feb 2017.

There are costs associated with cancellation levied by C.I.T.I: Cancellation without fees can be achieved by notification more than 89 days before the *ad*. If cancellation is notified up to 29 days before *ad*, 50% payment of the rent rate is required. If

cancellation is made less than 29 days before the *ad* 100% of the rent is due (C.I.T.I., 2001). C.I.T.I. defines “last minute bookings” as those bookings in which the booking period is between 7 and 28 days. A cancellation could be made without charge 24–48 h before the date. In all cases of “free” cancellations, transaction fees will be levied.

The categorization of seasonal variables are: High Winter (HW): December, January and February; Low Winter (LW): November, March and April; High Summer (HS): June, July and August and finally Low Summer (LS): May, September and October.

4.2 Methodology for the First Research Question: Kaplan-Meier Estimator and Sampling Methods

Booking Period (BP) denotes a variable t_i , which is the indicator of the time lapse between the booking (*bd*) and the stay date (*ad*). BP is assumed to be the realization of a random process T , where T is the random variable measuring the arrival time or the booking horizon; the probability that a booking arrives on the *ad* time increases as time goes by. For the BP cumulative distribution function we mean: $B(t) = \Pr(T > t)$. In order to calculate this function a non-parametric estimator is used: The Kaplan-Meier (KM) estimator (Gémar, Moniche, & Morales, 2016). The description of this model is included in a previous study (Scaglione et al., 2017). The authors used SAS Institute 9.4 software (*proc surveysselect*) and programmed a customized routine in order to produce and analyse 10,000-simulations: A first routine draws a random sample on the original data set (154,668 booking transactions) having 300 transactions of each combination of the 8 origin countries and 4 seasons, that total $300 * 8 * 4 = 9600$ transactions. Therefore for each combination of country/season the number of transactions is 300. In order to avoid side effects the authors followed the advice of Boehmke, Morey, and Shannon (2006). A second subroutine performs the estimations of KM that are carried out using the SAS routine *proc lifetest*.

Figure 1 shows the survival plot for one of the 10,000 having 300 transactions for Belgium and HS segment. At the *ad* ($t = 0$) the probability of having arrived is 100%. For BP equal 2 (duration of days), the probability of having already arrived is at the most 95% at 2 days. Therefore, in this sample the LMM is two days. This process is repeated on the 10,000 sample for each of 32 origin/season segments in order to obtain the corresponding 10,000 LM estimators. These estimates are gathered in SAS SQL data base. Once this process is finished the median and 95% confidence interval for each of the 32 origin/season combination samples of LMM is calculated using the bootstrap process using SAS proprietary macro code (SAS Institute Inc., 2007).

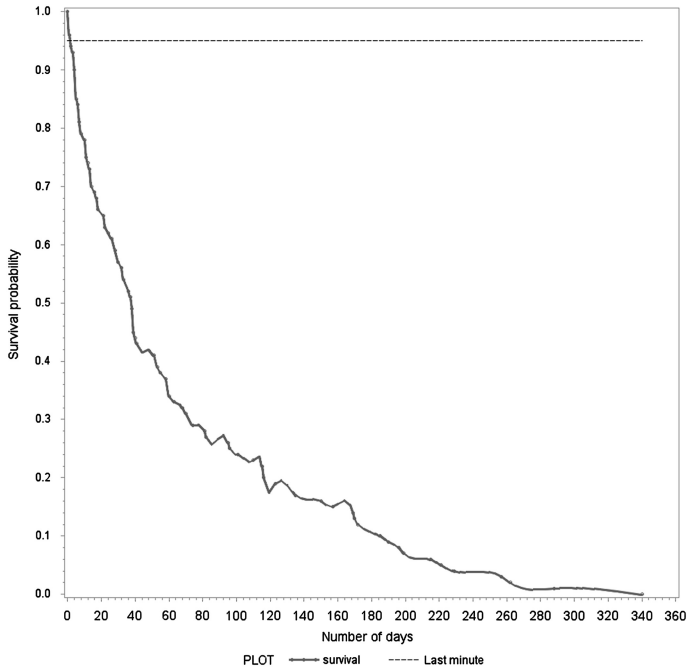


Fig. 1. Example of survival plot of BP. Probability to have already arrived (y-axis) at time t in days, BP (axis x). The dotted line indicates the probability 0.95 corresponding to 2 days on the axis- x

4.3 Methodology for the Second Research Question: Logistic Regression

A dummy variable is created on the raw data transactions file, having 1 if the transaction is “last minute” and 0 if otherwise. A customized routine was developed in SAS base language. It calculates the total number of transactions recorded at each arrival date (ad); then it calculates the cumulative number of transactions referring to ad at the date of each booking day (bd). If the percentage of booking over the total arrival is at least 0.95, then the transaction is coded as 1 as a “last-minute” booking.

The last-minute odds transactions versus not last-minute is estimated through multiple logistic regression using as prediction variables the numerical variable Length of Stay (LOS) and the categorical variables origin country (O), destinations (D) and Party Composition (PC). Let p be the probability for a transaction of being last-minute, the model adjusted is the following:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 * LOS + \beta_2 O + \beta_3 D + \beta_4 PC$$

The calculi are based on the link function Logit and carried out by SAS Institute V9.4 Proc Logistic routine, which fits linear logistic regression models for binary response data (Last-minute or not for a transaction) by the method of maximum likelihood (SAS Institute Inc., 2010, p. 3862 ss).

5 Results

5.1 First Research Question

Figure 2 shows that the histograms of the distributions of the LMM paired in 10,000 simulations per origin/season are either not normal (as they are asymmetric or bi-modal) or having a high level of variability that is surprising given the size of the samples (10,000). This result is unexpected on the basis of Central Limit Theorem (CLT); the explanation is that the samples do not fulfil the hypothesis of CLT, namely these LMM estimations do not come from the same population. The segmentation on origin/season fails to yield a reliable central estimation that also shows that a more precise categorization would be necessary. In other to gain some further information relevant for the sector, the authors calculated a 90% Confidence Interval (CI) for the median using bootstrap, a non-parametric method.

Table 1 shows, in the second column, those intervals representing the number of days [Low Limit, Upper Limit] = [LL.UL] for 32 country/season segments. In order to evaluate those estimates empirically, the authors calculate for each *ad* in the data base, the cumulative booking observed up to the date = *ad* minus LL, that is named the *cut date*. Then the ratio of this value over the total number of bookings at the *ad* was calculated. If the ratio was between 90 and 95%, the estimate for the pair *cut date* and *ad* counts as a success, A failure otherwise.

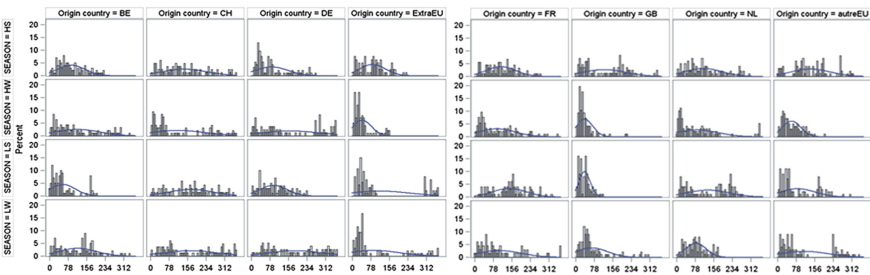


Fig. 2. Histograms of the LMM Paired in 10,000 simulations per origin country and seasonal panels, x-axis, number of days (*t*)

Description of an example: In the case of the first row, Table 1, Belgium HS, the LMM 90 CI is [7,17] and the arrival date 8 June 2012 (*ad*); the routine calculates the cumulated number of bookings received up to the arrival date of 8 June 2012 minus 7 days (LL), the cut *date* = 1 June 2012. If the percentage of cumulative bookings over the total number of observed bookings at *ad* (8 June 2012) is greater than 90% then it counts as a success, and as a failure otherwise. Finally, the number of success on the total number of trials was calculated yielding the value named in Table 1 as the confidence index.

Other empirical measures of accuracy may be found under the column “Observed shares”. The most relevant is the overall geometric average of the percentage of cumulative bookings, overnights, and arrivals after each *cut date* till the *ad*, namely the observed percentage of remaining bookings after the *cut date*. This value is expected to be less than 5%. Table 1 shows in bold the segments whose empirical accuracy measures are not satisfactory either because the confidence index is less than 80 or the percentage of remaining is more than 9%.

These results show that the segmentation based on origin/season fails to yield a LMM distribution with *suitable* statistical properties (such as symmetry, the existence of the first and second moments), allowing the calculation of a central value such as the median. The empirical analysis carried out on the basis on CI shows, for some cases, the workable lapse of time for launching last-minute deals that will be discussed in the conclusions section.

