Concept for a multimodal business travel portal: Identification of a holistic business travel process and the required functional building blocks

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Abstract

Business travels are an important component of our economy and essential in a globalized world. However, to date there are no business travel portals which support travelers over the holistic travel process – before, during and after the trip. Thus, the aim of this work is to define the necessary clusters of services (building blocks) for a business travel portal that allows the traveler to satisfy his/her mobility needs by a single self-service portal.

Through the structured analysis of business travel use cases this research identified seven building blocks to provide full support in all phases of the trip. Before the journey begins travelers have to be supported by routing (geographical routes and selection of adequate transport modes) and booking services. During the trip the travelers need navigation services, a real-time itinerary and payment tracking services. After the trip services for the travel expenses and a mobility reporting are required.

1. Introduction

Mobility is a foundation of modern society and economy. The growing need for mobility in private and business life becomes a challenge for humans and the environment. Sustainable mobility concepts have to deal with customer needs and cost efficiency - this applies for rural areas as well as the city. Actual ownership of motor vehicles declines in importance while car-sharing models increasingly reflect the spirit of modern life. A sustainable mobility concept has to combine various modes of transport also involving adjacent areas of mobility like accommodation or telecommunications. Especially business mobility has not yet been studied sufficiently and the development of appropriate concepts is an upcoming challenge.

Regardless of the often proclaimed telecommunication offerings (like video conferences etc.) business travel remains a prerequisite for business success in a globalized world. In many cases business travel expenses represent the second or third largest cost in the company (depending on the industrial sector of the company). German business travelers spent around 48.2 billion euros in 2013 on 171.1 million business trips. This is an increase of about 3% compared to the year 2012 [1].

In order to identify and realize cost saving potential companies are increasingly looking for technological solutions in this area. Self-booking tools are a promising way to increase efficiency. They enable the traveler to meet his/her mobility needs without requiring human resources within the company or the costly services of a travel agent. However, today’s travel portals cover only part of the process of a business trip and leave further automation potential untapped. Although there are a variety of separate solutions for different process steps, these are often not integrated or not compatible with another.

The focus of previous research is mainly on the identification of the traveler’s information needs for multimodal journey planning in the private travel sector. Business travel, however, differs in several aspects. For example, the purpose of travel is determined by external factors and the cost of the trip is not borne by the traveler personally. As such it can be assumed that business travelers require additional or other services compared to private travelers. Therefore it is essential to analyze the specific business travel needs to develop products which are specifically aligned to the demands of this target group.

To address this issue, this paper poses the question: What are the essential building blocks of a holistic multimodal business trip planner supporting the business traveler before, during and after a business trip.
To identify the necessary building blocks of a multimodal business trip assistant two fields of research are examined: the state of research on **business travel** and the specific requirements for **multimodal travel portals**.

Previous research in the area of business travel needs to be considered for its findings regarding standard processes, stakeholders and design requirements. The analysis of multimodal travel portals is important to derive insights from private travel providers which may be transferred into the business travel domain.

The result is an overarching concept for a business travel portal which holistically supports the business travel process end-to-end. As proof of concept the findings were tested through interviews with senior experts in the business travel domain. The paper closes with an outlook to further research, an explication of its limitations and a conclusion.

### 2. Review of the Literature

The literature specifically on business travel is scarce. The available papers mainly cover questions of volume, segmentation of travelers, developments of participants in the business tourism market and how to attract business travelers to specific regions.

As such, a review of the literature on business travel has to cover multiple sources: academic as well as practitioner journals but also internet resources dealing with the issue. The participants of the business tourism market, as well as the typical business process have mainly been discussed by practitioner’s literature. It is sufficiently explained which providers of business tourism services (transport company, lodging company, intermediaries) exist and who the buyers of these services are (business travelers, companies). Academic research is focused on the characteristics of the market actors, their goals, relationships, and, influences that exist in the tension of business tourism [2,3,5]. However, the specific question for the necessary building blocks, which a holistic multimodal business travel has to include, is only partially answered by the existing literature.

The focus of research regarding IT systems in business travel management is predominantly on systems which allow the booking of the classic tourism service providers (hotel, flight, train or rental car). In addition they cover only a portion of the entire business process (especially pre- and post-processing of travel). [6,7] These systems are called online booking engines. In literature the optimization potential for business travelers compared to conventional tourism bookings through travel management companies (via phone, fax, e-mail, etc.) is highlighted frequently [8].

