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Abstract

Mobile information services are gradually supplementing or even replacing traditional information sources relevant to tourists during their on-site stay (Anegg et al. 2002; Berger et al. 2003). The scope of the paper is to identify mobile information services which prove to be relevant to tourists during their city destination stay (Page, 1995; Wöber et al. 2003). For this aim, a qualitative approach to deduce potentially accepted mobile information services targeted to the specific destination use is presented (Rasinger et al. 2006). Firstly, based on a record of tourists' information requirements and focus group interviews a ranked list of 15 mobile information services is deduced. Secondly, results from a web-based expert survey are presented exploring most promising configuration alternatives for mobile information services designed for the urban (i.e. city) destination context.

Key words mobile information services, pre-prototyping, expert survey, city tourism

1. Introduction

Next to friends and relatives, the internet has grown to be the number one source for acquiring information for travel purposes in the pre-trip phase (Bieger & Laesser, 2004). Much effort has been spent in investigating the "does and don'ts" of tourism websites. However, in the on-site phase internet services have by far not tapped their full potential (A.T. Kearney, 2004). Possible reasons are a lack of destination infrastructure, the effort of going through an exhausting search process or simply the fact that there are less demanding alternatives, such as tourist information centres. Mobile information services, however, due to their *ubiquitous* nature, may overcome many of the shortcomings of traditional stationary internet services. Benefits from ubiquity which tourists may capitalize stem from *spatial, temporal and contextual mobility*, respectively. Put differently, tourists may be in touch with the destination specific information network and may be reached at any place and any time using portable devices (e.g. mobile, smart-phone). The scope of the paper is to conceptually explore mobile information services which are most relevant to tourists during their urban (i.e. city) destination stay. In addition, and similarly in the '*pre-prototype*' phase, corresponding functionalities related to the various mobile information services should be deduced (Davis & Venkatesh, 2004). For this aim, a comprehensive *qualitative approach* using both, supplier- and customer-based as well as expert-based data is presented (Meuser & Nagel, 2005). The paper on hand is structured as follows: Chapter two briefly highlights useful approaches to categorize mobile information services and corresponding functionalities. Based on the paper of Rasinger et al. (2006), chapter three is presenting a procedure to deduce already in the '*pre-prototype*' phase concepts for most likely accepted information services in tourism. Furthermore, after having briefly discussed the expert survey method (Bogner & Menz, 2005), chapter four presents qualitative results obtained from a web-based expert survey. International expert-based data serve, firstly, to validate the findings generated at the supply and at the demand side, respectively (i.e. chapter three). Secondly, they serve to detect the most promising set of functionalities related to mobile information services designed for the urban (i.e. city) destination context. Finally, the conclusion section summarizes main findings and sketches future research challenges regarding the issue of mobile information services in tourism (Beer et al. 2007).

2. A categorization of mobile information services

Mobile information systems comprising services for the tourism domain are often referred to as mobile tourist guides. These systems usually constitute a number of mobile services for supporting tourists during their destination stay (Schwinger et al., 2005). Both, in academia as well as in the industrial field, many initiatives for developing such systems took place. For instance, more than hundred projects have been identified by the POSITION team (Pugh et al., 2004; Murphy & Schegg, 2006) which reviewed 57 of these relevant to the tourism domain. Thereby, they could identify a total of 14 projects with a specific focus on the *on-site phase*. Many differing services are offered by these systems, such as location-based tour guides (e.g. Anegg et al., 2002; Hinze & Voisard, 2003), interactive route guides (e.g. Wohltorf et al., 2005), access on local event-, nightlife-, restaurant-, shopping-, and sightseeing information, to name a few (Berger et al., 2003). A prominent recent project is etPlanner (Höpken et al., 2006), a mobile information system for tourists, supporting both recommendation, adaptation and personalization functionalities on a wide variety of content, including event-, accommodation-, gastronomy-, weather-, and transportation information. The project promotes adaptation functionalities in terms of mobile device (multi-modality), content (multilingualism, user-based content adaptation) and process. At a general application level, Hess et al. (2005) classified mobile information services by means of a generic service market process model (Figure 1).