Table 1. Empirical accuracy measures from LMM based on 90% confidence intervals

Segment origin_season	Observed share				Observed share						
	LMM CI 90% (*)	Confidence Index	% of last minute bookings (%)	% of last minutes arrivals (guests) (%)	% of last minute bookings (%)	Confidence index	LMM CI 90% (*)	Segment origin_season	% of last minutes arrivals (guests) (%)	% of last minutes arrivals (guests) (%)	% of over nights (%)
BE_HS	[7,17]	78.83	4.22	3.87	4.22	78.83	[16,20]	FR_HS	3.07	12.88	10.30
BE_HW	[8,12]	76.72	2.80	2.68	2.80	76.72	[5,14]	FR_HW	2.98	1.06	0.90
BE_LS	[2,4]	99.62	0.10	0.11	0.10	99.62	[20,28]	FR_LS	0.02	31.65	25.81
BE_LW	[7,15]	80.45	2.11	1.98	2.11	80.45	[4,14]	FR_LW	1.84	1.04	0.46
CH_HS	[10,22]	31.71	9.37	8.37	9.37	31.71	[6,15]	GB_HS	10.28	4.44	1.69
CH_HW	[5,10]	71.77	1.39	1.21	1.39	71.77	[5,10]	GB_HW	2.70	1.19	1.02
CH_LS	[9,33]	36.53	10.87	9.63	10.87	36.53	[7,10]	GB_LS	11.11	5.59	2.41
CH_LW	[5,28]	71.26	3.78	3.20	3.78	71.26	[4,12]	GB_LW	7.20	1.17	0.41
DE_HS	[12,17]	57.63	9.23	8.05	9.23	57.63	[7,16]	NL_HS	6.47	4.52	4.20
DE_HW	[4,13]	89.74	0.78	0.60	0.78	89.74	[3,7]	NL_HW	0.67	0.26	0.26
DE_LS	[5,13]	86.43	4.37	3.78	4.37	86.43	[9,15]	NL_LS	3.06	7.89	4.16
DE_LW	[9,42]	74.61	2.80	2.20	2.80	74.61	[10,22]	NL_LW	3.13	5.03	4.06
ExtraEU_HS	[6,11]	85.44	5.22	5.00	5.22	85.44	[5,11]	otherEU_HS	3.37	5.49	3.45
ExtraEU_HW	[4,9]	94.1	1.16	1.25	1.16	94.1	[5,14]	otherEU_HW	0.74	1.65	0.92
ExtraEU_LS	[9,13]	78.15	11.15	9.91	11.15	78.15	[7,10]	otherEU_LS	7.28	10.68	7.75
ExtraEU_LW	[4,8]	93.97	1.56	1.74	1.56	93.97	[5,10]	otherEU_LW	0.75	2.31	1.37

In bold, origin/season segment showing poor performance

5.2 Second Research Question

Four logistic analyses were carried out, one for each season. The contrast categories against which odds are calculated are: for party “alone/couple”; origin “Switzerland” and; destination “Nendaz”. Due to space limitations, the results could not be reported but the SAS Institute outputs and graphs may be found in the online annex (<https://www.tourobs.ch/5700.aspx>). In total 131,685 transactions were used for the estimations across the four models: LS: 9847 transactions/28.2%, last minute; LW: 31,664 transactions/11.4% last minute; HW: 66,471 transactions/8.9% last minute; HS: 23,803 transactions/15.8% last minute. All 4 algorithms strongly converge and all the fit statistics AIC, SC and -2Log L show that the explanatory variables are relevant in the models. These results are confirmed by the global tests of adjustment (Wald, Score and Likelihood Ratio) and reject, in the 4 models, at a very significant level the null hypothesis that all the coefficient $\beta_1, \beta_2, \beta_3, \beta_4$ will simultaneously be null.

All explanatory variables are very significant in every model except for the party composition in LS where the p -value is 0.02, on the basis of Wald chi-square statistic.

The Wald chi-square statistic for testing if each coefficient of variables is equal to zero is rejected for all of them in the 4 models and in a very significant level except, as already stated, for the party composition.

LOS is very significant with a negative and quite robust estimate across the seasons; its range in exponential transformed is from 0.79 to 0.90, so the longer the LOS the lower are the odds for a transaction to be last-minute.

This is also the case for the party composition “more than 8 persons”: The coefficient is negative in all cases and very significant. In the case of both winter seasons (LW. HW), the odds for a transaction being last-minute is around half than that for “alone/couple”. In the summer seasons, the odds are greater around 8/100 in comparison to “alone/couple”. For the party “3–7 persons/family” there are significant differences in comparison to “alone/couple” party in HW. For all the other seasons, the coefficients are positive but they are at slightly significant levels with exponential values close to 1: The range is 1.06–1.086. Therefore, the larger the number of persons in the party, the lower is the odds of being last-minute, even if, for some “alone/couple” and “family 3–7” there are no significant differences in some seasons (cf online results report <https://www.tourobs.ch/5700.aspx>).

Table 2. Exponential transformed coefficients for the models (in column) and countries against Switzerland (CH) origin country

	LS	LW	HW	HS
BE	0.65***	0.79***		0.85***
DE	0.78***	0.75***	0.89***	0.89***
FR	1.95***			1.18***
GB	2.17***	1.98***	1.62***	2.5***
NL	1.48***			1.16**

** p -value < 5%

*** p -value < 1%, in grey cells with significant differences to CH

The odds for Belgium and German transactions of being last minute are lower than for Switzerland; the opposite happens for France, Great Britain and the Netherlands. Great Britain shows the most last-minute propensity behaviour in comparison with Swiss residents. For the summer season, the odds are more than twice Switzerland followed by LW, that is almost twice (1.98) and HW (1.62). France shows also a higher propensity than Swiss residents but only for the summer season especially in LS (1.9). Similar patterns exist for the Netherlands but with lower odds than for that of France. Due to space limitations, it is not possible to have a more exhaustive discussion about destinations but output and estimation graphs are available online: <https://www.tourob.ch/5700.aspx>.

6 Conclusions

6.1 Scientific Conclusions

The segmentation based on origin/season that yielded satisfactory estimations of the median time of booking period (Scaglione et al., 2017) fails in the case of 95% percentile estimation, the LMM in this research project. The results of the second research question show that it is the LOS and the party composition, not just the country of origin and season (Dunne et al., 2011; Sirakaya & Woodside, 2005) that are necessary for the description of last-minute behaviour. The analysis of behaviour based on this set of self-catering data confirms the findings discussed in the literature review that was often more generally oriented towards the hotel sector.

6.2 Managerial Conclusions

This research project fails to give a LMM on the basis of solely origin/season segmentation, but Table 1 indicated some confidence intervals where the level of confidence could offer some insights on the LMM. This is the “empty” part of the half empty bottle. This could result in a more targeted marketing campaign, for example in the case of reservations from Britain, the estimate of LMM’s CIs show acceptable confidence index, suggesting 7 days before the *ad* as an appropriate moment to launch last-minute deals. This is particularly appealing given their propensity to book using these kind of deals is twice than that of Swiss residents (cf. Table 2). Swiss and French residents show similar behaviours in both summer seasons. The level of confidence for LMM is low in both cases (Table 1) and their propensity for last minute deals are similar (Table 2). One possible explanation could be that, some other aspects such as the weather could be taken into account for these countries in the summer.

The “full” part of the glass half empty is that the second research question shows the relevance of other factors such as LOS, size of party, destination, etc. It is suggested that a more finely tuned segmentation strategy is needed centred on destination and size of the party i.e. family oriented or couple oriented and season. This strategy would result in a more accurate targeting of the last-minute deals segment being accomplished. It is intended for this to be a part of the future research agenda.

The C.I.T.I cancellation policy appears extremely strict and somewhat uncompromising. That may have an undue effect on competitiveness, especially given the rise in the sharing economy with companies such as Airbnb and couch surfing, that have more liberal cancellation policies.

6.3 Limitations and Future Research

In future studies, the KM model will adjust for season/origin and destination analysis clusters. LMM distributions obtained using these clusters are expected to verify CLT and yield more reliable central estimation for LMM. Some limitations are the following: In the logistic analysis, only the destination having more than 20% of the total booking were taken into account in order to prevent imbalance sample effect. Therefore, for some destinations no information is available. Some observations have missing values in some relevant variables that reduced the number of observations under analysis. Furthermore, the cancellation transactions are not recorded on the database. This prevents an analysis of the cancellation behaviour that could give some interesting insights on RM optimization.

This research only tests the limit fixed on the share of 95% of the arrivals as on-hand-booked as the LMM. Other share values should be tested in order to find more workable timing for the provider. It is most likely that a workable limit depends also on origin, season, and destination.

Annex

Online results of logistic models with destination details and estimation graphs are available in <https://www.tourobs.ch/5700.aspx>.

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Using Transactional Data to Determine the Usual Environment of Cardholders

Juan Murillo Arias, Juan de Dios Romero Palop^(✉),
Diego J. Bodas Sagi, and Heribert Valero Lapaz

BBVA Data & Analytics, Madrid, Spain
{juan.murillo.arias, juandedios.romero,
diegojose.bodas, heribert.valero}@bbvadata.com

Abstract. Digital data sources can be useful in measuring the evolution of tourism. In particular, card transactions are a good way of analysing domestic tourism. To do so, firstly, transactions have to be classified as touristic or non-touristic. This paper presents a methodology to identify the usual environment of cardholders, so as to determine whether their transactions are carried out inside or outside that area. The United Nations World Tourism Organization definition of ‘usual environment’ is used as a basis to create the methodology. The resulting procedure can be adapted to different geographies by varying a single parameter. Some tests validating the methodology are shown at the end of this paper.