Another relevant stream of research refers to the general requirements placed on multimodal travel portals. It is already explored, what information needs to be covered by multimodal planning portals but without much detail in the specific case of business travelers.

Consolidating the current state of knowledge the question remains unanswered how to define the functions which a business travel portal must offer to support the business traveler during all phases of the journey – pre-, on- and post-trip.

### 3. Business Travel Process

If a business trip is segregated into a sequence of processes it can be divided into three main sections according to the "phase diagram of travel" by Freyer [1]: travel preparation (pre-trip), travel processing (on-trip) and travel follow-up (post-trip). This phase diagram is the procedural view on a journey. In the context of travel management is often spoken of an "end-to-end" process – the processing and/or control of the whole process. The term "end-to-end", which refers to the processes, should not be confused with the term "door-to-door", which refers to the coverage of all the different geographical sections (see Figure 1). Subsequently the individual phases will be discussed and typical features highlighted.

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**Figure 1: Phases of a business trip**
The planning phase (pre-trip phase) for business trips – in contrast to tourism travel – takes only a few hours or days [3]. In this phase, decisions regarding means of transport or accommodation will be made on the basis of more or less intensive information gathering. The scope of information gathering is determined by the duration of the trip, the distance and the number of destinations to be visited [4]. Business trips mostly consist of individually arranged travel packages. The individual elements of the journey (transport, accommodation, etc.) are planned and booked as comprehensively as possible. After obtaining information (flight schedules, expenses, etc.), the fundamental decision is made whether travelling or not. Transport or accommodation is usually booked or reserved prior to departure, but also incomplete preparations (e.g. flight without hotel) are encountered in practice [5]. Depending on the organization within the company, this phase is done independently by the business traveler or an assistant or under the inclusion of a travel management company [4]. Studies show that business travelers usually feel comfortable if simple bookings can be performed via travel booking portals by the traveler her-/himslef [6]. In addition to the objective of cost containment companies increasingly implement such systems for that reason. After booking, the traveler receives the travel documents. These consist almost of electronic tickets nowadays [7].

The on-trip phase starts with the actual departure, defined by leaving the apartment or workplace [3]. The on-trip phase is characterized by taking place mainly outside of the habitual abode. This phase consists of at least transportation (round trip within a day) and possibly accommodation at the destination [4]. A major concern of international travelers is the loss of productivity while traveling. So they perceive the occurrence of flight delays and cancellations as serious aspects [8]. These interruptions can lead to direct costs (e.g. costs for alternative flights or additional accommodation and meals) as well as indirect costs due to missed business opportunities and the loss of time in case of excessive waiting times at airports, time that could otherwise be used for productive work [9]. Therefore especially business travelers will benefit from services that facilitate early notification in such situations in order to schedule their time better. However, not only the notification of changes are essential. Also detailed information on the estimated duration of the delay as well as regular updates of the status are needed [10]. The use of mobile technology is a valuable enabler for mobility providers like airlines to improve customer relationships. Electronic tickets, online check-in services and bar code boarding passes help saving time for the business traveler - before the flight and at the airport [8]. During travel arising costs are mainly paid by credit card (corporate card or personal credit card) or sometimes cash. If the payments were not paid by the corporate card, invoices and receipts for expenditures must be archived so that they can be attached to the travel expenses for reimbursement and accounting [7].

The post-trip phase consists of billing and reimbursement of travel expenses. The expenditures paid by corporate card should automatically be detected by the cost accounting system. Cash payments and payments with a private credit card must be recorded manually. In the case that no accounting system is available all spending would need to be captured manually [4].