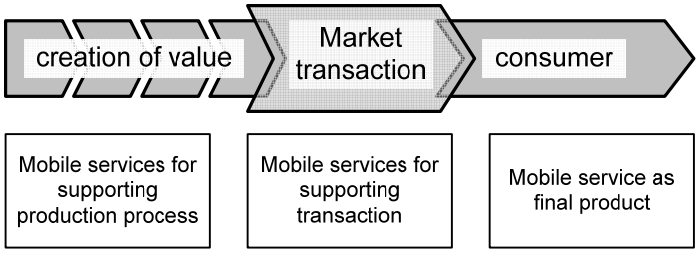

Fig. 1 - Application Areas of Mobile Information Services (Hess et al. 2005)

Similarly, one can differentiate for the tourism domain between mobile information services that support a specific market-transaction phase, such as information, agreement, settlement and after-sales (Rayport & Sviokla, 1996) and those information services being defined as final service products having clear economic values and prices. For the empirical evaluation purpose presented below, however, the focus lies on mobile information services supporting market transactions. Furthermore, tourism literature suggests the coverage of information requirements along the phases of the tourist *life-cycle*, namely, the pre-trip, the on-site and after-trip phase (Werthner & Ricci, 2004). For the below discussed approach the focus lies on mobile information services supporting solely the on-site phase (Rasinger et al. 2006).

The following discussion intends to classify mobile information services according to their core *functionalities.* Liang and Wei (2004) developed a typology for mobile information services concerning the core attributes, namely *mobility* and *reachability*. In this regard, they identified a total of six basic types of mobile information services: *Time-critical* services exploit the reachability property of mobile users for providing emergency and time-critical services. *Location-aware* services create value particularly through the identification and exploitation of the current user's location. *Identity-enacted* services make use of the technological ability to actually identify and authenticate mobile users (thereby, for instance, allowing to conduct financial transactions). *Ubiquitous communication* and *content delivery* services facilitate personal contact to various information sources anytime and anywhere. Finally, both *business process streamlining* services and *mobile office* services create value through supporting or enabling business processes. Similarly, however on the functionality-level, promising functionalities for future mobile information systems have been suggested by various authors. In particular for tourism related mobile information services these functionalities can be described as *search & browse* functionalities, value adding functionalities, such as *recommendation* and context-aware *push*-functionalities (Staab & Werthner, 2002), *mCommerce* functionalities, such as reservation, booking and payment (Barnes, 2002) as well as *feedback* functionalities (Forum, 2005). Employed as a categorization scheme, these functionalities successfully supported the below presented qualitative approach to discover potentially accepted mobile information services in tourism.

3. A qualitative approach to discover accepted mobile information services in tourism

During their on-site phase tourists usually satisfy their information needs by posing specific questions at particular points of information (Wöber et al. 2003; Rasinger et al. 2006). Thus, in a very first methodological step a total of 16 interviews with representatives of the various information points have been conducted in order to record typical information requirements most often articulated by tourists. For acquiring this data, qualitative (i.e. semi-structured) interviews have been conducted in the capital city of Tyrol (Austria) during September 2005 at prominent face-to-face information encounters (e.g. tourist information points, highway welcome centres, taxi, airport, etc.).

The following information typology distinguishing between archetypical information needs was used to structure the obtained answers: *Hedonic* information (Dhar & Wertenbroch, 2000), *surveillance* information (i.e. satisfies the need to understand the environment relevant for well-being), *guidance* information (i.e. satisfies the need to know which alternative is best), *performance* information (i.e. satisfies the need to know how to behave to get the highest possible performance from a chosen alternative) and *reinforcement* information (e.g. satisfies the need to boost one's confidence) (Atkin, 1973). Finally, the empirically gathered information requests of tourists (i.e. 290 statements) were mapped as shown in Figure 2 according to both the corresponding information-need (Raffée and Silberer, 1981) and the corresponding tourism product on the *tourism value chain* it refers to (Bieger, 2005).