Keywords: Usual environment · Big data · Domestic tourism
Digital footprint · Payments · Data science

1 Introduction

Since the beginning of the 1960s, coinciding with the international opening of its economy, the touristic industry in Spain has increased in importance on a yearly rate. Given its contribution to the economy, it is critical to gather and analyse relevant and accurate data in order to understand the evolution of this sector, and make informed decisions.

There are currently numerous studies focusing on the monitoring of international tourism (Kozak & Rimmington, 2000) using surveys carried out at the points of entry to a given country and then complementing these with data provided by touristic agents such as hotels, travel agencies or airlines. However, measuring the evolution of domestic tourism presents additional difficulties, as it is not feasible to gather information via surveys from every single touristic agent.

Using the digital footprints left behind by the use of bank cards is an innovative approach to better understand tourism. It has already been used to track the activity of foreign visitors (Sobolevsky et al., 2015). Applying the methodology of analysing the activity of cardholders’ spending throughout the country could be helpful to measure flows of domestic tourism. More specifically, this research shows how the data generated by tourists’ card payments can be helpful to define areas and activities of interests of national visitors, and their origins. However, as stated in Eurostat (2014),

the main challenge faced when using this new kind of sources is to differentiate between touristic and non-touristic trips. One option is to use the address declared by each cardholder when opening their bank account, and to only consider those transactions as touristic that are carried out in locations different from the given place of residence. Nonetheless, this alternative has some problems: Firstly, that information can at times be outdated, because customers do not need to notify their bank when changing address. Furthermore, and even more importantly, only by knowing a cardholder's place of residence is not enough to determine which transactions are touristic. Nowadays it is very common for people to live in a locality far from the place where they work or study, and also far from the area where they tend to spend most money; as such that kind of consumption is not related to touristic activities.

Mobile phones trajectories have already been used to confirm that humans follow identifiable patterns in their lives (González, Hidalgo, & Barabási, 2008). Taking this into account, this paper focuses on defining and implementing a general methodology to identify the principal areas where cardholders do most of their daily spending. The methodology is based on the definition of usual environment proposed by United Nations World Tourism Organization (UNWTO): "The usual environment of an individual, a key concept in tourism, is defined as the geographical area (though not necessarily a contiguous one) within which an individual conducts his/her regular life routines" (UNWTO, 2010). In particular, this methodology will be applied to Banco Bilbao Vizcaya Argentaria (BBVA) cardholders as a case study.

2 Data Source: Representativeness, Size and Privacy Concerns

BBVA is one of the largest banks in Spain, it has over 4.8 million active cardholders, which—in a country with 46 million inhabitants—is a representative sample to measure the country's domestic touristic patterns.

BBVA customers make more than 2000 million payments or cash withdrawals per year inside the country, this vast quantity of information has been used to develop and validate the proposed methodology. Nevertheless the chains of transactions per customer have heterogeneous lengths, as their individual rate of activity is quite variable.

The methodology assigns to each of the active cardholders a list of localities where they made a payment in a given period of time. This is a challenging issue from an infrastructural and data processing point of view, since its implementation has to manage the entire set of BBVA cardholders, including a large variety of profiles, from those using their cards every day to others that only use their cards once in a while.

Focusing only on the cardholders with lots of transactions would mean losing part of the extra value provided by transactional data; therefore, one of the challenges is to develop a methodology that works for every profile in the dataset. Another challenge is to make the methodology as non-dependent from the characteristics of the geography where it is applied as possible. Regarding the case study, Spain, approximately, has an area of 506,000 km² and is divided into 8191 localities. The average locality size is 62 km². However, there is a great variance in the distribution and size of the localities

within the country. For instance, while the locality of Caceres is the biggest with more than 1700 km², there are 80 localities smaller than 2 km².

Each time cardholders pay at a store, a record of the transaction is sent to their bank. These data are a powerful tool to describe routines as each transaction is characterized by, *inter alia*, the place, the time and the economic category (e.g. fashion, bars & restaurants, and leisure) of the merchant where they take place (taking into account the information provided by the merchants during the Point of Sale sign-up process). These features make inferring the usual environment of the cardholders possible, and allow eventually to label every transaction as touristic or non-touristic.

For the purpose of this research, the data used were anonymized, so no specific individual can be directly identified by name or card ID. Necessary fields describing socio-economic parameters of the customer, the location where a transaction is made or the kind of service that was paid, remained as part of the information needed for the research project.

The implementation of the process uses all the transactions carried out during a 12-month window in order to include seasonal behaviours. The reason behind this decision—instead of using the entire set of transactions in every execution—is to identify cardholders' routine changes in order to have updated information when labelling transactions as touristic or non-touristic.

The methodology has been implemented in R programming language, and, due to the large amount of transactions involved in each execution, the usage of parallelization and optimization libraries is necessary (R Development Core Team, 2008).

3 A Methodology to Determine the Usual Environment of Cardholders

This methodology is divided into four stages: (1) measuring locality importance, (2) geospatial clustering, (3) cluster selection, and (4) defining the usual environment area.

3.1 Measuring Locality Importance

As stated before, routine is the key concept of the UNWTO usual environment definition. Therefore, the first step of the algorithm is to find which localities receive most of the cardholders' regular expenses.

One question that arises is which transactions should be used to identify routines. To answer it, two aspects have been considered: (a) the type of merchant and (b) the timestamp of the transactions. Firstly, transactions belonging to touristic or non-regular expenses categories, such as hotel reservations or real estate, have been removed since they are not part of routines. Instead, cash withdrawals are included as an accurate indicator of daily habits. Done that, the remaining transactions are divided in two groups according to the type of date they were conducted: transactions carried out at weekends, national holidays and the entire month of August (summer holiday month in Spain) belong to one group (labelled as holiday transactions) and those carried out on weekdays to the other (labelled working transactions). This distinction seeks to assign

more importance to those transactions made in working days when determining which localities are involved in the cardholders' routine. For each pair cardholder-locality, a numerical index is assigned using the following formula:

$$index_{cl} = \alpha * holiday\ transactions_{cl} + working\ transactions_{cl} \quad (1)$$

where c identifies the cardholder, l the locality and α determines the importance given to each group. In the BBVA case study, *working transactions* are considered twice as valuable as *holiday transactions* in order to delineate the usual environment; therefore α is set to 0.5. A deeper analysis of the sensitivity of this parameter remains a future objective.

3.2 Geospatial Clustering

The previous *index* could be used to rank the localities where cardholders make their expenses and select those with higher values, but the UNWTO definition of usual environment refers to a not necessarily contiguous area. For this reason, the next step of the algorithm groups, for each cardholder, the localities where they conducted at least one transaction using a geographical criterion.

The Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm has been selected to carry out this process (Ester, Kriegel, Sander, & Xu, 1996). The R implementation of this algorithm has been used (Hahsler & Piekenbrock, 2017). The main idea behind this algorithm is to find the core localities, those surrounded by many localities forming a dense area, and use a loop to build the clusters around them. In each step, those localities reachable from the current members of the cluster are added to it.

Apart from its general approach, two characteristics of the DBSCAN algorithm were key to select it above other alternatives (Xu & Wunsch, 2005): Generation of irregular clusters, and no need for number of clusters specification. Due to the heterogeneous distribution of localities along the country and to the irregular shape of the coast areas, it is important to be able to get clusters with irregular shapes. Adding to the cluster any locality reachable from a current member of the cluster ensures its expansion in any direction. Thereby, the definition of reachable is one of the parameters of the algorithm; ϵ is the maximum distance that the algorithm uses when looking for new members of the clusters.

Values of ϵ from 20 to 60 km, 5 by 5, were tested before selecting 40 km as the optimum value for this parameter in this case study. The final decision is based on the shape of the clusters obtained and on the distribution of the number of localities included in the usual environment of the clients. For example, when a 60 km parameter was used, the clusters become so big that when developing the domestic tourism analysis almost no transactions were considered touristic. On the other hand, when the parameter was set to less than 40 km the resulting clusters were so small that localities settle on the periphery of big cities were not considered part of the same cluster. That was one of the things to avoid in order not to label their transactions in those localities

as touristic. It must be emphasized that the value assigned to the ε parameter depends on the characteristics of the geography being analysed. This parameter may have a greater value when applying the algorithm to bigger and more sparsely populated countries and vice versa.

Apart from the irregular shape of the areas, as said above, developing an algorithm that works for most cardholders regardless of their behaviour is a challenge. For this reason it is crucial to find a clustering algorithm that does not ask for specifying the number of clusters. DBSCAN meets this requirement; it only needs to know how many points are needed to form a cluster. In this case, this value is set to 1 since an isolated locality could be the usual environment of a cardholder and fixing this parameter to a higher value could make the algorithm to discard isolated localities.