4. Specific requirements of multimodal travel

This research focuses on multimodal journeys. This means that on a trip several modes of transport are used [2]. Literature also refers to this as mobility chains, which represent the individual link of means of transport and information to overcome spatial distance [10]. Therefore, several linkages - also known as traffic stations- need to be included in one itinerary. Traffic stations are facilities that must be visited for the usage of a transportation mode. They also represent interfaces when changing from one transport mode to another [10]. Multimodal trips can be divided into three sections (see figure 1). The first route section is the way from the starting point (e.g. place of work) to a transport station (e.g. airport). Usually this section of the journey is a short-haul section. The subsequent main section is the longest distance (long-haul, e.g. airport-airport), in the travel chain which is done using the main mode of transport (e.g. airplane). The last section is like the first route section a short-haul to the final destination. The coverage of all partial sections between start and destination is referred to as “door-to-door”. The distance covered in the subsections is not necessarily in accordance with accumulating time or expense. Thus, for example, the trip to the airport could cause a similar amount of time compared to the subsequent short-haul flight. At the destination itself further transportation modes like rental cars or public transport are used. However, it must also be noted that a large part of business travel is conducted using motorized private transport. Thus, there is no transfer
between modes. This case it is not called a mobility chain [11].

**Multimodal planning portals** are IT-systems that can create trips and routes from sequences of different modes of transport. This implies that such travel portals have to have access to timetables and flight schedules of public transport (bus, train, plane, streetcar, subway) and transport networks (roads, footpaths, cycle paths) for private transport (car, on foot, bicycle). To specify the requirements for multimodal travel portals Zografos et al. (2010) evaluate various travel planning portals, which are available in Europe, China and Japan [12]. They developed hypotheses regarding the information needs of multimodal travelers and verified them by a survey among 50 people. For this study relevant results from this study are presented below combined with results of similar studies:

**Personalization:** A multimodal travel portal must be able to be personalized and tailored to the individual profile of the user. The customization involves two aspects: personalization of route generation and provision of personalized information while traveling. Customization regarding routing means that the route is created under the inclusion of user preferences. Therefore numerous parameters need to be considered which have a significant impact on the perceived quality of the route and also on the user acceptance. Such parameters are for example preferred or excluded modes of transport or the maximum number of changes [13]. The information processing should be individual tailored to the user and the travel situation. Factors which are determining the information needs of travelers are time and day, purpose of travel, travel time and distance, and personal factors (gender, age, education, disabilities, etc.) [14]. A lack of information depth can especially be a barrier if the trip leads in an unfamiliar environment and the traveler needs additional information about the transport system.

A multimodal travel portal needs to adapt the information needs of the user so that she/he can decide how much information is needed [12]. This need is in contrast to most of the current information systems of public transport, which provides information primarily for the general public [13].

**Route selection and optimization:** Trip optimization is usually done based on only a single criterion (e.g. fastest or most cost-effective route). Thus, it is left to the user to assess alternative routes based on a second or multiple criteria [12]. This has to be regarded as particularly critical, if the sections can be assigned to several modes of transport resulting in a high number of possible alternatives [15]. The studies of Kenyon and Lyons (2003) showed that the choice of transport mode is influenced by experience and depends on a subjective assessment of the suitability of the means of transport [16]. Through the preparation and presentation of multimodal travel chains the advantages of alternative transport come up clearly which may lead to a reconsideration of the transportation habits of the traveler [16].

**Orientation information:** Possible interceptions during a multimodal trip (e.g. modal shift) result in an increased information need as the traveler has to orientate on each traffic station and has to find the correct connecting transport mode. Access to the most current and accurate information is particularly important on international trips and in an unfamiliar environment [12, 13].

**Geographic and intermodal related coverage:** A fully comprehensive geographical and modal coverage is the base of multimodal travel portals. Today, cross-country routes in neighboring countries are usually possible as is long-distance transport (e.g. aircraft). However, international and comprehensive integration of all possible modes of transport including a booking function are commonly regarded as elementary services of multimodal travel portals [12].

**Real-Time Information:** Real-time push-information is an essential service for smooth and trouble-free journey [12]. Thereby the traveler has the opportunity to respond to unexpected interruptions ad hoc. Also Baptista et al. [17] noted that the lack of real-time information lead to enormous uncertainty among travelers. Especially the inclusion of real-time information - such as the current traffic situation - for dynamic route planning increases the quality of travel. For international travelers, this is a central service as the traveler is in an unfamiliar environment with different kinds of uncertainties caused by a foreign transport system [12].

5. **Research Methodology**

This research on business travel portal development aims to identify the functional building blocks of a holistic business travel portal. As such it is a case of design science research which is less suitable for analyzing existing concepts, but for the creation of something new. In design science research knowledge is generated through the creation of
artifacts like models, methods or prototypes [18]. Based on the approach proposed by Hevner et al. this work is structured as shown in Figure 2.