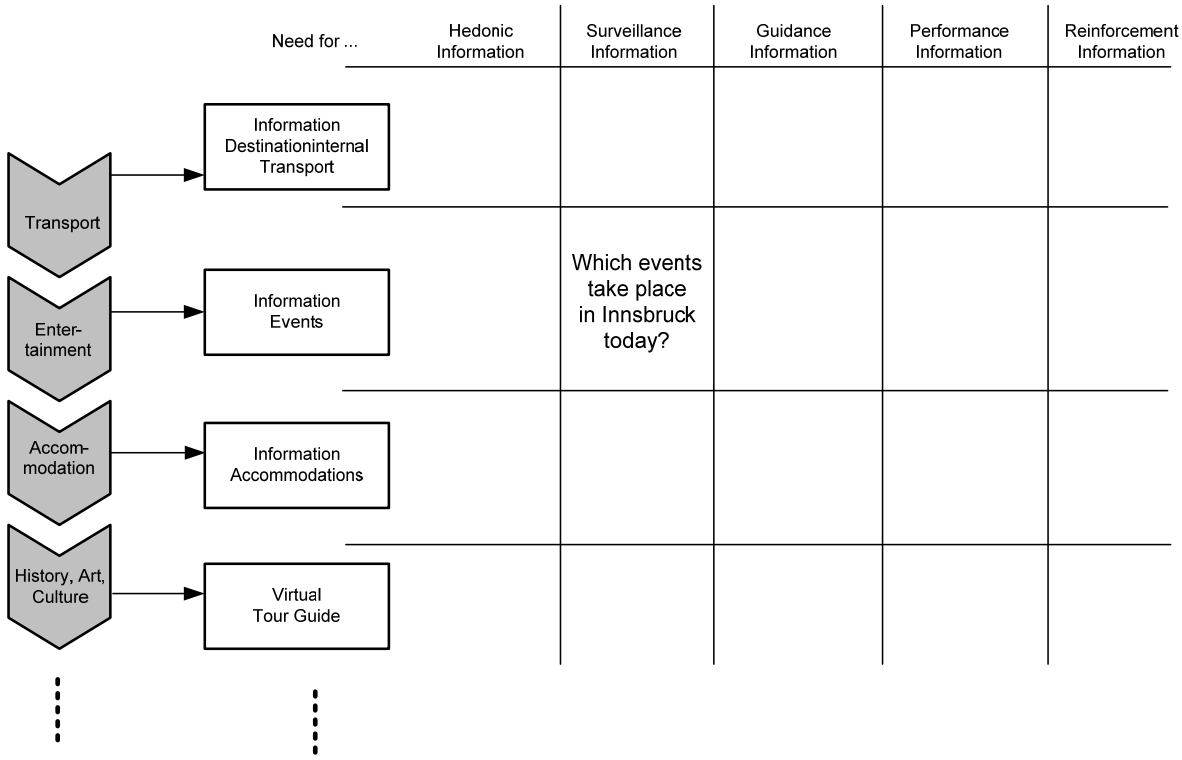

Fig. 2 - Mapping of Information Needs to Information Services (Rasinger et al. 2006, p. 37)

In doing so, a total of twelve differing information services to support tourists during their destination stay emerged, namely: (1) transport information, (2) accommodation information, (3) security information, (4) event information, (5) information on recreation offers, (6) gastronomy-nightlife information, (7) information on sights (8) information on hiking and skiing tours, (9) car-rental information, (10) information about currency & money exchange, (11) sports information and (12) information on day-trips. Although these findings support the categories described in Pröll and Palkoska (2002), it has not been identified so far as to how the information support should be realized by means of *mobile* devices. Put differently, no insight on the particular functionalities was provided at this stage. Therefore, as described in chapter two the most promising functionalities for future mobile information systems have been considered, namely *search & browse* functionalities, *recommendation* and context-aware *push*-functionalities (Staab & Werthner, 2002; Beer et al. 2007), *mCommerce* functionalities (Barnes, 2002) and *feedback* functionalities (Forum, 2005). The idea was to relate the tourists' information needs to the above stated functionalities. For instance, the need for surveillance information can typically be covered best by *search & browse* functionalities. Additionally, also context-aware *recommendation* as well as *push*-functionalities may ideally help to satisfy this specific information need (Staab & Werthner, 2002). Table 1 summarizes the coverage of tourists' information needs through specific functionalities of mobile information services (Forum, 2005).

