Bringing Online Visibility to Hotels with Schema.org and Multi-channel Communication

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Abstract Now more than ever, it is becoming critical for businesses in the tourism industry to have a strong online presence. In order to achieve this goal, the proper use of multiple communication technologies and channels is crucial. This includes semantic annotations that can be understood by search engines, scalable multi-channel publishing, and feedback collection. We present our approach to improve touristic service providers' online visibility with techniques comprising modelling by means of ontologies, particularly, schema.org, as well as multi-channel communication. Having implemented the approach for *Tourismusverband (TVB) Innsbruck und seine Feriendörfer* as well as hotel pilots, we describe how the above mentioned technologies are being used to achieve the set goal. Our findings and results show that already in the first few weeks of deployment, with eventual decrease of human social media work power in times, the use of schema.org and multi-channel communication solutions by a typical hotel increased its website visibility by 20 %, and the leads generated by social media platforms by up to 40 %.

Keywords Schema.org • Hotel • Semantic annotation • Multi-channel online communication • Semantic technologies • Smart data • Social media • Rules • Marketing

1 Introduction

Having a good online marketing approach results in higher online visibility and ultimately leads to increased sales. In order to achieve this goal, having semantic annotations on the website that can be understood by search engines is extremely important, as it boosts the online visibility and increases the chances that the website is in the search engines' results to a relevant query. As schema.org was adopted by Google, Yahoo, Bing and Yandex, its uptake on the web has been observed as rapid and intensive (Mika & Potter, 2012). Further, it is essential that multiple communication channels (e.g. social media channels, websites, blogs, etc.)

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and technologies are used, as a large fraction of potential customers are present there.

Almost all the regional tourism boards in the Alps have continued to enhance the quality performance of their websites for the last 10 years (Mich, 2013). However, most touristic service providers nearly fail completely when it comes to using Web technologies (including Linked Data and semantic annotations), either by not using them at all or by using them only minimally and mostly inappropriately (Stavrakantonakis, Toma, Fensel, & Fensel, 2013). Namely, Stavrakantonakis et al. (2013) analysed more than 2000 touristic service providers, namely hotels and hotel chains in Austria. In contrast, intermediaries such as booking engines (e.g. booking.com, hrs.de) have been using these technologies nearly perfectly. In social media, hotels in the European region are still in the first stages of developing strategies that present a moderate level of integration among different media (Minazzi & Lagrosen, 2013), and the use of multiple social media channels is still experimental and not fully utilized within the destination marketing organization of the top 10 most visited countries by international tourists (Hays, Page, & Buhalis, 2013).

In this work, we suggest a new approach and solution to efficient semantic-based multi-channel communication that could bring the highest visibility to the touristic service providers. We have deployed and validated it with the TVB Innsbruck[1] and a number of hotels, demonstrating that using multiple communication channels and the latest Web technologies, including Linked Data and semantic annotations, brings concrete, measurable benefits to online communication in terms of effectiveness and efficiency. Using the Kaysers[2] hotel as an example, we show that our solution of online marketing brings immense benefits to the hotel business owners.

The TVB Innsbruck is one of the biggest tourism boards in Austria. It combines 41 holiday destinations under its umbrella and has more than 12,000 members. Serving touristic service providers, it faces the challenge of being visible at its best in search engines, but also in the constantly growing number of other communication channels. In 2014, it distributed more than half a million emails of monthly newsletters in 5 languages, made 4 regional campaigns in 7 countries, ran 5 websites, 3 mobile apps and 6 social media channels in 9 languages. This was all executed by a team of editors and a blogger network.[3] Given this complexity and scale, the main goal of our cooperation is to improve the visibility of the TVB Innsbruck by enriching the content of its online presence and by developing a simple, and as much as possible automatic, solution to disseminate information and to collect feedback in various communication channels.