A basic requirement for identifying the relevant functional building blocks is to determine the business travel specific services in order to create additional value to existing travel portals. Therefore the business travel process has to be analyzed for specific characteristics which differ from private travel requirements. This task was facilitated by the investigation of typical business travel use cases along with a literature review covering the relevant research in business travel and the development of multimodal journey planning systems. The description of the use cases is conducted based on a template of Cockburn [19]:

**Name and Identifier:** Indication of name and an identification number.

**Involved Roles:** Organizations or persons who are involved in the travel process

**Start event:** The reason which triggers the application.

**Input information:** Information which must be present for the application and further actions.

**Process:** Description of the typical flow scenarios of the use case

**Output information:** Information which is generated after successful processing of the use case.

**Special Considerations:** Explanations which contribute a better understanding or define further conditions

**End-Event:** The event which is expected after a successful run of the use case.

The use cases are examined for repetitive activities and information needs which can be summarized into activity clusters. These clusters form the basis for the functional building blocks.

The building blocks were validated by a group of senior experts in travel management as well as number of experienced business travellers in quantitative interviews.

### 6. Typical use cases of a multimodal business trip

After explicating the travel process and the necessities of a multimodal trip assistant for business travelers the next step is to define the functional building blocks to identify value propositions. This is done by modelling use cases of a typical business trip. On the base of these use cases typical travel situations can be identified and necessary features derived. A use case describes an agreement that is reached between the stakeholders of a system with respect to its behavior in order to achieve a defined goal. It thus captures the behavior of a system taking into account different conditions, by responding to a request of stakeholders [20].

The travel depicted in figure 3 is representative for a typical multi-modal business trip.
The depicted modes include the traditional travel service providers (air, train, car) as well as new transport modes which increasingly gain relevance in the context of modern mobility (public transport, car sharing, corporate car-sharing). It is assumed that the traveler gathers information about the transport systems before departure as comprehensively as possible and executes all bookings prior to departure (as possible). The travel process adheres to three factors which impact the whole travel process but cannot be reflected in full by the use cases:

**Mobility Infrastructure**: All physical facilities which are included in the travel process (e.g. airports, railway stations, roads), as well as technical facilities which impact the process (e.g. online check-in, online booking) are travel dependent. The traveler can only use the existing infrastructure between start and destination. In addition the traveler can only make use of technical equipment the company provides (e.g. online booking engine) or has access to it (e.g. smartphone), or the specific provider offers certain services (e.g. online check-in). Also individual transport modes (for example corporate shuttle services) were not considered in the use cases.

**Corporate Travel Policies**: Company guidelines are company specific and can have very diverse content. The traveler can only make decisions within these guidelines, therefore they must be taken into account when designing the services of a travel portal.

**Personal Preferences**: The journey design depends to some extent on the individual preferences of the traveler. These preferences can affect a variety of dimensions such as the choice of transport mode, the provider or the route itself.

These factors are in a hierarchical order: (a) The mobility infrastructure represents the fundamental factor. It defines the extent to which the portal suggests routes in consideration of the available modes of transport. (b) The corporate travel policy may reduce these options or dictate specific modes/routes. (c) Within these limiting factors the traveler has the opportunity to make decisions based on individual preferences.

The use cases cover the overall process of business travel on a high level of abstraction. Through structured capturing of the travel process recurrent processes and information becomes evident. Also dependencies between use cases emerge. It will become evident in which situations the travel portal can provide support. The use cases were modeled based on expert interviews and also validated through experts ex post.

### 7. Analysis of the business travel use cases

Through analysis of the use cases it becomes obvious if certain activities occur in a use case recurring. Thereby, it is possible to form activity clusters. Table 1 shows an overview of the relevant information for the design of a business travel portal, and the clusters that have been identified.

