Evaluation Approaches for HCI Related Aspects of Occupational Safety Regulations Exemplified by Mobile Hotel Booking Applications

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Abstract. The popularity of smartphones led to a rising and still increasing amount of mobile hotel bookings through applications like Booking.com, Expedia or HRS. Usually these kind of applications allow the users to book the amount of hotel rooms, the amount of nights and amenities needed for a stay in a hotel. Compared to classical travel bureaus or bookings made on stationary desktop computers, apps offer a higher degree of flexibility and personalization as they are not primary designed for the planning stage of a trip. Mobile apps also make it possible to change initial aspects of the booking on the trip or to give the traveler personal real-time information regarding the trip. Business travelers often are obliged to use certain applications their company defined in their travel regulations. Therefore this paper aims at defining the requirements of occupational safety regulations in this kind of applications.

Keywords: Occupational safety · User experience · Travel · Context · Hotel booking · Mobile

1 Introduction

Booking.com, Expedia or HRS are companies selling hotel rooms online. Usually these kind of applications allow the users to book the amount of hotel rooms, the amount of nights and amenities needed for a stay in a hotel. Compared to classical travel bureaus or bookings made on stationary desktop computers, apps offer a higher degree of flexibility and personalization as they are not solely used at the planning stage of a trip. Mobile apps make it possible to change initial aspects of the booking or to give the traveler personal real-time information regarding the trip. Business travelers often are obliged to use certain applications their company defined in their travel regulations. Therefore the question arises if these applications have to meet the requirements of occupational safety regulations like other business software does. In our research we focus on two aspects of occupational safety:

1. Human factors and ergonomics of mobile apps
2. Travel- and risk-management

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For the human factors and ergonomics part we analyze the typical tasks business travelers have to fulfill to achieve their trips and what role hotel booking apps play in these tasks. Furthermore we critically evaluate if current German health protection laws provide sufficient regulations to fulfill the needs of business travelers working with small screens (smartphones). In a second step we explore the main factors and categories of a companies occupational safety measures on business trips. The goal is to develop a set of evaluation approaches to pursue the question if hotel booking apps can (partly) be used as a substitute for classical travel- and risk-management in future research.

2 Human Factors and Ergonomics on Mobile Small Screen Devices

The German ordinance on occupational safety and health protection during work with visual displays (Bildschirmarbeitsverordnung - BildscharbV) [1] sets a juristic framework for workplaces and software used in occupational environments. Furthermore the BildscharbV regulates standards on stationary desktop work places but says little about aspects regarding mobile devices. As Kohn and Stamm [6] point out the BildscharbV still is valid on mobile working places except the following aspects:

- Inclinable Keyboard (limited)
- Variable arrangement of the work equipment (limited)
- Desk, chair, footrest, copy holder (not always possible)
- Sufficient space, light, windows, etc.

These aspects apply mostly to tasks done over a longer period of time whereas our scope of interest – hotel booking apps- usually are being used occasionally. Kohn and Bretschneider-Hagemes also mention that in todays environments of remote work (which also includes working with screens while on business trips) also psychological stress needs to take into consideration regarding a holistic view on occupational safety [3]. They also constitute the term 'mobile computer-assisted work' as any location-independent work assisted by computers. For software design that takes aspects of Human-Computer-Interaction into account especially four sections of the BildscharbV have to be considered:

21.1 The software must be adapted to the tasks to be done
21.2 The systems must give information about the dialogue flow to the user immediately or on request
21.3 The users must be able to influence the dialogue flow of the systems. Possible errors must be explained and the user needs to have the possibility to correct them with a limited amount of work.
21.4 It must be possible to adapt the software to the knowledge and experience of the users regarding to the tasks to be done.

In this paper, we present a study as part of a larger research agenda that aims at understanding the influence of mobile hotel booking applications on business travelers regarding aspects of occupational safety and how they influence the user experience. The aim is to analyze the users needs and the external influences in the various and changing usage contexts and to develop a set of evaluation approaches for mobile applications and devices respecting current regulations and norms.

