

# The Unexploited Benefits of Travel Planning Functionalities: a Case Study of Automatic Qualitative Market Analysis

Elena Not<sup>a,b</sup> and  
Adriano Venturini<sup>a</sup>

<sup>a</sup>eCTRL Solutions, Italy  
venturini@ctrlsolutions.com

<sup>b</sup>Fondazione Bruno Kessler, Italy  
not@fbk.eu

## Abstract

Travel planning services integrated in eTourism web portals comprise user-friendly functionalities that support users in composing their personal itineraries. Travel plans provide an invaluable source of high-quality information about: how website users compose their personalized travel package, how the travel planning process takes place, how the social and travel context influence users' travel needs and preferences. This opens up new opportunities for automatically analysing the user interactions with e-tourism web portals to derive prospected consumer behaviour and market trends, that go beyond the results provided by traditional web site analysis tools, and that are typically available to tourism organizations only through long-term, expensive surveys. A case study of this approach of qualitative market analysis is presented to exemplify the concrete potential provided by travelling planning functionalities as tools to support tourism managers in strategies formulation.

**Keywords:** Travel Planning; User Interaction; Data Mining; Market Analysis.

## 1 Introduction

Many of the most successful eTourism web portals for promoting destinations and tourism products provide a wide set of contents and services (like for example recommender systems and travel planning functionalities) allowing their visitors to acquire rich information on the promoted products, as well as tools and functions which guide users in assembling their personalized vacation (Fesenmaier, Werthner & Wöber, 2006). With these functionalities in place, eTourism web portals can become an invaluable (still underestimated) source of information to understand consumer behaviour (Pitman *et al.*, 2010). With the promise of receiving personalized travel advice, users can explicitly be solicited by the system to provide their general travel constraints (e.g., means of transport, travel companions, ..) and preferences (e.g., interest in culture and museums, preferences for sport activities,..) at early stages during the portal access (Mahmood *et al.*, 2008). A significant amount of additional information comes from the products that consumers choose when freely assembling their personal travel plan and, more generally, from the search queries that they make.

This opens up new opportunities for automatically analysing the user interactions with eTourism web portals to derive prospected consumer behaviour and market trends, that go beyond the results provided by traditional web site analysis tools. Indeed, by combining profile information with the actual travel plan choices of a large amount of users it is possible to understand, for example, for different types of user groups: the advance with which travel planning takes place before the actual travel and the favourite periods for holiday planning; preferences about the duration of holidays; features of the various product categories that seem to meet the users' favour; which types of products tend to be grouped together to assemble self-made holiday packages. This information can be extremely informative for Destination Management Organizations and Tourism Operators to understand (and foresee in advance) market trends and to single out factors that may help tune more appealing holiday packages and more effective online marketing campaigns (Dolnicar, 2008), saving the high costs of other field analysis methods. In this paper we discuss the concrete potential provided by travel planning functionalities integrated in DMO portals and in more general eTourism sites, as tools to support tourism managers in strategies formulation. Throughout the paper, the experience gathered in integrating the Trip@dvce recommendation and travel support system (Not and Venturini, 2010) in various DMO portals will be used as a source of evidence and exemplification. Section 0 describes how meaningful data can be elicited from users or extracted from their personal travel plans and how it can be processed to meet the informational needs of decision-makers in the tourism field. In Section 0 some preliminary results that have emerged from data processing experiments on real travel plans complement the description. Section 0 concludes the paper with a discussion of future work and challenges for this approach.

## **2 Methodology**

Several sources of information can be exploited in travel support systems to derive the informational needs of website users. A significant amount of data comes from the search queries users make and their navigation and interaction behaviour within the pages of the eTourism portals. *Session analysis* techniques can be applied to fruitfully interpret the frequency of page accesses, path lengths, typical entry and exit points, to identify the most successful or weak parts (and products) of the observed sites. More advanced *Data Mining* techniques –like unsupervised learning, association rule mining, sequential pattern matching– can be applied on the same data to discover meaningful groupings of pages or products that tend to be accessed together (Liu, 2007). For example, (Pitman *et al.*, 2010) show the benefits of combining query term analysis and user clustering in the tourism domain to single out user groups with significantly differing informational needs. However, by exploiting the more qualitative information gathered during the users' travel plan building activities it is possible to employ more specific techniques of market segmentation (Dolnicar, 2008) to uncover interesting market trends and phenomena, that are typically available to tourism organizations only through long-term, expensive surveys.