<table>
<thead>
<tr>
<th>Activity Clusters</th>
<th>pre-trip</th>
<th>on-trip</th>
<th>post-trip</th>
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<tr>
<td>Planning a trip</td>
<td>X X X X X</td>
<td>X X X X X</td>
<td>X X X</td>
</tr>
<tr>
<td>Booking a trip</td>
<td>X X X X X</td>
<td>X X X X</td>
<td>X X</td>
</tr>
<tr>
<td>Usage of company car</td>
<td>X X X X X</td>
<td>X X X</td>
<td>X X X</td>
</tr>
<tr>
<td>Travelling by air</td>
<td>X X X X X</td>
<td>X X X</td>
<td>X X X X X</td>
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<tr>
<td>Using a taxi</td>
<td>X X X X X</td>
<td>X X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Using public transport</td>
<td>X X X X</td>
<td>X X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Accommodation</td>
<td>X X X X X</td>
<td>X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Using car sharing</td>
<td>X X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Usage of renting car</td>
<td>X X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Usage of corp. carsharing</td>
<td>X X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Travelling by rail</td>
<td>X X X X</td>
<td>X X</td>
<td>X X</td>
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<tr>
<td>Expense reporting</td>
<td>X X X X</td>
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<table>
<thead>
<tr>
<th>Cluster</th>
<th>Routing</th>
<th>Itinerary &amp; Mobility Keys</th>
<th>Mobility Reporting</th>
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<tbody>
<tr>
<td>Booking</td>
<td>Payment Tracking</td>
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</tr>
<tr>
<td>Navigation</td>
<td>Expense Reporting</td>
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</tr>
</tbody>
</table>

Table 1: Activity clusters of a business trip
By analyzing use cases also optimization potential became obvious which should be considered in the design of business travel portal.

**Pre-trip phase**: the use case "Plan a Trip" shows that temporal and geographical coordination of transport modes and accommodations are done Table 1: Activity clusters of a business trip manually by the traveler. The choice of modes of transport and hotels is always influenced by the travel policy of the company and the preferences of the traveler. The traveler must gather planning information on public transport from the airport to the place of the business meeting or hotel. Based on this the traveler decides which traffic stations and transport for the journey are useful and the traveler can begin planning. With the number of intermediate stations the (time) effort of the selection process increases. In addition, the same travel parameters have to be entered multiple times in different information systems. The traveler cannot obtain all relevant planning information from one source. Information on air travel, rail travel, car rental use or hotel needs to be collected from within the company or from online booking engines. For information on public transport, car sharing or corporate carsharing, the traveler must use other specialized portals. All these activities aim to build a complete and time coordinated travel chain. These activities can be summarized to the cluster “Routing”. The goal for the implementation of routing functions in a business travel assistant has to be a completely automated multimodal route generation. Thereby the effort for the coordination and planning process could be minimized. A high degree of automation reduces time and therefore process costs for travel preparation. Also, booking complete travels cannot be executed with a single point of contact. Whether a pre-trip booking is generally possible, depends on the type or provider of the transport mode. If the reservation can only be made during the trip an additional availability check of transport is necessary (e.g. car sharing). Therefore, bookings prior to departure as well as bookings during the journey can be summarized in the cluster “Booking”. Goal of implementing booking functionalities in a business travel portal has to be the creation of a single point of contact. Thereby there is no need for capturing the same data (e.g. destination, dates, etc.) in multiple portals.

**On-trip phase**: At departure, the traveler needs relevant information (e.g. departure times, hotel addresses) on the booked modes of transport and accommodation. As a source of information for travelers tickets and reservation confirmations can be used if they provide all the required details. For complex travels with many involved transport modes and traffic stations the traveler must also have an overview which means of transport are planned for the respective sections. In case of such complex trips managing the tickets and reservations or the information contained therein is a lot of effort. In addition, the traveler must be regularly informed about the status of time-critical transport modes to respond early to unexpected changes like flight delays or cancellations. Managing tickets and reservations thus is closely related to the creation of a complete itinerary with regularly up to date checks. These activities could be combined to the cluster “Itinerary & Mobility Keys”. The use cases also show situations during the trip in which the traveler must identify the best ways especially in the context of changing modes of transport. For example if the traveler changes to public transport after a car ride she/he needs information regarding the closest parking space and from there to the connecting transport. These orientation situations also come up within complex buildings, for example, when the fastest way to the departure gate at the airport must be identified. Thus the indoor and the outdoor navigation can be summarized to the cluster navigation. The collection of invoices is one of the most common activities that occur in the use cases. If the traveler uses e.g. a taxi or fills up a rental car the invoice must be archived in order to add these documents to the travel expense report. Payments can be summarized within the cluster “Payment Tracking”.