Types of Information needs	Search & Browse	Recommendation	Context-aware Push	mCommerce	Feedback
Hedonic Information	x				
Surveillance Information	x	x	x		
Guidance Information		x	x		x
Performance Information			x	x	x
Reinforcement Information		x			x

Tab. 1 – Coverage of information needs through functionalities of mobile information services

It should be stated that Table 1 may only be interpreted as suggestion for most plausible relationships between tourists' information needs and the corresponding (i.e. most convincing) functionalities of mobile information services. Thus, in order to record people's attitudes towards tourists' information search with mobile devices, additionally, *focus group interviews* have been conducted in fall 2005 with a total of 17 individuals from different European countries (i.e. Italy, Germany and Austria) (Krueger, 1998). The opening question at the group discussion was: "*Imagine getting a mobile device from your hotel in order to support your destination stay. Which information would be of main interest to you?*" Firstly, interestingly enough, relatively strong scepticism towards mobile information services became apparent. According to literature (BCG, 2000; Accenture, 2001) the main barriers and limitations, such as display size, bandwidth, I/O-interface, stability, durability, connection quality and costs were immediately emphasized.

Nevertheless, the participants also came up with promising ideas. A first suggestion was a navigation system designed as a mobile version of *GoogleEarth* allowing to freely '*search & browse*' in the virtual space to obtain information about streets, restaurants, sights, shopping-possibilities, POIS (points of interest) and buildings and public exhibitions. Furthermore, a mobile tourism information system should calculate routes not only for car usage but in particular also to support exploration of city-destinations by foot. Secondly, an emergency service helping users to get assistance in case of (e.g. car) accidents, traffic-jam or natural disasters was proposed (*Service No. 13*). Furthermore, a mobile platform supporting full-access to the shopping possibilities of a tourism destination was emphasized (*Service No. 14*). Finally, a mobile *search & browse* service was discussed which should offer fast internet access to ensure the searchability of 'typical internet information' such as, weather information, dictionaries, local news, news from the home country and phone numbers (*Service No. 15*). The results from the above qualitative surveys have been used to put in concrete terms various concepts for mobile information services. This led to a list comprising a total of 15 differing mobile information services to be used by tourists during their destination stay. Due to size restrictions only a selection of six mobile information services will be described in more detail below (see Table 2).

	Search & Browse	*Recommendation*	*Context-aware Push*	*mCommerce*	*Feedback*
Transport	Routing service, incl. public transport	Inclusion of local position, daytime, traffic into the routing	Actively informs on delays	Booking public transportation (i.e. ticketing)	-
Event	Event search by keywords, Category-based search	Automated search for events nearby, recommendation	Active informing on relevant events, delays or cancellation	Booking events directly	Reading and giving feedback for/to specific event
Sights	Search sights, museums, historic info., etc. by key words, category based search	Automated search for sights nearby, recommendation e.g. "what to see"	Active informing on important sights along the way, tour-guide functionality	-	Feedback on sights, museums etc.
Gastronomy	Search for restaurants by key–words, category based search	Automated search for restaurants nearby, recommendation	-	directly making reservations	Reading and giving feedback for/to specific restaurant/pub/…

Weather & News	Weather forecasts and news	Recommendation of news most essential to the users	Active informing on weather and news.	-	-
Security	Browse for risks/ threats at specific locations or when pursuing activities	Risks/threats at current position at current time	Active informing on acute threats (e.g. storm)	-	-

Tab. 2 - Mobile Information Services qualitatively deduced from typical Tourists' Information Needs

4. Exploring Mobile Information Services: Results from an Expert Survey

Bogner and Menz (2005, p. 7) summarize the advantages coming from the qualitative expert-survey approach as follows. Firstly, expert surveys save extensive research efforts by allowing rapid initial access into a specific research subject-matter. In doing so, they also help to *canalize* research in a very reasonable way. Secondly, results from expert surveys are rapidly available as experts can relatively easy be convinced to participate at the survey. In particular, they are better motivated because they better understand both, the meaning as well as the relevance of the undertaken survey. Thirdly, also an important methodological advantage is mentioned. It stems from the much more simplified communication relationship with experts as they most often show excellent social as well as linguistic competencies. To summarize, Meuser and Nagel (2005) are defining experts as "(…) *individuals, which are themselves part of the field of action related to the object of research* (…)" (ibid. p. 73). Put differently, whether someone may be defined as an expert is mainly dependent on the concrete research endeavour at hand.