3.3 Cluster Selection

For each cardholder, the result of applying DBSCAN is a list of clusters and the localities belonging to each. The next step is to decide which clusters conform the usual environment of each cardholder. This decision is based on the value of the indexes calculated before, that are a function of the number of payments accumulated by each cluster. As a measure of their importance in the cardholders' usual behaviour, every cluster gets an index calculated as the sum of the indexes of its localities. Thus, the cluster with the highest index will represent the area where the cardholders mainly conduct their routines.

However, the UNWTO definition specifies that separated areas could be part of someone's usual environment. For that reason, the algorithm not only selects the cluster with the highest index value but also accepts those clusters with a high relative importance in the cardholder routine. After carrying out an analysis of the distribution of the percentages of transactions in every cluster, the following formula was created to determine where the limit should be set between those clusters belonging to the usual environment, and those that are not part of it, because of the sudden decrease of the activity registered:

$$\frac{2}{3}max_pct < cluster_pct_i \quad (2)$$

where max_pct is the percentage represented by the cluster with the highest index value and $cluster_pct_i$ is the percentage represented by cluster i .

As there are lots of different cases, the formula is based on the percentages represented by each cluster and uses the highest percentage as reference. According to this mathematical expression, every cluster i representing at least two thirds of the percentage means the highest ranked cluster has been selected to be part of the usual environment.

For example, if the highest ranked cluster represents 60% of the cardholders' usual behaviour only another cluster with the remaining 40% could be included. However, if the highest cluster represents 40%, then every cluster representing at least 26% of the behaviour has been included in the cardholders' usual environment.

3.4 Usual Environment Area

At this point, a list of localities is associated to each cardholder. But, as said before, the main objective pursued is to determine which transactions are touristic (made outside the usual environment). For that reason, the algorithm has to consider that cardholders may not have carried out a transaction in every locality of their usual environment. However, that doesn't mean that they couldn't move in every direction the same distance to make a regular expense and, therefore, those transactions should not be considered touristic. One more step has been included in the algorithm to ensure that transactions carried out in the area of influence of the localities in the current list are not considered touristic.

To do so, the centroid of each cluster selected in the last step is calculated. These points are set as the centres of circular areas that conform the usual environment of each cardholder. The maximum distance between this centroid and the localities included in the cluster is called d . As it was concluded that 40 km is the optimum value for ϵ , the DBSCAN distance parameter, if d is less than 40 then the radius r used to create the circular area is set to 40 km. If d is greater than 40 then r is set to $d + 5$ km. Figure 1 shows an example of each of these cases. Thus, a heuristic margin error is added to avoid considering routine transactions as touristic. Every locality whose centroid is located within the circular area is considered part of the cardholder's usual environment, even if no transactions were registered there.

This last step could be omitted for cardholders performing lots of transactions since their digital footprint would be big enough to be sure that every locality out of the former cluster is not part of their routine. But, in order to adapt the algorithm to all the cardholders and to be sure that non-touristic transactions are well identified this final step has been included.

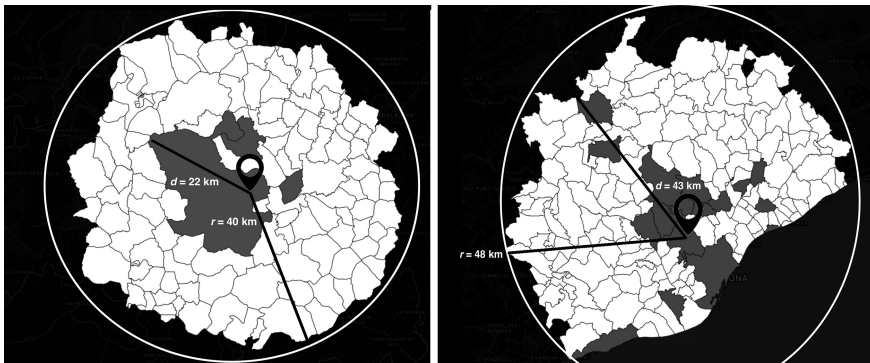


Fig. 1. Examples of usual environment areas: **a** $d < 40$ km; **b** $d > 40$ km

4 Results

To validate the methodology results, the following procedure has been applied: firstly, a comparison with the cardholders' declared address is made. Although many of these addresses are out-of-date, the percentage of usual environments that include the declared address of the cardholder gives an estimation of the performance of the algorithm. Thus, 92% of the more than 4.8 millions cardholders whose usual environment has been calculated for 2016 have their declared locality included in the resulting list of localities.

Besides, looking at the cardholders with a change of address is also good way to see how the algorithm works. In fact, those whose movement implies a change of province are the most reliable since it is unlikely to have the new locality in the usual environment of previous years. From those who declared a change of address during 2016, nearly 40,000, 94% of them had the new locality included in their usual environment.

Another analysis that helps to validate the methodology is to calculate the percentage of transactions used as input that is included in the resulting usual environments. This value shows the percentage of the transactions that is considered part of the cardholder's routine. In this case study, the percentage has been obtained for each cardholder and the mean value is 93% with the median at 97%. These values show that the methodology is identifying most of the transactions as regular ones.

4.1 Distribution of the Number of Localities in the Usual Environment

Apart from these values, a study of the distribution of the number of localities included in the cardholders' usual environment has been carried out (Figs. 2 and 3). Due to the heterogeneous density of localities within the country, together with the distribution of the population along them, a non-uniform distribution of the transaction frequencies was expected. Still, some peaks coming from the great amount of people living in the big cities is expected to appear. In addition, a comparison between the data from 2015 and 2016 can help to check the consistency of the algorithm.

The figures show that the great majority of cardholders have between 20 and 150 localities as their usual environment. Both graphs present a valley around the value 100, a peak at value 20 and another one at value 110. Those peaks are so remarkable that it's worth looking for their causes. The peak at value 20 corresponds to those living in the Canary Islands. The Canary Islands form an archipelago composed of 7 islands and the biggest are separated more than 40 km. Hence, when applying the last step of the algorithm to the cardholders who live on one of those islands, only the localities of the island are included in the circle. It is a coincidence that these islands contain 20 localities each and, therefore, lots of cardholders have a usual environment comprising 20 localities.

Something similar happens with the other peak: those cardholders that have only carried out transactions in the city of Madrid share the same usual environment. It includes all the localities covered by the circular area of 40 km radius and the centre in the middle of Madrid.

The most important difference between both figures is the level of the peak at value 144. While in 2016 it reaches a height similar to the Canary Islands, in 2015 it stays much lower. Once again this peak corresponds to the cardholders that have only carried out transactions in the city of Barcelona during the 12-month window. The reason for such a difference in the number of cardholders is the acquisition of Catalunya Caixa by BBVA in September 2016 (European Commission, 2014). From that moment, all the Catalunya Caixa cardholders were included in BBVA datasets. Thus, the amount of cardholders located in Catalonia processed by the usual environment procedure in 2016 was much greater than previous years.

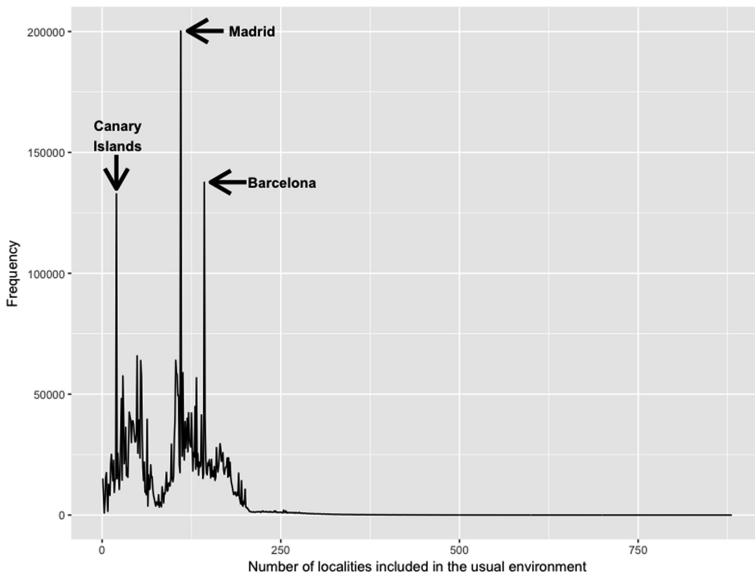


Fig. 2. Distribution of the number of localities included in the cardholders’ usual environment. Year 2016