[1] TVB Innsbruck: http://www.innsbruck.info

[2] Hotel Kaysers: http://www.kaysers.at

[3] Renate Leitner (TVB Innsbruck) and Anna Fensel (University of Innsbruck). "#Love Innsbruck# Ein Erfahrungsbericht", Mayrhofen, Austria, 16.05.2014, TourismFastForward Conference (www.tourismfastforward.com; Tourismus2020 in the past). Video of the talk: https://www.youtube.com/watch?v=N34fq_frz6A

The Kaysers hotel is located in the province of Tyrol, in the area of Mieming, which is ca. 45 km west from Innsbruck. This is a 4-star property, with 48 rooms, and it offers and promotes a large variety of activities in the hotel itself, as well as in the province of Tyrol: golf, skiing, tennis, hiking, city trips, etc. The hotel had a limited web presence before the study: its own website, a presence on booking platforms, and very limited own use of social media, mainly occasional use of Facebook. Therefore, this hotel has been an ideal candidate on which to apply our automated content marketing solution, which helps the hotel generate and distribute relevant content.

Our semantic approach to enhance the TVB Innsbruck visibility is based on two main features: (1) inclusion of semantic annotations in the TVB website and (2) uniform dissemination of content through multiple channels. To achieve this goal we conducted the following activities: (1) Analysis of TVB and hotel content, (2) Design and application of an ontology, primarily reusing schema.org, (2) Mapping of content from the different channels to the common framework, (3) Design of publication rules, (4) Implementation of the TVB and hoteliers' sites and (5) Evaluation.

The paper is organized as follows. Section 2 describes state of the art and related work. Section 3 presents the semantic approach and ontology we have developed in order to provide a unified and integrated framework of all the disseminated content by TVB Innsbruck and Kaysers hotel through their multiple channels. Section 4 describes the implementation of the pilot: TVB Innsbruck alignments between the content published in TVB Innsbruck's social media channels and the developed ontology; the implementation of the semantically-enabled TVB Innsbruck website: mapping of feratel content to schema.org, the content to ontology mapping, and the functional core of publishing: overview of the publication rules we have defined together with the TVB Innsbruck and hotels. Section 5 summarises our evaluation of findings. Section 6 concludes the paper and provides a discussion on the future outlook.

2 Related Work

Compared to the existing work in the immense area of leveraging the information and communication technologies (ICT) into the tourism sector, we aligned our work to at least two topics as described below.

Use of Semantic Web Technologies in Tourism Data heterogeneity and isolation remain big problems on the web. In the tourism domain, a lot of work has been done to solve the problem by utilising semantic web technologies to enrich information, enabling machine process-able and interpretable data, in a way the data will be easy to find, connected and integrated. There are four application scenarios of applying the semantic web into tourism information systems (Maedche & Staab, 2002): (1) semantic search that allows for querying distributed data, (2) semantic portal

that integrates available information based on topic or location, (3) semantic-based electronic markets that enable matching between providers and requesters, (4) transactional web service that enables automatic web service discovery, execution, composition and interoperation. More specifically, ontology as a formal, explicit specification of a shared conceptualisation (Studer, Benjamins, & Fensel, 1998) has been applied in the e-Tourism area almost since its very appearance. For example, the Harmonise project (Fodor & Werthner, 2005) was one of the early adopters in this area. Further, Cardoso (2006a) introduced an e-Tourism ontology to answer three main questions in developing tourism applications: 'What can a tourist see?', 'What are the interesting places to see and where are they?', and 'When can a tourist visit a particular place?' A hotel matching framework was introduced by Niemann, Mochol, and Tolksdorf (2008) to search and rank hotels in various contexts (location, feature, price, etc.). It uses two main ontologies: person and hotel as well as sub-ontologies point-of-interest, hotel features, passenger transportation, etc., such that the framework can be used to match the available hotels to the user's context. A prototype system that combines semantic web technologies with traditional e-Tourism applications was developed by Damljanovic and Devedžic (2009) to enable data exchange between different e-Tourism systems in order to ease the process of maintaining the systems for tourist agencies as well as easing the process of searching for perfect vacation packages for tourists. In particular, systems based on modular approaches catering delivery of personalised applications e.g. geo-spatial, have been addressed (Barta, Feilmayr, Proll, Grun, & Werthner, 2009), where a core Domain Ontology for Travel and Tourism (cDott) was introduced as the core domain ontology for the tourism sector for integration of ontologies in a way in which the ontologies could be extended modularly. Particularly in Austria, even though the semantic annotation could improve the visibility of touristic service providers (Toma, Stanciu, Fensel, Stavrakantonakis, & Fensel, 2014), the content itself and machine access to the web content has been lacking up till now (Hepp, Siorpaes, & Bachlechner, 2006), and especially in online direct marketing, the semantic web technologies are not used properly by hotels (Stavrakantonakis et al., 2013).