The now presented expert survey was conducted by the means of non-moderated standardized *online questionnaires* addressed to a totality of 40 international experts in the academic and industrial field, both with tourism and an 'e-tourism' background (Werthner & Ricci, 2004). The experts were first asked to rate the listed mobile information services in terms of their relevance for city tourists using a 6-point Likert-scale (i.e. 6 = highest relevance 1 = no relevance at all). In order to avoid systematic bias, the position of the mobile information services in the evaluation list was randomly changed for every questionnaire. Furthermore, the online questionnaire automatically led the experts to rate those five services in more detail which had been ranked as most relevant. For this aim, each mobile information service was described by the five functionalities already discussed above. To follow up in more detail, they comprise the *search and browse* functionality providing a user-triggered search process for retrieving content explicitly initiated by the (e.g. mobile) user. The basic methods are "keyword search on structured data" and "directory based browsing" (e.g. Sights > Churches > St. Paul's Cathedral). The *push-functionality* automatically delivers information to the user (i.e. tourist) *without* explicit requests (Staab & Werthner, 2002). The information push is mainly triggered by contextual events, such as changes in the user's location or opening times of attractions (Beer et al. 2007). The *recommendation-functionality* satisfies the individual information need to know which alternative is best according to a specific purpose (i.e. recommending those tourism products that are most relevant to tourists by taking into account their specific tour history). Furthermore, *mCommerce-functionalities* allow the user to initiate transactional processes such as reservation, booking or ticketing (Barnes, 2002). Finally, the *feedback-functionality* enables users to share tourism experiences and to annotate objects of interests with comments and/or evaluative ratings (Forum, 2005).

Following, in a very first step, mean values from the relevance ratings attached to the various mobile information services as well as to the corresponding functionalities were compared. Figure 3 displays the relative distribution of the experts' relevance estimations concerning different mobile information services for tourists in major urban (i.e. city) destinations.

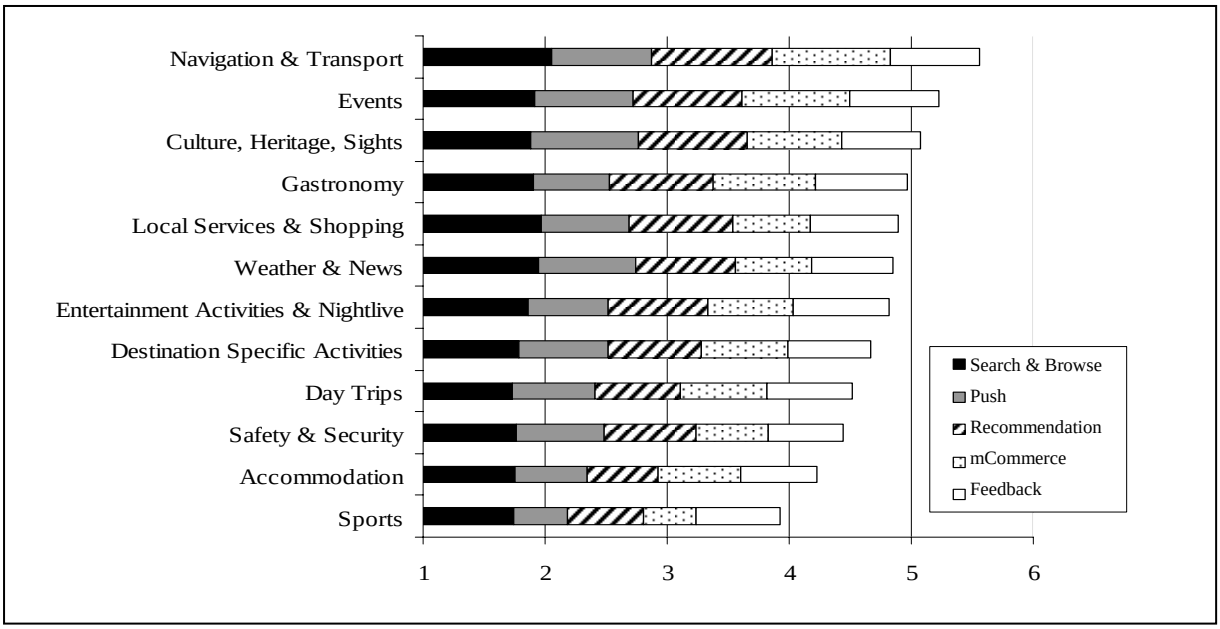

Fig. 3 - Expert rating of mobile information services for tourism

A first finding at a very general level is that mean values are ranging relatively high between 3.9 and 5.6 (i.e. 6 = highest relevance). Data stem from 30 international tourism experts, thus building a highly satisfactory rate of return amounting at 75%. Interestingly enough, data suggests a rather even distribution of the functionalities among the various mobile information services under study. In a next step, hierarchical clustering technique based on the *Mahalanobis* measure of similarity was applied (Hair et al. 2005). Furthermore, Ward's Method was applied to group the 30 experts into three homogenous groups (see Figure 4 and Table 3).