4.2 Number of Cardholders Belonging to Each Locality

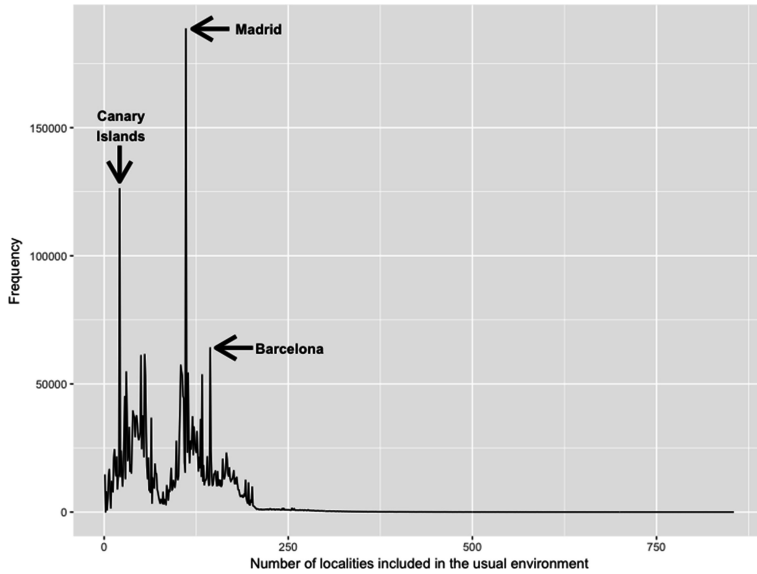


Fig. 3. Distribution of the number of localities included in the cardholders' usual environment. Year 2015

In addition to the previous results, for each locality the number of cardholders whose usual environment includes the locality has been obtained. Although BBVA's market share differs in each region, the most populated cities of the country should be included in the usual environment of a number of cardholders proportional to their population.

Figure 4 visualizes that: The greater the number of cardholders whose usual environment includes the locality the darker is the colour assigned to it.

Although the darkest areas are those around Madrid and Barcelona, the rest of the country's big cities can also be identified in the map: Valencia and Alicante in the Mediterranean Coast; Malaga, Seville and Cordoba in Andalusia; and Bilbao and Zaragoza in the north. The big area in white between Madrid and Barcelona and the union of the coastal provinces of Galicia is also remarkable.

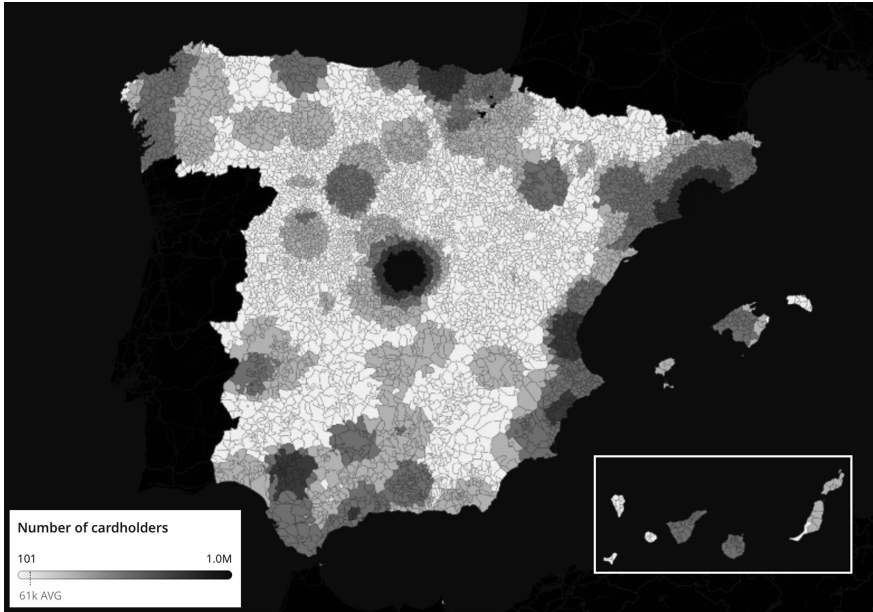


Fig. 4. Number of cardholders whose usual environment includes the locality. Year 2016

A comparison between the areas of influence of the two biggest cities of the country has been carried out. Figures 5 and 6 show the number of cardholders whose usual environment includes the locality in addition to Madrid and Barcelona respectively.

In both cases, the maps show the great influence that these cities have in the immediate surroundings. Barcelona's area of influence mainly spreads throughout Catalonia and even includes part of Aragon while the city of Madrid has a powerful influence not only in the entire province of Madrid but also in the adjacent provinces (Toledo, Guadalajara, Avila, Segovia and Cuenca).

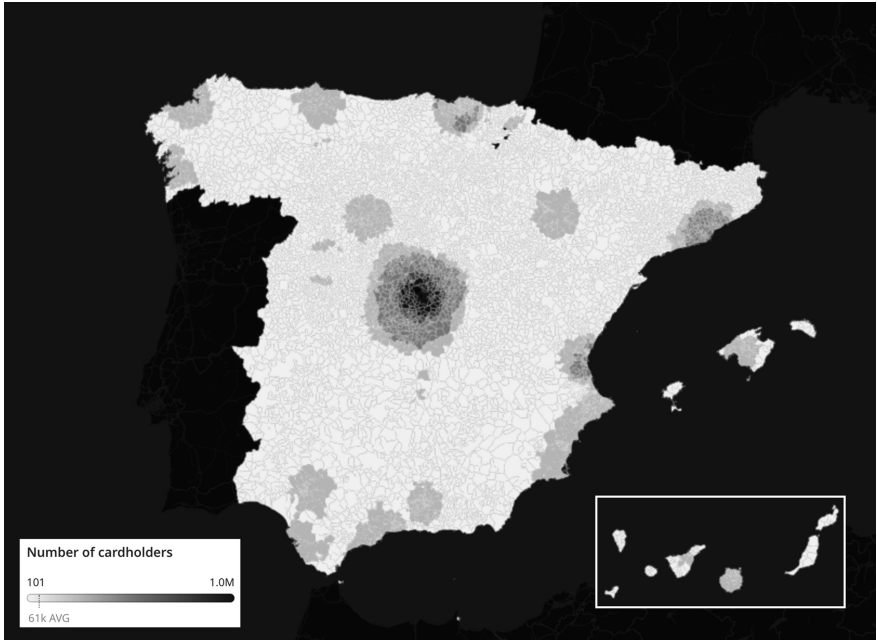


Fig. 5. Number of cardholders whose usual environment includes Madrid and the locality. Year 2016

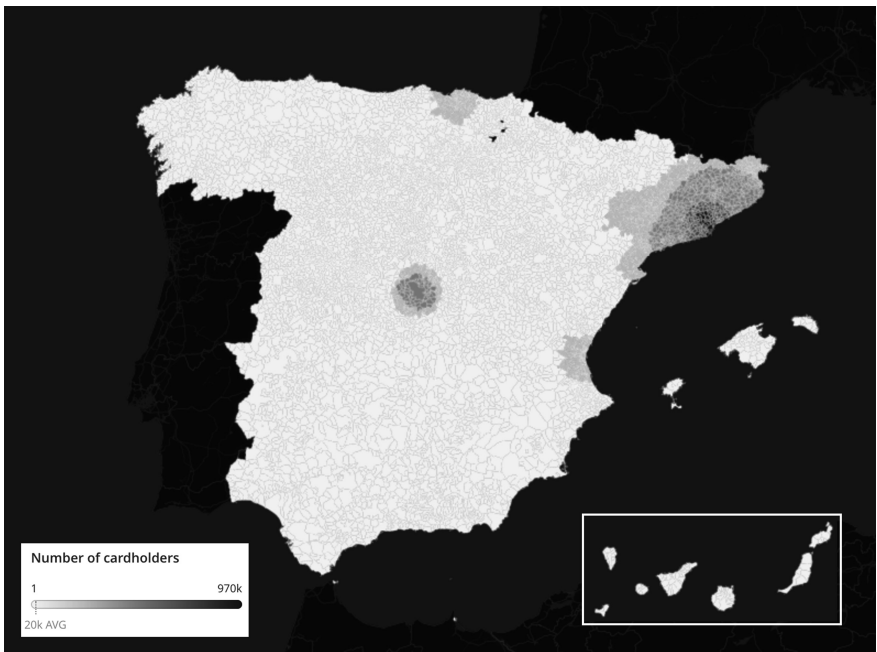


Fig. 6. Number of cardholders whose usual environment includes Barcelona and the locality. Year 2016

The great difference appears when analysing the cardholders whose usual environment includes one of these cities and other big ones. Figure 6 shows that Barcelona only shares cardholders with Madrid, Valencia and Bilbao while Fig. 5 shows how Madrid shares cardholders with almost every big city of the country. Apart from the central geographic position of Madrid, the reason behind these differences is that the transport networks (both by land and air) between those big cities and Madrid have a great quality facilitating the appearance of commuters. It is also noteworthy that most of the international companies' headquarters are placed in Madrid, which increases the influence of this city within the country.

5 Conclusions and Further Work

In the present paper, a general methodology based on card payments data has been proposed to identify the principal areas where cardholders do most of their daily spending. As a consequence, cardholders' usual environment can be inferred. This methodology allows BBVA to differentiate between touristic and non-touristic transactions, which is essential when analysing spending patterns of domestic tourists. Moreover, this information could also be used for urban planning or optimization of public transport.