**Post-trip phase**: the post-trip phase consists primarily of billing and reimbursement of travel expenses. Expenditure must be categorized and assigned to accounts. The traveler must allocate the relevant invoices and documents to the expenditure. Private spending, paid with the corporate credit card are to be declared in the travel expenses. All these activities have the objective to generate a complete travel expenditure report and can be summarized to the cluster “Expense Reporting”. In the context of travel management the travel behavior of employees is analyzed regularly. Through expert interviews it became clear that the challenge is that the data must be consolidated from various sources (systems, receipts, etc.). The quality of reporting depends on the number, completeness and accuracy of input data. The reporting activities
8. Building blocks of the business travel portal

Based on the findings from the use cases and those described in the requirements for multimodal travel portals the building blocks of the business travel assistant can be defined. The functions can be segregated into seven building blocks, which are influenced by three factors (Mobility Infrastructure, Corporate Travel Conditions, Personal Preferences).

By evaluating the use cases it became evident that the features supported by the business travel portal can be largely associated with the travel phases pre-, on- and post-trip (see Fig.4). To meet the specific circumstances of each phase the portal must be available on different devices. Building blocks which are used primarily in the pre-and post -trip phase must be available primarily via a web portal. Building blocks which are mainly needed in the on-trip phase have to be available for smartphones, tablet PCs etc. Ideally the gps-navigation and communication systems of vehicles (rental cars etc.) are fully integrated to provide the traveler with travel directions towards the chosen destinations.

8.1. Routing

The function block "Routing" includes the generation of seamless multi-modal routes taking into account the transfer between individual means of transport and stations (door-to-door routes). The user defines only the start and destination as well as the date and time of arrival at destination together with the date and time of the intended return. Task of the business travel assistant is to decompose the total distance into sections and the chronologically assignment of transport modes. In addition, the system needs to integrate accommodation in the itinerary, if necessary. The portal should offer alternative routes optimized under different aspects. Examples of such optimization criteria are aspects such as "shortest travel time", "lowest cost" or "trip with the lowest CO₂ emissions".

In addition the system should suggest a "recommended route" in which the optimization criteria have been considered in a hierarchical order (e.g. travel time optimization → CO₂ optimization → cost optimization). The user must have the option to adjust the suggested route manually by altering single elements. If the user works for a company with a travel policy the applicable restrictions must be incorporated as planning parameters. As such the traveler can be assured of regulatory compliance.

Personal preferences should be stored by the portal in order to give the user the possibility of excluding transport modes or to favor certain modes of transport or vendors in planning. In further stages of development the system should be able to learn about the preferences of a user by analyzing her/his travel behavior. For example, if the traveler usually chooses hotels which are located in the city center this preference should be recognized in future route generation. The added value for the business traveler through this building block consists of time saving through the automated policy compliant itinerary for the whole trip taking personal preferences into account. For travel management the value of the possibility to influence route proposals and thus controlling the travel behavior of the employees. In addition, indirect costs can be saved by the optimization of the planning process. Considered abstracted the building block consist of different parameterizations (destination, arrival time, travel policies, preferences, etc.) and the actual route generation service (means of transport, timing, etc.).

8.2. Booking

The functions of the building block “Booking” executes the booking of all items which were generated in route planning. This function also allows the traveler to make changes and cancellations.

As large companies usually have individual contracts with travel agencies and special conditions with suppliers it is important to ensure that these conditions are taken into account when booking. Therefore the business travel portal must be capable to obtain prices from various sources (Global
Distribution Systems, systems of business travel agents, booking systems of service providers, etc.). In addition to the individual booking of all elements separately the business traveler should have the opportunity to book all proposed elements in one step (“One-Click Booking”).

Not all modes can be booked in advance. Especially short-haul transportation can often not be arranged in advance. Also the inclusion of innovative modes can be challenging. Reservation of a car-sharing vehicle, for example, only makes sense if there is an unassigned vehicle in the right location at the time of demand. Therefore the user should be proactively informed by the travel assistant in case of a booking possibility respectively alternatives if the originally planned transport mode is not available. The function block thus consists of the services of long- and short-haul booking as well as booking of accommodation.