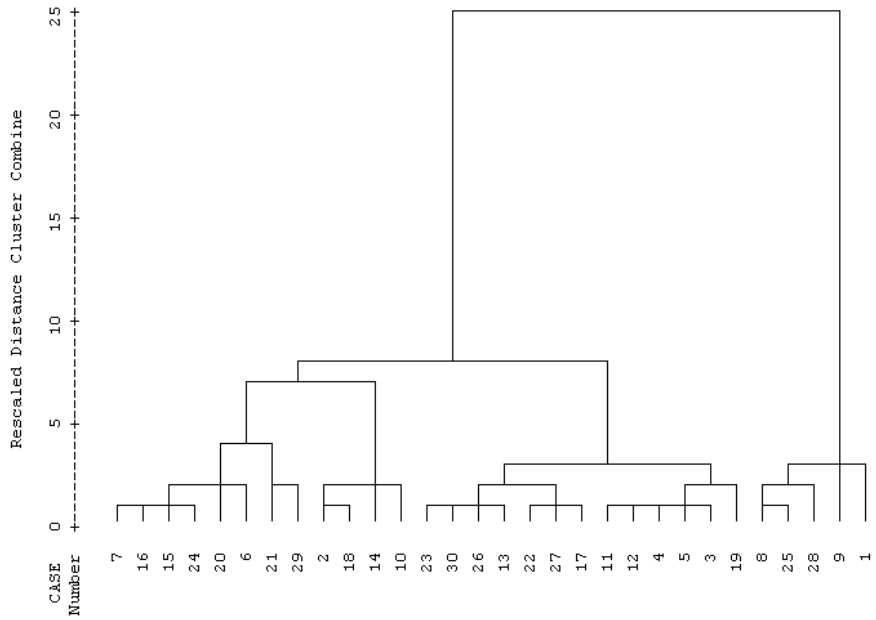

Fig. 4 - Dendrogram using Ward Method

In doing so, 13 experts could be allocated to the first cluster characterized by high mean values throughout all the service evaluations (i.e. *optimists*). Cluster two, however, is formed by 12 experts characterized by differentiated assessments with respect to mobile tourist guides. While in an urban (i.e. city) destination context members of cluster two have high expectations for mobile services in the field of 'gastronomy', 'events', 'navigation' and 'nightlife', the same experts attach relatively low relevance values to mobile 'accommodation' and 'sports' guides, respectively. The remaining minority of 5 experts shows a rather low general expectation when looking at the relevance of mobile information services in a city destination context (i.e. *sceptics*).

MEAN	Cluster 1 *Optimists* (N = 13)	Cluster 2 *Differentiated* (N = 12)	Cluster 3 *Sceptics* (N = 5)	AVERAGE MEAN (N = 30)
Navigation & Transport	5.85	5.58	3.40	5.33
Safety Security	4.77	4.25	3.40	4.33
Weather & News	5.54	4.33	4.00	4.81
Events	5.46	5.33	3.80	5.13
Gastronomy	5.15	5.08	3.00	4.77
Sights	5.62	4.83	3.00	4.87
Accommodation	4.92	3.83	3.20	4.20
Shopping & services	5.54	4.75	2.60	4.73
Day trips	5.23	4.17	2.60	4.37
Spec. dest. activities	5.38	4.42	2.40	4.50
Sports	4.85	3.25	2.60	3.80
Nightlife & Entertainment	5.08	4.92	3.40	4.73

Tab. 3 – Relevance Score Values among Expert Clusters

For the four 'top-ranked' mobile information services, namely "Navigation and Transport", "Events", " Culture, Heritage, Sights" as well as "Gastronomy" Figure 5 gives further insights into the assessment distribution obtained from the thirty experts.