The geographic independence of the methodology is its main strength since it can be applied regardless of the country being analysed, it is only necessary to adjust a few parameters to the characteristics of that country. The methodology is divided in four steps: locality importance, geospatial clustering, cluster selection and usual environment establishment. The value of the DBSCAN ϵ parameter in the third step is the most important one since it is completely dependent on how each country is divided. After some tests and taking into account the particular characteristics of the geographical area, a distance of 40 km was selected as optimum value, given the structure of Spain's administrative divisions.

The following results have been obtained in the case study: 92% of the more than 4.8 million cardholders whose usual environment has been calculated for 2016 have their declared locality included in the resulting list of localities. The mean percentage of input transactions considered part of the cardholder's routine is 93% (the median value is 97%). In addition, other analysis taking into account the localities included in the cardholders' usual environment have been carried out. In particular, the distribution of the number of cities by cardholder and the cardholders' distribution by cities show great similarities with the country's population distribution.

The current statistics based on surveys can be complemented with data deriving from a new source. In fact, BBVA has already used this methodology in the framework of collaboration with the Mexican Secretariat of Tourism (SECTUR) (BBVA, 2016). The main objective of this project was to measure the impact of tourism in eleven Mexican touristic corridors and in the entire set of municipalities belonging to the "Pueblos Mágicos" program (Secretaría de Turismo de México). To do so, it was necessary to use the methodology presented in order to differentiate between residents and domestic tourists.

Using big data and scalable computer infrastructure, real-time insights can be obtained from this kind of work. As opposed to working with surveys, transactional data provides a continuous stream of information, which can be useful to build useful dashboards for companies and governmental administrations. It should be noted that individual privacy rights (according to the European Union laws) are granted as data is anonymized and only aggregated data is shown in the dashboards and the analysis.

As mentioned earlier, one of the aspects to bear in mind when analysing domestic tourism through transactional data is the market share distribution within the country. For this reason, a methodology for building solid samples for tourism analysis will be addressed in future works. Apart from that, further research will also have to consider the extension of the algorithm to smaller levels of aggregation such as cities. It would be of great benefit to know which areas of the cities correspond to the usual environment of cardholders. This information could be used not only for touristic purposes, but also for urban planning or optimization of public transport.

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Developing and Testing a Domain-Specific Lexical Dictionary for Travel Talk on Twitter (#ttot)

Florian J. Zach¹(✉), Scott A. Wallace², Iis P. Tussyadiah³,
and S. Priya Narayana²

¹ School of Hospitality Business Management, Washington State University,
Pullman, USA

florian.zach@wsu.edu

² School of Engineering and Computer Science, Washington State University,
Pullman, USA

{wallaces, p.narayanasubramani}@wsu.edu

³ School of Hospitality and Tourism Management, University of Surrey,
Guildford, UK

i.tussyadiah@surrey.ac.uk

Abstract. The wealth of electronically generated communication combined with increased computing power and sophisticated algorithms provides the opportunity for destination managers to listen to travellers. Identification of sentiment with a domain-oriented lexicon is beneficial for natural language processing to analyse public opinion. Indeed, in the context of travel, sentiment analysis enables tourism decision makers to devise marketing and development strategies that address the information learned. This study presents a lexical dictionary approach for sentiment extraction and opinion mining of travel related messages posted using the Twitter microblogging service. In this study, we propose a human coded sentiment dictionary specific to the travel context. Terms were identified from a pool of more than 1.38 million travel related tweets collected over a nine-month period. Human coders assigned sentiment scores to these terms and the travelMT 1.0 dictionary was produced to enhance the existing labMT 1.0 dictionary. The quality of the travelMT 1.0 dictionary was tested against the original labMT 1.0 dictionary and human judges. We found that, with a larger number of travel terms in a tweet, the enhanced dictionary, travelMT 1.0, produces a more accurate sentiment score than the labMT 1.0 dictionary.

Keywords: Lexical sentiment analysis · Travel · Twitter · Opinion mining

1 Introduction

The analysis of public communication on social media and other platforms provides the opportunity to determine consumer sentiment towards brands (Ghiassi, Skinner, & Zimbra, 2013), to better understand traveller's experiences (Tussyadiah & Zach, 2017), and to facilitate predictions of the stock market (Bollen, Mao, & Zeng, 2011). Using

publicly available communication data, especially opinion-rich data from blogs or reviews, is a new opportunity to understand people's opinion regarding products and services. The fragmented travel and tourism industry can particularly benefit from mining visitor opinions. That is, experiences created at a destination are typically a result of traveller interactions with products and services from multiple providers spanning from transportation to lodging, food and beverage and destination-related activities (sports, attractions etc.). While the individual providers might have access to proprietary data (e.g. individual ratings on hotel review websites or transaction and ad-tracking data), tourism managers that aim to market the destination as one seamless experience often do not have access to such data. Mining opinion about a destination and services thus enables tourism managers to understand what travellers like/dislike and to learn how they communicate this with others. As such, the sentiment embedded in public communication data can be analysed to guide destination development, marketing initiatives, and future investment.

The computational analysis of opinion rich data is conducted via sentiment analysis (Pang & Lee, 2008). There are two main approaches to automatically extract sentiment: sentiment classification and dictionary-based approach. Sentiment classification is a supervised machine learning approach that builds classifiers from labelled text data and extracted features (e.g. unigrams) (Taboada, Brooke, Tofiloski, Voll, & Stede, 2011). With lexical analysis, on the other hand, the sentiment of a text is calculated using a dictionary that associates key semantic elements, often words and phrases, with specific sentiment values (Turney, 2002). During analysis, words listed in the dictionary are extracted and their sentiment values from the dictionary are used to calculate a single score for the analysed text (e.g., the mean sentiment across all constituent words or phrases in the text). The dictionary-based approach is often preferred for its simplicity and, in many cases, it can perform better than the more complex machine learning models (Schmunk et al., 2014). As such, this study aims to generate a travel-centric dictionary for sentiment analysis of travel-related communication on Twitter. Specifically, this study builds upon the previously well-tested and applied labMT 1.0 dictionary (Dodds, Harris, Kloumann, Bliss, & Danforth, 2011).

2 Value of Sentiment Analysis for the Travel Industry

Tourists increasingly leave digital traces during all travel-related activities and, with the advent of social media, more and more conversations about tourism experiences take place online in the forms of consumer reviews, blogs and microblogs, as well as discussion forums. As a result, consumer-generated content associated with destination evaluations and tourist satisfaction or dissatisfaction with products and services becomes abundant and easily accessible. Collectively, consumer-generated content forms destination online reputation (Marchiori & Cantoni, 2011), serves as a highly relevant source of information for travellers and thus contributes to destination image formation, supporting travel planning and decision-making processes (Lexhagen et al., 2012). Conversely, for destination managers and travel providers, consumer-generated content provides a knowledge base to enhance service quality (Lexhagen et al., 2012) and to better appeal to relevant target markets (Leung et al., 2013).

However, the sheer number of consumer-generated content creates challenges due to the complex tasks of finding relevant information and monitoring the progress of relevant conversations online (Martínez-Cámara et al., 2012). Travellers scouring social media will benefit from a more concise representation of opinions toward a particular product or destination (Bosangit et al., 2009) and destination managers from being able to extract important features and link them to consumer perception and evaluation. However, the average human reader will have difficulty to accurately summarise the information and opinions contained in the various channels of social media today (Liu & Zhang, 2012). The task of understanding consumer-generated content is even more complex when opinions are not expressed explicitly. Therefore, it is necessary to develop systems that automatically search, retrieve, classify, and present point of views from a massive number of consumer-generated content. Sentiment analysis or opinion mining, “the computational study of people’s opinions, appraisals, attitudes, and emotions toward entities, individuals, issues, events, topics, and their attributes” (Liu & Zhang, 2012, p. 415), has emerged to solve these complex challenges.

The interest in sentiment analysis among travel and tourism researchers has grown in recent years (e.g., Marrese-Taylor, Velásquez, & Bravo-Marquez, 2014; Schmunk et al., 2014; Ye, Zhang, & Law, 2009). Schuckert, Liu and Law (2015) reviewed publications on hospitality and tourism online reviews and found a cluster on sentiment analysis and opinion mining, where researchers demonstrated significant relationships between valence of online reviews and purchase intention (e.g., Capriello et al., 2013; Pekar & Ou, 2008). Researchers have utilized and compared different supervised machine learning algorithms (e.g., Support Vector Machine, Naïve Bayes, N-gram-based model; Ye, Zhang, & Law, 2009) as well as lexicon-based approaches for sentiment classification of tourism-related content (Schmunk et al. 2014). Schmunk et al. (2014) found that, surprisingly, dictionary-based methods, which are easier to implement and do not necessitate in-depth knowledge of data mining, in some cases perform better than the more complex machine learning methods. However, as most previous research used general-purpose lexicons for sentiment analysis of travel-related products, researchers recognised the need for domain-specific lexicons with respect to product features to increase accuracy (Pekar & Ou, 2008).