### **2.1 Collecting meaningful data from travel planning interactions**

Travel planning services comprise user-friendly functionalities that support users in composing their itineraries by arranging in a personalized cart the preferred tourism

items, i.e. places to visit, attractions, accommodation,... and by supporting user generated contents like personal notes, images, comments on travel items etc. The possibility of scheduling activities in a calendar, accessing the travel plans from mobile devices and sharing personal itineraries or product evaluations with a community of travellers additionally strengthens users' engagement and fidelisation. Travel plans provide an invaluable source of high-quality information about: how website users compose their personalized travel package, how the travel planning process takes place, how the social and travel context influence users' travel needs and preferences. By combining profile information with actual travel plan choices of a large amount of users it is possible to derive prototypical tourists' behaviour and online market trends, by applying commonsense or data-driven market segmentation analysis (Dolnicar, 2008). The issue of motivating users to communicate their personal profiles and travel preferences (like travel party, season of travel, preferred accommodation, duration of stay, interests,...) becomes then crucial. Users need to perceive a clear benefit to compensate the burden of providing personal information: personalized product recommendations allowing users to quickly locate the most interesting products may be an effective counterpart (Mahmood *et al.*, 2008).

## **2.2 Qualitative Market Analysis**

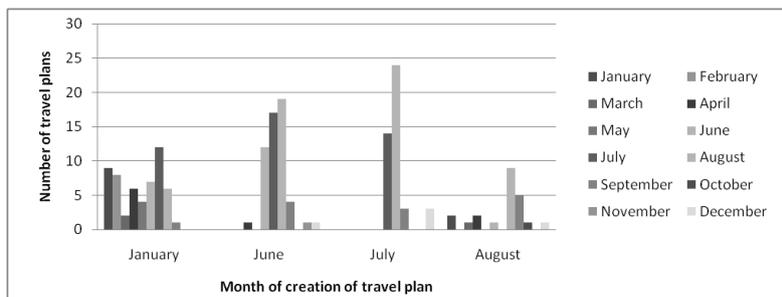
Tourism organizations starve for information that helps them understand: *who* their tourists are; *from where* they come from; *when* they start thinking about their holidays and when they are expected to come; for *how long* they will stay; *what* expectations and budget they have and what destinations, activities and services encounter they favour. Obviously, tourists planning their travel on eTourism web portals are just a subset of the larger community of tourists visiting a destination, and the results obtained from the analysis of travel profiles and plans created online may not be representative of the overall community. For example, in the data analysis experiments described in Section 0, the segmentation of online users according to the travel party revealed that business travelers were underrepresented within the group of users traveling alone, probably because the travel planning tools are more intensively exploited when planning a leisure travel. In addition, travel plans created online might not result in an actual holiday, and therefore online surfers may not turn into actual travelers, though the integration with booking engines may allow to identify travel plans with a high commitment. Despite these limitations, the analysis of the characteristics and the choices of the population of visitors who use a tourism web portal in a productive way (not just for exploration purposes, but with an explicit travel planning intention) allows the automatic computation of a set of interesting indexes. Furthermore, the generation of the statistical analysis output can also be personalized according to the specific needs of the organization by varying, for example: the output rendering (e.g., type of graphs); the reference period for the computation of the various indexes and the frequency of update or comparison with previous data (e.g., monthly, yearly, several years,...); the geographical area taken as a reference for the computation.

## **3 Results from a case study**

To check the validity and usefulness of the proposed methodology, we conducted a pilot data analysis experiment over a sample of 1226 travel plans created in the period

September 2009 – August 2010 by registered users of visitfinland.com, the official destination tourism portal of Finland. In this preliminary analysis, it was decided to consider just registered users, as the effort of creating a new login on the portal was considered as an additional evidence of the user commitment towards a meaningful interaction with the portal for travel planning purposes. We computed both statistical distributions of specific indexes as well as *a priori* and *data-driven* segmentation of multidimensional data (Dolnicar, 2008). The following information derived from travel profiles and plans emerged as of particular interest:

- Days in advance between creation of travel plan and actual travel: The output of this statistical elaboration can be useful to schedule focused advertising campaigns. For example, in our case study, it is interesting to note that January is characterized by a higher travel planning activity than the rest of the months (13% of the travel plans were created in January), and, surprisingly, a significant part of the travel plans is already referred to the next Summer season, whereas during the Summer months travel planning is mainly concentrated on Summer holidays (Fig. 1).