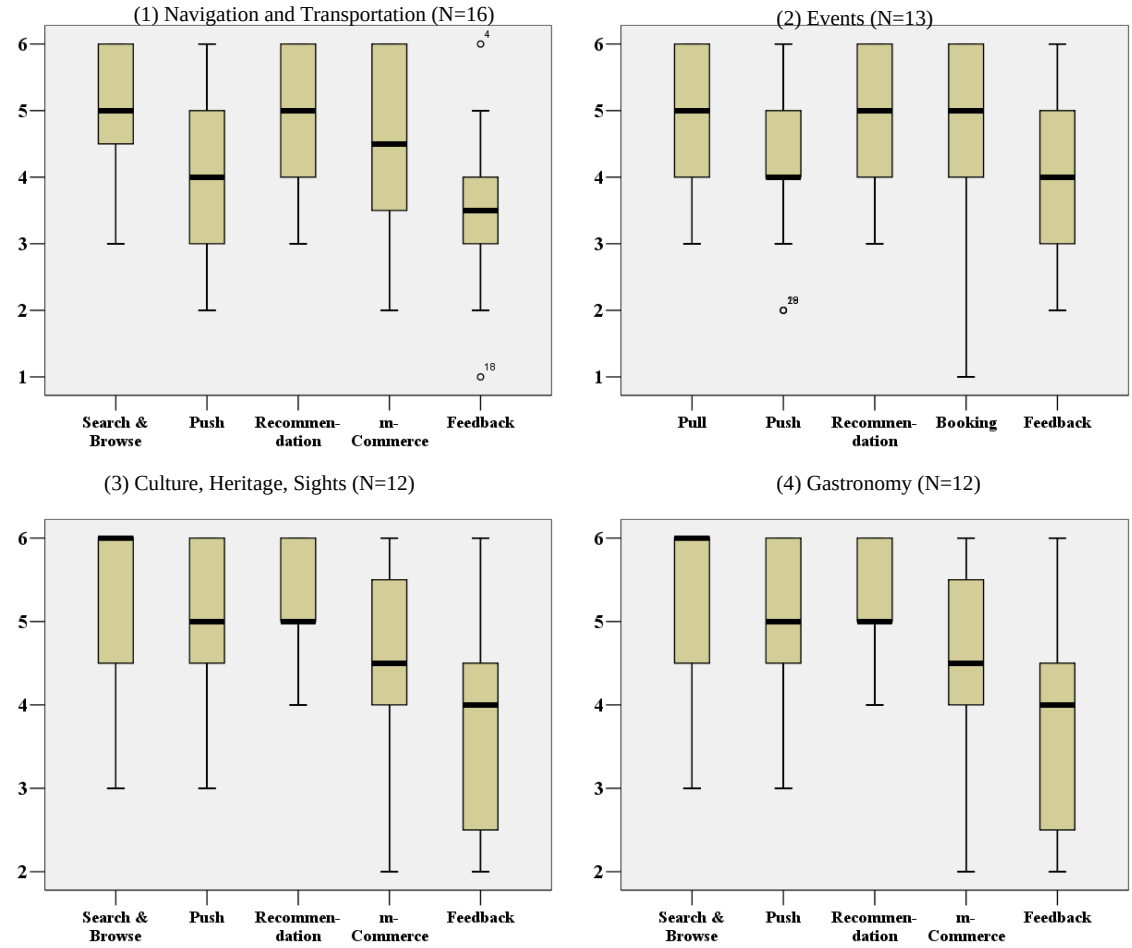

Fig. 5 – Box-Plots Top-ranked mobile services

The depicted Box-plots are reflecting a relatively large variation of the given assessment ratings. Nevertheless, it should be stated that the sample size is not large enough to be interpreted as 'representative' in a quantitative sense. Rather, mean values are used solely to aggregate experts' *evaluation tendencies*. Thus, it could be observed that mean values corresponding to *pull*, *push*, and *recommendation* functionalities are consistently high throughout all the different mobile information services. In contrast, both, *mCommerce* and *feedback* functionalities have been rated a being less relevant for mobile applications in a city destination context.