3 Method

3.1 Travel-Lexicon Subset Sentiment Scores

There are two assumptions for calculating sentiment scores using lexical dictionaries: Prior polarity (i.e., words have a sentiment value independent of context) and that the sentiment can be expressed as a numerical value (Osgood, Suci, & Tannenbaum, 1957). To build a travel dictionary, this study followed the same approach as the labMT 1.0 dictionary, which was built to evaluate happiness on Twitter (Dodds et al., 2011), although our study is smaller in scale. To build the labMT 1.0 dictionary, researchers collected three years of tweets (about 20 million per day) and identified a list of the 5000 most frequent terms. That list was matched with the 5000 most frequent terms

from other sources (Google Books in English, music lyrics, and the New York Times) and resulted in a 10,222 unique list of most frequent terms in English. Using the Amazon Mechanical Turk (MTurk) service, each term received 50 human ratings on a scale from 1 (sad) to 9 (happy). As such, the Dodds et al. (2011) study was consistent with popular valence ratings of the Affective Norms for English Words (ANEW) study by Bradley and Lang (1999) and has proven useful for sentiment analysis.

Our study draws from more than 1.38 million travel tweets collected over a nine-month period from fall 2015 to summer 2016. All tweets contain the #ttot (travel talk on twitter) hashtag or are a response to tweets containing #ttot. Tweets from any source (human, organization, or bot) were retained. The most frequent 2000 terms were extracted and manually reviewed to eliminate non-English terms, numbers, conversation queues from question and answer sessions (a1, a2, etc.), mentions (terms preceded with a @-symbol) of travel bloggers. Additionally, individual terms that are part of a geographic location (e.g. Costa) were merged to fully represent the location (e.g. Costa Rica). Terms that were listed both with and without a prefix (# for hashtags or @ for mentions) were retained. Similarly, both singular and plural forms of terms were kept; for example, the terms hotel, hotels, #hotel and #hotels are included so long as each variant occurred within the top 2000 terms. In an effort to develop a comprehensive dictionary, the terms were manually screened to identify terms that belong to sets (e.g. days of the week, months, US states, countries). If about one third of set terms were present, the remainder was added. Furthermore, the dictionary section of US travel guide books to Sweden, France, Brazil and Japan from different publishers were consulted to identify relevant travel terms that were subsequently added to the list (e.g. ferry, shower, border crossing, check point, first class, economy class, delay, stormy, cloudy). These efforts resulted in a list of 1983 unique terms we call the travel-lexicon subset. Using MTurk, each term was rated by 38–43 individuals on the 1 (sad) to 9 (happy) scale. MTurkers were limited to being located in the USA and having performance rating of 99% or higher. Respondents were asked to evaluate the terms in the context of travel.

3.2 Tweet Sentiment Scores

To evaluate the usefulness of the term sentiment scores identified in the travel-lexicon subset, a random set of 1000 tweets was extracted from the overall pool of more than 1.38 million travel tweets. To qualify, tweets had to meet these criteria: English language (by checking both the language meta-information of the tweet and rejecting tweets that did not contain at least three words common in the English language), variety of users (maximum one tweet per user), range of sentiment (scores were calculated using labMT 1.0 and tweets with a range of labMT scores were selected), scorable (tweets had to contain at least one word each from the travel-lexicon subset and the labMT 1.0 dictionaries), original tweet (retweets were rejected), and unique content (each tweet had to produce a distinct term-frequency vector; meaning no two tweets could have the same frequency of terms).

The set was then scored three times. First, all 1000 tweets were assigned sentiments using different sentiment dictionaries: labMT 1.0, and travelMT 1.0—an expansion of labMT 1.0 by adding new terms unique to the travel-lexicon subset and updating

existing scores for terms already listed in labMT 1.0 (see details in Sect. 4.4). Following Dodds et al. (2011), the sentiment for each tweet was calculated with a naïve algorithm that scaled up term sentiments to tweet sentiments by computing the mean of term sentiment scores found within a tweet. Formally, tweet sentiment (TS) was calculated as

$$TS = \frac{\sum_{i=1}^N ts_i f_i}{\sum_{i=1}^N f_i}$$

with ts_i representing term sentiment for any given dictionary and f_i representing frequency of the i th term. Differences between sentiment scores of the two dictionaries were used to identify a subset of 130 tweets with a balanced representation of tweets: similar tweets (difference score within $\pm 1/4$ standard deviation from the mean difference score) or dissimilar tweets (difference score between 1 and 2 standard deviations higher or lower than the mean difference score). Second, these 130 tweets were also human scored from 1 (sad) to 9 (happy) by 44–46 individual MTurk coders. The same MTurk criteria as for term rating were used (location = USA, performance rating = 99% or higher).

4 Findings

4.1 Terms Unique to Travel-Lexicon Subset

Most of the 843 unique terms in the travel-lexicon subset are terms that are to a large extent travel-centric (see Table 1 for an excerpt). The mean sentiment across all unique terms is 6.03598.

Table 1. Top, median, and last ten unique travel-lexicon subset terms based on sentiment score (descending sentiment score)

Top 10	Score	Middle 10	Score	Last 10	Score
Spectacular	8.46511	#Macedonia	6.16216	Libya	2.48780
Day off	8.38095	Taipei	6.16129	South Sudan	2.45000
Sunsets	8.30952	EUR	6.15625	Wheelchair	2.41860
#Paradise	8.30952	#Budapest	6.15385	Somalia	2.39024
Waterfall	8.23810	24/7	6.14634	Illegal substance	2.36585
Vibrant	8.21951	#Hong Kong	6.14286	#Danger	2.35000
Breathhtaking	8.18605	#Volunteer	6.13514	North Korea	2.23256
Beaches	8.17073	Reservation	6.12500	Syria	2.20930
Waterfalls	8.15000	Georgia (US state)	6.12195	Missing luggage	1.66667
Coastal	8.14634	#People	6.12195	Missing person	1.14634

Notes Across all 1983 terms “relaxing” received the highest score (8.6) and “missing person” the lowest sentiment score

4.2 Travel-Lexicon Subset Terms in the LabMT 1.0 Dictionary

Sentiment scores of the 1140 terms listed in both the travel-lexicon subset and labMT 1.0 were compared to identify terms with either close or very different scores. It was found that in terms of absolute score differences, 10 terms differ by 2 or more. These terms are big movers as they sway the sentiment considerably. The other differences are as follows: 174 terms have absolute differences from 1 to 2 (referred to as movers), 382 from 0.5 to 1279 from 0.25 to 0.5 and 295 differ by less than 0.25 (terms with a difference of less than 1 are non-movers). Among the big movers, three scored higher in a travel context; these are falls, hidden and retreat. Not surprisingly, terms such as school, work, jobs, lines and job score lower for travel. An interesting finding is that the terms kids and baby also score lower for travel (Table 2).

Table 2. Big movers—travel-lexicon subset terms scored by labMT 1.0 with absolute difference of at least 2 (descending by absolute score difference)

Term	labMT 1.0	Travel-lexicon subset	Difference (travel-lexicon subset—labMT 1.0)
School	6.26	3.38095	-2.87905
Work	5.24	2.48718	-2.75282
Kids	7.38	4.71429	-2.66571
Falls	3.60	6.04762	2.44762
Jobs	6.32	3.90244	-2.41756
Lines	5.26	3.00000	-2.26000
Job	5.96	3.78049	-2.17951
Hidden	4.48	6.64286	2.16286
Retreat	5.18	7.30233	2.12233
Baby	7.28	5.23256	-2.04744

Table 3. Excerpt of movers—travel-lexicon subset terms scored by labMT 1.0 with absolute difference around 1.5 (descending by absolute score difference)

Term	labMT 1.0	Travel-lexicon subset	Difference (travel-lexicon subset—labMT 1.0)
Student	6.58	5.04878	-1.53122
Quit	3.90	2.37500	-1.52500
Arkansas	5.40	3.88095	-1.51905
Breaks	4.42	5.93023	1.51023
Sights	6.00	7.50000	1.50000
Lonely	2.86	1.37500	-1.48500
Wrong	3.14	1.65854	-1.48146
United	7.32	5.85366	-1.46634
Italy	6.18	7.64286	1.46286
Scenes	5.90	7.35714	1.45714

Table 4. Last ten non-movers—travel-lexicon subset terms scored by labMT 1.0 with absolute difference around 0 (ascending by absolute score difference)

Term	labMT 1.0	Travel-lexicon subset	Difference (travel-lexicon subset—labMT 1.0)
Dinner	7.04	7.39535	0.00465
Minnesota	5.24	5.24390	0.00390
Calling	5.74	5.74359	0.00359
Cook	6.64	6.64286	0.00286
Brazil	6.10	6.10256	0.00256
Magazine	5.90	5.90244	0.00244
Zoo	6.62	6.61905	-0.00095
Poland	5.88	5.88095	0.00095
Tennessee	5.82	5.82051	0.00051
Discovered	7.00	7.00000	0.00000

Table 3 shows an excerpt of ten movers (absolute score differences from 1 to 2) that have an absolute difference around 1.5. Among these ten terms four score higher in a travel context (breaks, sights, Italy and scenes). Of the six terms scoring lower are terms that already had a below average score in labMT 1.0 (quit, lonely and wrong).