**Fig. 1.** Preferred month of travel, as planned in January, June, July and August

- Distribution of travel interests: this global index provides an immediate view over the strengths and weaknesses of the tourism offer of a certain destination (as perceived by online browsers), and their fluctuation in time. By additionally segmenting the travel interests according to the travel party and season of travel, it is possible to understand how the social context influences the trip goals and the consequent expectations and behavior of travelers. For example, in our case study, it emerged that the interest for art and design is typically higher for couples, especially in the Summer season, whereas nature, sightseeing and traditions, represent, in order, the strongest attractions of Finland, for all travel groups, in all seasons.
- Segmentation of user groups: data-driven automatic clustering techniques can be applied over travel profiles and plans to identify in an exploratory way prototypical groups of travelling behaviour and preferences. For example, in our case study, the k-means clustering method (Witten & Frank, 2005) was used to divide the sample population who explicitly provided their travel preferences online (583 travel cases) into natural groups (clusters) according to the resemblance of their intended travel experience in Finland. This information is very relevant to complement traditional statistics with

multidimensional information that helps tuning holiday packages appealing for online browsers. This is exemplified by Table 1 showing ten prototypical traveling experiences for couples derived by clustering data about preferred accommodation, season and duration of travel.

**Table 1.** Clusters of travel experiences for couples

cluster #	0	1	2	3	4	5	6	7	8	9
Cluster centroids:										
TravelParty	Couple	Couple	Couple	Couple	Couple	Couple	Couple	Couple	Couple	Couple
AccomPlace	Cottage	Camping	Hotel	B&B	Hotel	B&B	Hostel	Hotel	Hotel	Cottage
Season	Summer	Summer	Summer	Summer	Summer	Summer	Summer	Winter	Christmas	Summer
Duration	>2weeks	2weeks	2weeks	2weeks	week	week	2weeks	2days	2days	2weeks
clustered instances	40 ( 18%)	12 ( 6%)	34 ( 16%)	18 ( 8%)	70 ( 32%)	17 ( 8%)	5 ( 2%)	7 ( 3%)	6 ( 3%)	9 ( 4%)

## 4 Challenges and Future Work

Data from our experiments reveal that the major part of users create travel plans without being registered (anonymous travel plans are approximately ten times more numerous than those created by registered users). One of the main challenges then consists in analyzing the significant amount of data produced in anonymous sessions, with the problem of automatically filtering out those travel plans that contain poor or inconsistent data (e.g. missing travel profiles and/or unrelated items). Careful consideration is also needed to investigate whether anonymous users are characterized by different styles of usage of the travel planning tools (e.g. whether advanced planning functionalities such as calendar schedule and product comparison facilities are used by anonymous and registered users in the same way). Important future work additionally consists in applying data mining techniques that discover association rules to perform *Market Basket Analysis* over the carts of selected tourist products to identify types of products that sell well together.

## References

- Dolnicar, S. (2008). Market Segmentation in Tourism. In A. Woodside, & D. Martin (Eds.), *Tourism Management, Analysis, Behaviour and Strategy*. Cambridge: CABI.
- Fesenmaier, D.R., Werthner H. & Wöber, K.W. (2006). *Destination Recommendation Systems: Behavioural Foundations and Applications*. CABI Publishing.
- Liu, B. (2007). *Web Data Mining. Exploring Hyperlinks, Contents, and Usage Data*. Heidelberg-Berlin: Springer-Verlag.
- Mahmood, T., Ricci, F. & Venturini, A. (2009). Learning Adaptive Recommendation Strategies for Online Travel Planning. In W. Höpken, U. Gretzel, & R. Law (Eds.), *Information and Communication Technologies in Tourism 2009* (pp. 149-160). Wien, New York : Springer.
- Not, E. & Venturini, A. (2010). Supporting Users in Organizing their Vacation Before, During, and After the Travel. In U. Gretzel, R. Law, & M. Fuchs (Eds.), *e-Review of Tourism Research (eRTR)*. Special Section: ENTER 2010
- Pitman, A., Zanker, M., Fuchs, M. & Lexhagen, M. (2010). Web Usage Mining in Tourism – A Query Term Analysis and Clustering Approach. In U. Gretzel, R. Law, & M. Fuchs (Eds.), *Information and Communication Technologies in Tourism 2010* (pp. 393-403). Wien, New York: Springer.
- Witten, I.H. & Frank, E. (2005). *Data Mining. Practical Machine Learning Tools and Techniques*. Morgan Kaufmann