5. Implications for a prototypical implementation

The emerged results from the expert surveys have been incorporated into the design and development of a prototype for a mobile tourist guide (Höpken et al., 2006). In the course of the *etPlanner* project the above presented emerging set of mobile services supporting tourists during their city stay has been implemented. More precise, in accordance to the assessments delivered by the tourism experts, mobile information services related to "*sights*", "*events*", "*gastronomy*", and "*weather*" have been considered in the developed prototype. However, as "*Navigation & Transportation*" services don't lie in the technological focus of the *etPlanner* project so far they have been omitted. Interestingly enough, the mobile information service related to accommodation products was rated as being relatively unimportant by experts, but was one of the top-ranked services by tourists (i.e. future end-users) (Rasinger, 2007). Therefore, a mobile *accommodation* search service was also added to the service portfolio of the etPlanner prototype. Furthermore, expert-estimations were considered also with respect to the functionality configuration among the mobile information services in question. More precise, next to a basic "*search and browse*" functionality, "recommendation" functionalities have been implemented for the mobile "*events*" and "*sights*" services, respectively. Finally, tourists can subscribe to a mobile *push* service delivering relevant information about sights and events during the city stay (Beer et al. 2007).
In order to do an extensive field test for the *etPlanner* prototype, a test-instance for the city destination of Innsbruck (i.e. the capital of Tyrol) was set up. In particular, product design (i.e. branding) as well as corresponding promotional material (e.g. flyers, posters, etc.) was adequately realized. The undertaken field test for www.innsbruck.mobile.at (Figure 7) focuses mainly on Austrian city tourists and has started in November 2006 and will continue until March 2007. Average access rates for the prototypically implemented tourist guide are ranging from 800 to 1,000 users per month.

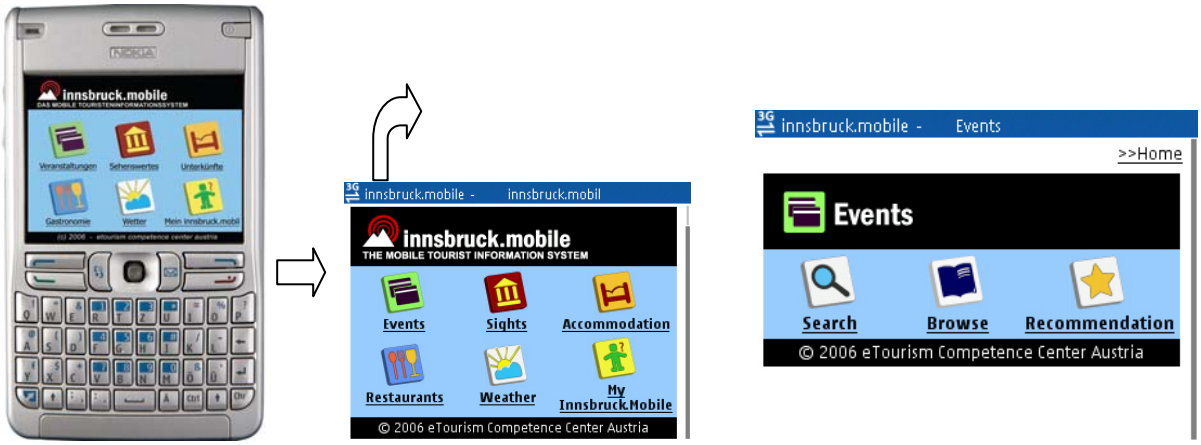

Fig. 6 - Innsbruck.mobile on a *Nokia E 61* (www.innsbruck-mobile.at)

6. Conclusion and Outlook

The purpose of the paper was to empirically explore suitable concepts for mobile tourist guides which would satisfy city tourists' information needs particularly occurring during destination stay. To cope with this challenge typically occurring at the *pre-prototype* phase, qualitative surveys (i.e. focus-group and expert interviews) have been employed. The latter provided a ranked list of potentially accepted mobile information services during one-site stay. In addition, first insights into the complex functionality configuration among the various mobile city guides empirically emerged. Although presented elsewhere (Rasinger et al. 2007), a representative final-user evaluation (N = 705) confirmed the great majority of the results obtained from the experts surveys (Amberg et al. 2004). More precise, again in the *pre-prototype* phase potential users (i.e. tourists) have not evaluated the mobile guide per-se, but rather have assessed the '*pictorial image*' they had in mind of a specific mobile information service. In turn, as presented in this paper, these results formed the base for defining clear requirement specifications to be used for the development of a testable web-based prototype of a mobile city guide (Höpken et al. 2006; www.innsbruck-mobile.at). In order to optimize mobile tourist information systems, future research should primarily be focussed on the comprehensive evaluation of the tourists' usage behaviour. For this specific aim, new types of *technology acceptance and usage models* developed particularly for mobile information systems should be applied (Kaasinen, 2005; Köhne et al. 2005; Rasinger et al. 2007).

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