3 Mobile Hotel Booking Apps

Mobile hotel booking apps are software products developed for smartphones, tablets and/or smartwatches that can access central reservation systems (CRS) to make transactions related to room bookings in hotels. A CRS for hotel bookings does typically include the following functionality:

- Check amount of rooms(-types) available
- Display rates for rooms in a dedicated time frame
- Allow the user to make a reservation
- Explain conditions
- Describe amenities and generic hotel information

Well known developers of such systems are for instance Booking.com, Expedia or HRS (Fig. 1).

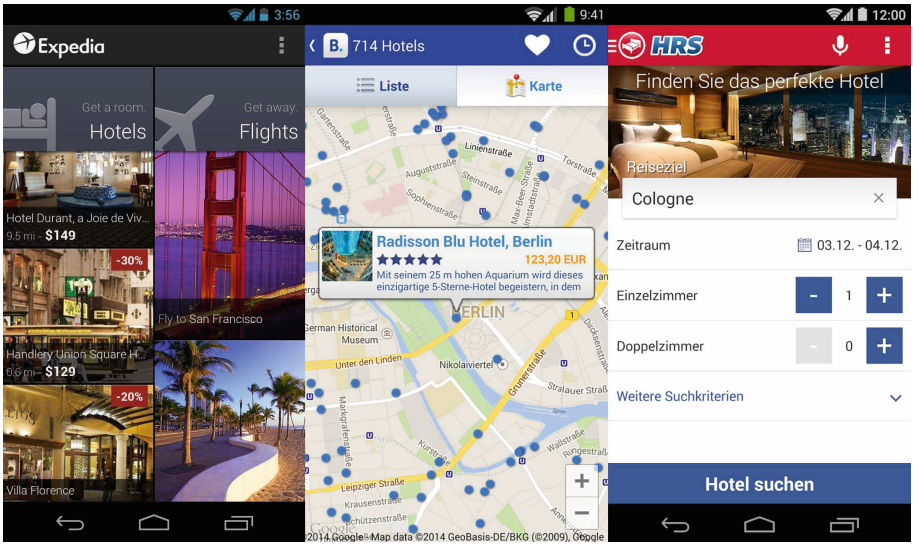

Fig. 1. Examples of hotel booking apps Expedia, Booking.com and HRS

3.1 CRS System

Schulz describes that the hotel booking business as part of the tourism industry is a system that can be modeled by dividing it into three groups of actors [9] (Fig. 2):

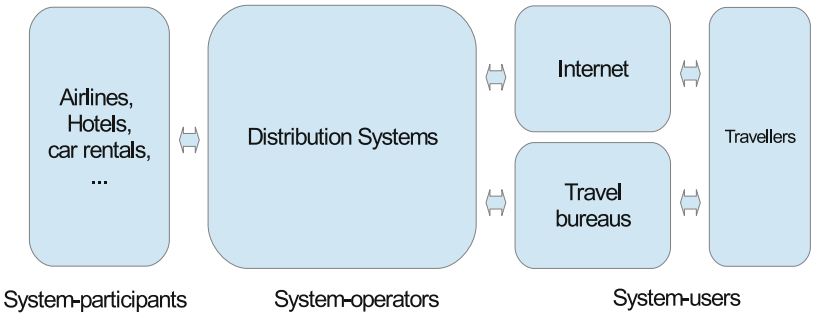

Fig. 2. Hotel business model by Schulz [9]

1. **System-participants.** These are mostly hotels, airlines or car rentals. Also tour operators, trains, buses etc. are part of this group. The participants hold the objects of interest (e.g. hotel rooms, flights, ...) the users are interested in to obtain.
2. **System-operators.** Operators take over the communication part between participants and users. They have the task to distribute and inform about the various products of the different participants. Hotel booking app services are located in this group.
3. **System-users.** Users are travelers / end-customers on the one hand but also travel bureaus on the other hand.

Before the rising popularity of the internet it was more common to rely on intermediaries like travel bureaus or other services with access to system-operators. Through the emerging booking app offers travelers now have a lot of opportunities to reach out for system-operators or system-participants directly.