Non-movers are terms with an absolute difference of less than 1. Table 4 lists the last ten terms with regards to absolute difference. Only one term (“discovered”), did not change in sentiments scores from labMT 1.0 to the travel context. Eight terms score marginally higher in the travel context. Interestingly, the labMT 1.0 scores for these last ten terms are all above 5; that is, they are all above the mean and thus more homogeneous than the top ten terms (see Table 2).

Overall, the mean square error (MSE, calculated as mean of sum of square differences), for the 1140 terms is 0.52631.

4.3 Comparing Term Variants

The analysis avoided lemmatizing terms; that means that terms were not reduced to their root form. As such, among the terms rated by human subjects were several terms that appeared in multiple variants; for example, subjects as singular and plural or with or without a prefix (# for hashtags or @ for mentions) or both or conjugations of verbs. One-way ANOVA was conducted on a few example terms to identify the means across all available variants were the same (null hypothesis).

One-way ANOVA tests in the below sample Table 5 do not show significant differences between the means. It also shows that stemming works well in some cases (e.g. attraction example castle), but not for others (accommodation example hotel).

Table 5. Sample results of one-way ANOVA

Term	N	Mean	Std. Dev.	Term	N	Mean	Std. Dev.
Attraction examples				Accommodation example			
Castle	41	7.2683	1.65868	Hotel	43	7.4651	1.48563
Castles	42	7.5000	1.56564	Hotels	42	6.7619	1.99768
#Castle	39	7.2564	1.48178	#Hotel	40	6.5000	1.46760
#Castles	41	7.1951	1.74956	#Hotels	43	6.7442	1.77406
F(3159) = 0.285, $p = 0.836$				F(3164) = 2.531, $p = 0.059$			
				Transportation example			
Holiday	41	7.8537	1.35205	Cruise	40	7.2500	1.59727
Holidays	43	7.8605	1.61218	Cruising	41	6.9268	1.64909
#Holiday	41	7.9512	1.41335	#Cruise	40	6.4250	2.39537
#Holidays	42	7.5000	1.86430	#Cruising	41	7.2195	1.68069
F(3163) = 0.668, $p = 0.573$				F(3158) = 1.702, $p = 0.169$			
				Country example			
Deal	41	7.4634	1.53456	Brazil	39	6.1026	1.90284
Deals	41	7.5854	1.41378	#Brazil	41	6.1707	1.74503
#Deal	42	7.4762	1.45230	F(178) = 0.028, $p = 0.868$			
#Deals	41	7.4146	1.84358	US state example			
#Traveldeals	42	7.1905	1.61151	Florida	42	6.6190	2.29477
F(4202) = 0.355, $p = 0.840$				#Florida	38	6.2895	2.34703
				F(178) = 0.403, $p = 0.528$			

The analysis above suggests that while the travel-lexicon subset included multiple variants of the same root term, many of these variants did not have sentiment scores that were statistically distinguishable from one another. This, in turn, suggests that it may not be appropriate to distinguish all term variants when scoring sentiment.

4.4 Travel Tweet Sentiment Scores

The effectiveness of a sentiment analysis technique can be evaluated by comparing an algorithmically computed sentiment score on travel related tweets to scores provided by human analysis. For this purpose, the 130 travel related tweets described in Sect. 3.3 were used. Table 6 below shows the Mean Squared Error (MSE) of sentiment provided by labMT 1.0, and travelMT 1.0, which is the combination of labMT 1.0 plus the addition of the travel-lexicon subset. travelMT 1.0 adds 843 new travel-related terms to the dictionary and provides new scores for the 1140 travel-related terms that were already a part of labMT 1.0. Based on the analysis in Sect. 4.3, travelMT 1.0 merges scores for term variants with different prefixes (e.g., #hotel, and hotel) to form a single term variant (e.g., hotel) whose semantic value is the average of all constituent terms. To maintain consistency with labMT 1.0's dictionary, stemming and lemmatization *is not used* to merge term variants with the same root (e.g., hotels and hotel remain as two distinct terms in travelMT 1.0 as they do in labMT 1.0).

Table 6. Deviation from human-scored sentiment over 130 tweets

	labMT 1.0	travelMT 1.0
MSE	1.034	1.085

Across the entire set of 130 test tweets, the difference in mean squared error between labMT 1.0 and travelMT 1.0 compared against human-scored sentiment value is minor (0.051) with travelMT 1.0 performing somewhat worse than labMT 1.0.

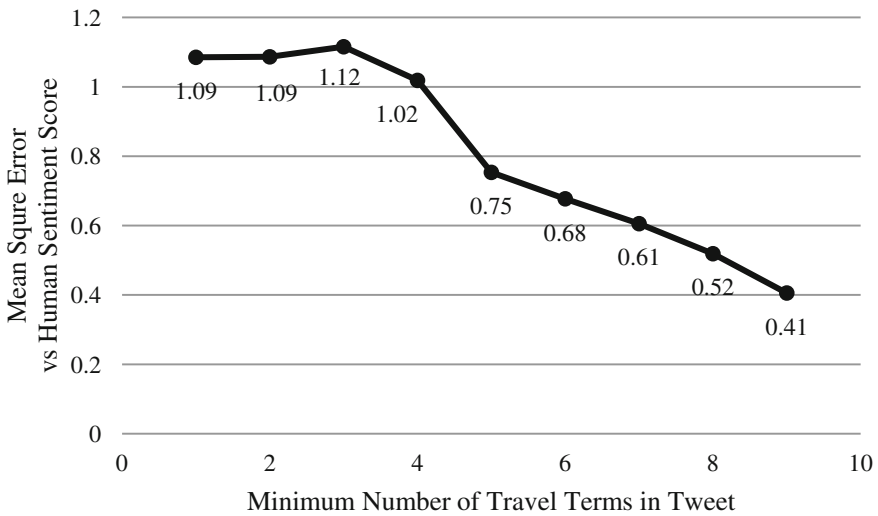


Fig. 1. Mean square error of travelMT 1.0—prediction error decreases with more travel content

However, the MSE improves when the number of travel-related terms in a tweet increases. Figure 1 plots the MSE between travelMT 1.0’s sentiment prediction and the Human-scored sentiment value as a function of the number of travel-related terms are in the tweet. It is clear that travelMT 1.0 does improve sentiment scores *for tweets with sufficient travel-related content*. Figure 1 shows this relationship.

Table 7 illustrates representative tweets with varying travel content and indicates human-scored sentiment value along with predicted sentiment values provided by labMT 1.0 and travelMT 1.0.

Table 7. Representative tweets with varying travel content and sentiment scores

[# Travel terms] text	Human scored sentiment	labMT 1.0 [Error2]	travelMT 1.0 [Error2]
[1] Bodo library Norway. Queens College Oxford. Stourhead House Wiltshire	5.28	6.54 [1.57]	6.56 [1.63]
[4] Lovely having you @fit_travels—please come back any time you need to relax! #crownlanta #kohlanta #travel	6.85	5.84 [1.01]	5.81 [1.07]
[5] @TK_INDIA Don't lie. You are the worst airline company and worst customer service of the world	3.74	4.78 [1.08]	4.61 [0.76]
[6] #Bucketlist #Batanes the northern most #island of the #PH Said to have slow paced living and views of grandeur #ttot	6.30	5.31 [0.98]	5.68 [0.38]
[8] The tea garden in Munnar you can't miss it... #Munnar #teagarden #Kerala #photography #ttot #nature #landscape	6.11	5.38 [0.53]	5.59 [0.27]

5 Conclusion and Recommendation

This study makes two major contributions. First, we developed and tested a domain-specific lexical dictionary for travel-related online conversations (travelMT 1.0). Specifically, this study enhanced an existing dictionary by adding travel terms and updating scores to the travel context. Second, the travelMT 1.0 dictionary was successfully applied to rate travel-related tweets that contain multiple travel terms. While the dictionary underperformed slightly for tweets with only few travel terms, further analysis revealed that as the number of travel terms increases so does travelMT 1.0 performance. Further analysis revealed that to improve travelMT 1.0 scoring performance for Twitter, more terms can be added and more labMT 1.0 terms should be re-scored in a travel context. Another approach to achieve better scores for travel conversations is to develop a dictionary using supervised machine learning algorithms. Another shortcoming is that Twitter demographics do not necessarily match traveller demographics. To overcome this limitation, the dictionary should be tested in a more travel specific context, such as hotel reviews.

Finally, tourism managers can use the travelMT 1.0 dictionary to perform sentiment analyses on social media communication relevant to products and services provided, enabling them to learn about visitor sentiment towards their destination. Managers can extract which aspects of a visit were liked/disliked and can use this information to adjust their social media communication on the short term and make necessary investments to capitalize on positive or counteract negative experiences.

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