8.3. Itinerary & Mobility Keys

The content of the building block “Itinerary & Mobility Keys” is basically to schedule all planned and booked elements of a journey. Therefore the information and results from the building blocks “Routing” and “Booking” must be prepared and presented in well-arranged format. In addition to this aggregated overview for each travel element there must be a detailed view for deeper information (e.g. hotel description). The itinerary must be checked regularly by the system to ensure that the traveler is always up to date so that he/she can react to interruptions duly. Therefore there is a need for a push-notification-service with all relevant changes and interruptions. In addition to information on the travel elements the traveler needs a link to the necessary Mobility Key. Mobility Keys are documents (e.g. flight ticket or hotel reservation) which are required for the use of a travel element. The target is to manage all Mobility Keys completely through the travel portal. In case of air travel, for example, there must be a service for check-in as well as digital storage of the boarding pass in the travel. The added value for the business traveler is the consolidation of all relevant travel documents whereby a reference point for the traveler is created and the administrative effort can be reduced. The building block thus consists of the administration of Mobility Keys, the itinerary, providing real-time information and a check-in service.

8.4. Navigation

The functions of the building block “Navigation” support the traveler in finding the optimal route towards a destination in unknown surroundings. This occurs outdoors as well as in complex buildings (e.g. subway stations or large office buildings). The navigation therefore needs to assess whether the traveler is walking or riding a vehicle. The navigation has to consider the current traffic situation and be aware of vehicle-related points like parking, refueling and charging (electric vehicles).

For both, indoor and outdoor navigation, the classic functions of a GPS-navigation system must be available, such as adaptation of the calculated route in case of deviations or calculating the estimated time of arrival. In addition addresses in the travel plan should be automatically transferred into the navigation service. The benefit of the navigation service is that the traveler receives assistance in identifying optimal routes and guidance in foreign environment.

The services of this function block thus divided into outdoor and indoor navigation.

8.5. Payment Tracking

The function of the building block Payment Tracking is the automatic capture of payment flows. By storing the credit or debit card information in the travel assistant the system can query payment information from the financial service providers, which allows identifying and categorizing cash flows. On the basis of time/date and location these cash flows can be assigned to the particular business trip. Receipts of cash payments should be digitally recorded (scan or picture) and serve as proof of payment for travel expense accounting. With this building block the tracking of cash flows and the archiving of receipts and invoices can be automated whereby a time can be saved.

The building block thus consists of the services for the tracking of electronic payments (Online Payment Tracking) and the tracking of cash payments (Cash Payment Tracking).

8.6. Expense Reporting

Purpose of the building block Expense Reporting is the preparation of the tracked payment flows. Due to the fact that all relevant costs are captured by the Payment Tracking services a complete expense report can be created automatically. The system must be able to separate private from business spending.
Allowances for out-of-town trips will be automatically calculated and recorded in the cost report. Conditions and calculation parameters for the reimbursement of expenses are stored in the system. The structure and content of the report needs to be adaptable so that it can be customized to the individual requirements of each company. Various interfaces allow forwarding the data to the respective accounting system. The goal of this building block is not to replace the company's existing accounting systems. Rather, it should be taken off the traveler to consolidate the expenses manually. The service of this building block is to create an expense report as basis for reimbursement.

8.7. Mobility Reporting

Purpose of the building block Mobility Reporting is to analyze all corporate travel to provide a quantitative basis for strategic decisions and to identify optimization potential for operational processes. Through this analysis cost drivers can be identified, recurring travel patterns of employees recognized or preferred suppliers are determined and negotiated.

Due to the transparency created the Travel Management manager has the ability to analyze the mobility of the company and better opportunity to control it. Although such analyses are already performed the advantage of the business travel portal is that the data is stored in "one source" so the effort for analysis can be reduced. In addition the system should include a dashboard which provides an overview of the planned, ongoing and concluded trips and predict a travel trend (number of expected trips, modal split, etc.). The services of this building block create a dashboard (Mobility Dashboard), which provide information on the mobility of employees (Corporate Mobility Reporting).