Here, we follow the best practices of the past, while applying the schema.org extension, as it has become the de-facto standard, and is of clear practical relevance in recent years.

Multi-channel Communication Solution In a networked environment such as the web, all organisations in the tourism sector are facing a dynamic and innovative industry. Interoperability and/or integration of multiple platforms have been identified as major issues, and specifically multi-channel communication and advertisement on social web platforms and integration with Customer Relationship Management (CRM) systems (Werthner et al., 2015). Multiple channels (i.e. social media) have shaped consumers discussions in promotional mix, enable companies to talk to their customers on various different channels as well as enable customers to talk directly to one another (Mangold & Faulds, 2009). Social media also improves the quality of travel-related searches (Xiang & Gretzel, 2010), where

they found a significant amount of search results representing social media in Google, indicating that search engines likely direct travellers to social media sites. Multiple online information sources and channels contribute differently in the travel planning process (Fotis, Buhalis, & Rossides, 2012; Stienmetz & Fesenmaier, 2013).

Commercial social media management tools like HootSuite,[4] BufferApp[5] and many more realized the signs of the times and built toolkits to manage communication via Web 1.0 channels (Email, Blog) and via social Web 2.0 channels, e.g. Facebook or Twitter. Most of them provide capabilities to post in many streams via one click, using simple mechanisms to adapt the content to fit the channel output. Additionally, most of the toolkits provide processing of the content, allowing the user to create statistics and publish posts as well as retrieve feedback. However, currently none of the toolkits support the user in offering marketing content, automatic generation of social media posts, showing where to publish, or to whom to deliver the marketing content.

Further applications based on e-Tourism ontologies and structured data include dynamic touristic service packaging (Cardoso, 2006b; Fensel, Kärle, & Toma, 2015). Again, we are able to demonstrate real-life deployment and validation of some of the early theoretical principles, expressed there, e.g. semantic service composition.

Our Contributions Compared to the existing work, our work is utilising semantic web technologies in the touristic sector by: (1) increasing the findability of a website through semantic annotation, (2) integrating the distributed and isolated content sources by collecting the annotated content, (3) distributing the collected content to multiple social media channels.

Above all, the last two contributions were performed in a semi-automatic, semantically-empowered way, by utilising a rule-based system.

3 Ontology and Its Schema.org Model

In this section, we describe how we have chosen the ontology and its schema.org implementation, basing on the contents from TVB Innsbruck and the Kaysers hotel. The main goal of this analysis was to derive the key concepts to be modelled in the ontology. We have analysed the TVB Innsbruck's and Kaysers's websites and their publication to social media channels, as well as interviewed their personnel.

After the analysis of the TVB Innsbruck's website and TVB Innsbruck's Facebook we found out that relevant information for dissemination can be classified

[4] HootSuite: https://hootsuite.com

[5] BufferApp: https://buffer.com

according to the following categories: (1) Hotels, (2) Food and Drink Establishments, (3) Events, (4) Trips, (5) Place of Interest and (6) News.

On the other hand, it was found that the TVB Innsbruck's Facebook page offers short textual descriptions, photos and videos about the following topics: (1) Events, (2) Place of Interest, (3) News and (4) Food and Drink Establishments. These concepts identified in the analysis were initially used as main concepts to be modelled in the ontology, as described in detail in the technical report (Akbar, Lasierra & Tymaniuk 2014b). Further activities included a deep analysis of other organisations' channels and interviews and discussion sessions with TVB Innsbruck's personnel.

From the Kaysers hotel website we have identified six categories of content: The Kaysers, Rooms and Prices, Wellness, Nature and Indulgence, Activities, and Contact, and we classified them into the following categories: (1) Hotels, (2) Offers, and (3) News (Akbar & Toma, 2015). The category Hotels contains information about the entity of the hotel itself such as the address, phone, and email. The category contains various information of offered services from the room as well as other services such as spa, message, tennis, and so on. The last category News contains general information, from information about the weather, latest news from the hotel or information from the surrounding area, and so on.

4 Implementation

This section describes the specifics of the TVB Innsbruck and Kaysers pilot and its implementation, namely: (1) Contents to ontology mappings, (2) Semantic enrichment of the TVB Innsbruck and the Kayers hotel's website, (3) Social media publication rules and process.