9. Proof of Concept

For the evaluation of the concept, interviews were conducted with senior experts from different areas of expertise. These experts are members of international companies as well as members of business travel associations. The experts represented the role of a traveler as well as a travel manager so the concept is reviewed of different angles. The experts coincidently acknowledge the advantage of the business travel portal compared to existing solutions. On the one hand, the overall process of business travel is mapped – from planning the booking to reimbursement ("end-to-end"). In addition, the business travel portal provides multimodal "door-to-door" route planning, whereby the procedural cover includes a holistic route and transport mode planning. The experts unanimously see the added value for business, especially time savings and compliance.

Time saving is mainly caused by the automatic planning and synchronizing of the travel chain, as well as by the automatically tracking travel expenses, which accelerates the reimbursement process. For the travel manager it is a very important aspect that he can control the booking behavior of travelers over the entire travel chain. With the existing online booking engines he can only control the usage of the classic tourism service providers such as a hotels or airlines. The designed multimodal business travel portal offers the opportunity to also control the ad-hoc transport modes such as taxi or car sharing. This can be ensured by the flexible parameterisation of the routing algorithms (e.g. exclusion of transport modes, distance limits for taxi use, etc.). As a result, the travel manager must not solely rely on the traveler to know the travel guidelines in depth because the system proposes only compliant travel chains. In addition, the experts see the advantages in the range and the quality of data collected during the journey process and therefore the opportunity for a detailed reporting and controlling. The supplied data is much more extensive as it is not only entered by the employee but also automatically collected from the system during the whole trip.

The experts see in the implementation one of the biggest challenges. The inherent complexity of the integration with a multiplicity of partners increases exponentially with the geographical coverage of the portal. The planning and booking in the short-haul sector is a major hurdle because a heterogeneous landscape of small traffic operators have to be connected to the portal (e.g. public transport operators).

10. Limitations and further research

This study deals exclusively with a portal for business travelers. The requirements of private trips were not considered. Therefore the question which services a travel portal has to provide for leisure travelers to support them holistically before, during and after a journey remains unanswered.

In the concept it has been determined that the individual preferences of business travelers must be taken into account but were not completely defined. A complete analysis of those preferences has not been done scientifically. The question of the
specifications of business traveler’s preferences thus remains open and is subject of further research.

The building blocks were obtained from the analysis of the business use cases. To check the completeness of the identified building blocks, empirical studies would be conceivable. Also the influence of “virtual mobility” (e.g. video conferences) has been excluded in this work. Subject of further research could be the discussion of the influence virtual mobility on the functionality of a business travel portal.

Finally, the proposed concept would need to be implemented as a prototype in order to get tested empirically. It remains to further research to do so, however, first commercial companies expressed interest in implementing the suggested process and building blocks.

11. Implications for practice and theory

This research offers multiple contributions to practice and theory.

For practice an adequate business model can be developed to combine the different providers of the services described in the functional building blocks. Especially the question which party should take the lead role in the development of the portal appears to be particularly interesting. Future research can investigate which provider has the best conditions to realize such a holistic business travel portal. For example the Global Distribution Systems as the biggest aggregators within the classic travel services. Is it economically viable for them to expand their offerings into additional transport modes (e.g. car sharing) and services (e.g. travel expense accounting) or is it more attractive for a third independent party to aggregate individual components?

For theory this research offers a first step into the design of a multimodal business travel portal. Other researchers can benefit from these findings by using the model as a basis to investigate further specific scenarios or extensions.

12. Conclusion

In order to define the building blocks of a holistic business travel assistant use cases which typically occur before, during and after a business trip were created and analyzed. It was deducted that a multimodal business travel assistant shall contain seven building blocks to fully support the business traveler and also offer added value to the controlling tasks of travel management. The services range from route planning to the travel expense accounting.

It appears that for each identified building block there are single solutions available on the market but no service which combines these requirements in an aggregated portal. Both, travelers and the companies could gain large benefits through such a business travel portal. Companies could realize cost reduction potential through optimized travel planning and an enhanced controlling process. Travelers would benefit from a seamless and user friendly trip assistant which accompanies and supports them at all times. Additionally, the conceptualized portal considers their individual preferences while respecting the corporate travel policy.

The concept presented -process definition and building blocks- therefore would bring business travel to a new era of comfort for the traveler and transparency for the travel manager.

10. References