4.1 Contents to Ontology Mapping

To construct content to ontology mappings—to be used for the rule-based information dissemination, we consider only those classes and properties which have associated information items in TVB's and Kaysers's website and social media channels. Firstly the history of published content was analysed for last 6 months; afterwards, the content was divided into information items and mapped with the vocabulary, namely Schema.org as defined in a technical report by Akbar, Lasierra, et al. (2014b). Of course not all of the schema.org terms are relevant for the tourism domain. For the TVB Innsbruck website in particular the relevant schema.org terms are those that belong to the categories Hotels, Food and Drink Establishments, Events, Trips, Place of Interest and News. Most of the content on the TVB Innsbruck website is pulled from an external data source provider, namely feratel

media technologies AG.[6] More precisely, this includes: Hotels, Apartments, Camping, Restaurants, Bars or Pubs, Cafes, Events and Sightseeing. In the case of TVB Innsbruck's Twitter channel, it was discovered that there were no posts related to Hotels, Food and Drink establishments, rather the posts related to Trips, Place of Interests and News. In the case of TVB Innsbruck's YouTube channel, the published videos are related to Food and Drink establishments, Events, Trips, Places to visit and News items.

In the case of the Kaysers hotel, we mapped three obtained main concepts (Hotels, Offers, and News) into three relevant classes from Schema.org: Hotel, Offer and Article (Akbar & Toma, 2015). Additional classes were used to confirm the class and sub-classes relationships of Schema.org. Those additional classes are: PostalAddress and AggregateRating as sub-classes of Hotel, PriceSpecification and QuantitativeValue as sub-classes of Offer.

4.2 Semantically Enriching the Websites

In order to inject the semantic annotations into the TVB Innsbruck website, we have extended the integration of the TVB Innsbruck website and the feratel system. The integration is implemented as a Typo3[7] extension plugin, referred to as *seo_feratel* (Toma et al., 2014). TVB Innsbruck website is built using the Typo3 content management system, and the Typo3 extensions *seo_feratel* is responsible for periodically getting content from feratel and showing it in the Typo3 website.

In the case of the Kaysers hotel, we found no suitable plugin yet available to inject the annotation into the website. Therefore, the annotation was injected directly through the database (Akbar & Toma, 2015). In total, we were able to annotate more than 200 pages and sub-pages in three different languages (German, English, and French).

4.3 Publication Rules and Process

We utilised the publication rules (Akbar, Garcia, Toma, & Fensel, 2014a) to determine: (1) what contents will be disseminated to which channels, (2) the sequence of the disseminations of a content to multiple channels, (3) how a content should be disseminated to a channel. Rules are form of knowledge representation where a rule is represented in form **IF** < **Condition** > **THEN** < **Action**>. Condition can be a detection to a particular type of content, while action can be, in particular, a publication action, transformation action.

[6] Feratel: http://www.feratel.at

[7] Typo3: http://www.typo3.org

Based on the ontology categories previously considered, we determined the publication rules by answering the following four questions:

1. (Existence) Can we find similar categories in an output channel? If yes, then there is a mapping between the categories to that channel.
2. (Workflow) Is there any data dependency between channels? If yes, then the publication to this channel must hold until the publication to the other channels have been successfully performed.
3. (Content Transformation) How should the content be presented in a channel? This question is intended to determine the required content transformation for each category to fit it into the channel's requirements.
4. (Scheduling) How many contents should be published to a specific channel within a particular time?

The answer for each of the above questions is described as follows.

Existence of Content to Channel Mapping as Rules The mapping is representing a relation between the content categories and the available channels. If a similarity between the content of the website and the content of a channel is detected then we conclude there is a mapping between them (Akbar & Garcia, 2014).

Workflows as Rules Another important aspect that needs to be considered when determining the publication rules is the workflow. If there is a data dependency between two channels, then we have to make sure the publications of a common content to both channels are in correct order.

Content Transformation as Rules While a content item could have rich items, a channel has specific requirements that have to be followed. The process to transform the content items into an accepted format based on the channel requirements is called content transformation. We implemented content transformation as part of publication rules (Akbar, Garcia et al., 2014a), where users are capable of choosing various transformations to be applied to a specific input content whenever the content is published to a particular channel.

Listing 1 shows an example of rules in the form of Drools Rule Language,[8] where the first rule is a mapping rule to detect if there is an Event then publish it to channel Facebook. The second rule is a workflow rule, to detect if there is an Event and it has been published to channel Facebook then publish it to channel Twitter.

Listing 1
Publication Rules

```
rule "Publish Events to Facebook"
```

(continued)

[8] Drools Rule Language: https://docs.jboss.org/drools/release/5.2.0.Final/drools-expert-docs/html/ch05.html

```
when
i : Events()
then
insert(ItemToBePublished(i, channelFacebookWall);
end
rule "Publish Events to Twitter"
when
i : Events()
f : ItemToBePublished(i, channelFacebookWall)
then
insert(ItemToBePublished(i, channelTwitter, f.url);
end
```

Scheduling as Publication Calendar Another important aspect in publication is how often a content is published to a specific channel. According to the administrator of TVB Innsbruck's social media, regular posting to Facebook is 2 posts per day and the publication to Facebook is synchronized automatically with Twitter, but sometimes an independent Tweet is also required. We implemented the scheduling by giving the users a publication calendar where they can define what time the content should be published.

Our implementation of the tool supporting the above functionality is Onlim Tell-it!,[9] and its view of the publication calendar is shown at Fig. 1. It enables users (here, a hotel) to manage their publication schedule by specifying when and where

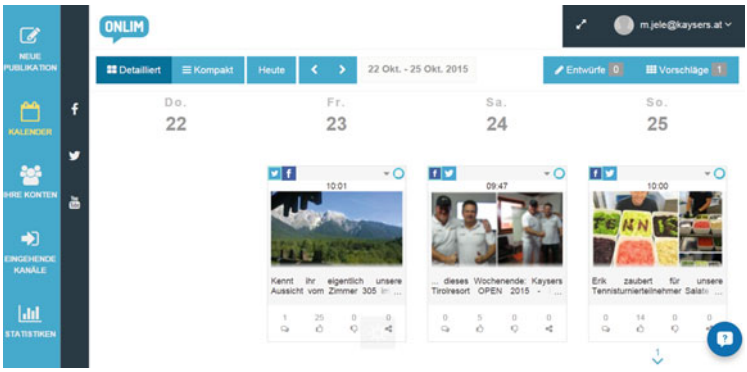

Fig. 1 Publication calendar in Onlim Tell-it!

[9] Onlim Tell-it!: https://tell-it.onlim.com

content will be published. The initial publications and their flow are pre-created by the semantic rules, as described above. The default configuration of these rules are pre-defined by social media experts, in consultation with the typical hotel pilots. When published, each posted content is associated with received feedback (e.g. likes, comments) from every channel.

Ultimately, there are two sources of online visibility provided by semantic web technologies. The first source is via search engine visibility through semantic annotation. The second source is from social media visibility through multiple-channel content integration and dissemination, where the integration and dissemination can be performed semi-automatically by using publication rules integrated with publication scheduling.

5 Evaluation

We have already performed a preliminary evaluation in order to measure the impact of having deployed semantic annotations according to schema.org on the TVB Innsbruck website. Particularly, we have demonstrated a complete technical feasibility of our solution, as well as an increase in visitors to the website (Toma et al., 2014).

Here, we also analyse the impact on the hotel's visibility which our solution has created, primarily based on the data of Kaysers hotel from Google Analytics and open web sources. We compared data of traffic to the website of Kaysers hotel before and after using Onlim Tell-it!, a multi-channel management tool which leverages semantic web technologies as described in this paper. The Kaysers hotel began using the tool intensively in July 2015, thus in this evaluation we collected data of website traffic from May to June 2015 and July to August 2015 as representation of before and after the deployment of the tool respectively. Both periods fall within the summertime, and the hotel and touristic sector generally observes the same level of touristic activity. Also, no other extra-curriculum activities, apart from using Onlim Tell-it!, have been performed by the hotel. A hotel which is not using any social media marketing tool has typically one employee spending an average 3 h a day on manually managing the hotel social media presence. The tasks performed by such employee include: finding content sources on the web which are relevant to the hotel audience, defining the content of the posts, manually customizing the actual posts to fit in different social media channels, checking feedback on each social media channel, etc. Our approach and tool, Onlim Tell-it!, substantially automate these tasks.

The results of our evaluation, explained in terms of the overall traffic increase to the hotel's website, the direct leads to it from social media platforms, and time spent on social media management by the hotel employee, are as follows.

Traffic to Website Figure 2 shows overall traffic to the website during the periods before and after deployment. The number of *Sessions* has increased by 24.97 %

Fig. 2 Comparison of traffic to website before and after using Onlim Tell-it!

Social Network	Sessions	% Sessions
Facebook		
May 3, 2015 - Jun 30, 2015	50	94.34%
Jun 30, 2015 - Aug 27, 2015	71	97.26%

Fig. 3 Comparison of traffic to Kaysers website originating from Facebook

(4669–6223), *Users* by 20.63 % (3502–4412), and *Pageviews* by 15.80 % (25,232–29,968).

We also collected about 100 of the latest tweets from Kaysers. Then, we identified what kind of social media tools were used to distribute those tweets. Our result shows that 92.1 % of tweets were disseminated through Onlim Tell-it!, only about 4.5 % were disseminated through the Twitter web client. Thus, the hotel has been clearly and predominantly using Onlim Tell-it!.

Traffic to Website Originated from Social Media We observed that traffic originated directly from social media, as it has been especially relevant for our multi-channel communication section. The results for Facebook, as the most common channel, are shown in Fig. 3: the social network sessions created by this platform increased by ca. 40 % after the tool deployment i.e. the pilot has been clearly using the set-up.

It is also worthwhile to mention that the tool has enabled the Kaysers hotel to engage and bring more visitors from Google+ (increase of 37.7 %) and Twitter (increase of 100 %). These are channels that the hotel was not able to serve extensively before due to time restrictions of marketing staff. Here we expect a further traffic increase from these and other social media channels supported by Onlim Tell-it!.

Work Time Spent by the Hotel on Social Media Management Taking the concrete example of Hotel Kaysers, they used to spend 2.5 h a day for their social media activities. Since they started using Onlim Tell-it!, they use 1 h only to perform their social media marketing activities.

6 Conclusion

In this paper we have presented our pilot with the *Tourismusverband (TVB) Innsbruck und seine Fereindörfer*, and the use of its content by touristic service providers, namely, hotels. The goal was to showcase possible applications and added value of the semantic technologies, particularly, semantic annotations and multi-channel information dissemination, for touristic service marketing stakeholders. We have demonstrated that our approach has facilitated the increase of visibility and customer touch points online for the hotel, and exemplified it with a real-life system user, the Kaysers hotel: a ca. 20 % increase to its website, and up to 40 % growth of the social media leads, and a ca. 2.5 less worktime spent in social media, resulting solely from our approach application.

We have created semantic annotations for the content of the touristic association, as well as for hotels, according to popular vocabularies, specifically, schema.org. We have applied schema.org-based ontologies as a basis for automation of multi-channel communication tasks. Currently we are looking into defining more advanced schema.org touristic vocabulary parts (e.g. exact service offers of hotels) a turning them into official schema.org extensions.

Furthermore, we have created and set up an approach and tool - Onlim Tell-it!, executing dissemination to multiple social media channels. Currently, our tool is capable of automated and intelligent publishing of content in the following channels: Facebook (text, image, link, and video), Twitter (text, image, and link), LinkedIn (text, link), Flickr (image, video), and YouTube (video), creating content based on the sources annotated with schema.org.

Some limitations of the current work included the fact that the insertion of the semantic annotations in the innsbruck.info website is not always integrated with the systems that initially generate the actual touristic data. In this case, we have applied a schema.org annotations plugin that is able to insert annotations not at the destination (e.g. touristic association website), but rather at the source (e.g. feratel).

In the area of multi-channel communication, there are still many relevant channels that need to be integrated; also, in some cases, such integration is complicated by the fact that the APIs of some channels are only restrictively open or non-existent (e.g. as in the case of Google + and Instagram). When it comes to the content and data, we are working to optimise the automated selection, reuse and spread of the content and data. Also, for dynamic content and data reuse from third-party sources, appropriate licensing models would need to be found.

Thus, we have demonstrated how a touristic association and its' hotel customers can be brought forward and become more automated in their marketing activities, employing the approach of semantic annotations and online multi-channel communication. With more hotels and other businesses using Onlim Tell-it! in the future, we will be able to deliver even more evidence and precision on the added value of the results. Eventually, our expectation is that the touristic structured data will serve as a powerful enabler for the touristic services provided online, and will contribute to the establishment of Tyrol as a role model region for e-Tourism.

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