4 Occupational Safety on Business Trips

Workers on business trips need to have the ability to make short-term decisions, to plan under difficult circumstances and to orientate in a flexible way [10]. The German law obligates employers to take responsibility for a safe work environment that ensures the workers health and life at work [2]. This applies to work environments like offices or factories as well to security issues on business trips.

4.1 Travel- and Risk-management

Employers can conclude a travel insurance but this only reduces their risk of liability. Furthermore it is necessary to act preventative regarding their employee's safety. Therefore companies have to take care of travel- and risk-management which typically consists of the following tasks [4]:

- Document the current location (Hotel, conference venue, ...) of each employee on a business trip
- Save the employee's contact data (phone number, email, ...)
- Access to current risk profiles of the destinations for business trips / give the information to the travelers if needed
- React in case of emergency and crisis

Especially in large companies with a lot of business travelers in different countries this can become highly complex. The important information about the travel destination's security is multifaceted [4]:

- Security situation (climatic situation, crime, ...)
- Security organizations (police, military, ...)
- Up-coming events (elections, holidays, ...)
- Safety reports (traffic situation, rescue services, ...)

The companies have to ensure their employee's on business trips have access to these information. Especially when security situations change while on a business trip these recentnesses need to be communicated to the travelers who are concerned. Hotel booking apps usually save the travelers residence and the time of arrival and departure which is the main necessary contextual data needed to make statements about the current travel- and risk-situation. Our further research aims to answer the question if hotel booking apps therefore are an appropriate medium for two main cases:

1. For travelers informing themselves about current risks at their intended residence of their business trip
2. If this way of communicating the risks is sufficient to take responsibility for a safe work environment that ensures the workers health and life regarding §618 Bundesgesetzbuch (BGB)[1]

4.2 Phases of Business Trips

When Business trips typically can be divided into several phases:

- Planning stage before the trip
- On the way to the destination
- While the trip Preparing the return trip
- The return journey
- Post-trip

[1] Paragraph of the German statute book for the regulation of workers health and life.

A special focus has to be given the factor that situations might change and have an impact on the trip. For instance the plane/train to the destination might be delayed so that the traveler arrives after the latest possible check-in time. Another typical change to the initial travel plan while already on the trip is the amount of nights the traveler stays at the hotel. And also the traveler might get ill, neither able to continue to work nor able to start the back journey.

5 Evaluation of Occupational Safety Aspects in Mobile Hotel Booking Apps

Regarding BildscharbV 21.1 the term 'tasks to be done' in the context of hotel booking for business travel needs to be defined and clarified, taking the different contexts into account. The superordinate target 'book a hotel' needs to be narrowed down to several sub-requirements to make it possible to compare prices, distances or amenities and to meet individual regulations for travel expenses and invoices. BildscharbV 21.3 mentions 'possible errors' that need to be explained with the possibility to correct them. These errors can either be caused by the system, the environment or the user. It is to be defined which errors are important in the different context where travel apps are being used and how the quality of explanations and possible ways to correct them can be evaluated. As a consequence of the changing contexts and influences due to the mobility of smartphone usage scenarios, standards which have been developed for the regulation of stationary desktop work places are not sufficient anymore. Aspects like – to name only a few- ambient light, ambient noise or distance between worker and monitor can not be regulated and standardized in a mobile context as it is possible in an office with stationary hardware [6].

5.1 Evaluation Approaches for Software Products

We understand software as a term covering different communicative patterns [8]. In the study we examine which characteristics of those patterns are relevant to evaluation of occupational safety and health protection and the criteria by which they are assessed. The advantages and drawbacks of evaluation approaches from the disciplines of cognitive psychology, informatics and communication sciences need to be taken into account. Its also important to take the users reactions to the changing contexts into account which might lead e.g. to orientation change of the device, switching to a different device or choosing a different way of holding or positioning the device [5,7].

5.2 A Survey on Device Usage on Business Trips

We now have pointed out connections and intersections between standards in HCI, the German BildscharbV, characteristics of the usage of mobile handheld devices on business trips and employers travel- and risk-management. Also categories for the evaluation of occupational safety and mobile handheld devices

have been discussed. To gain insights on the relationship of both topics our first step in a longer research agenda will be an online survey examining the behavior of business travelers regarding the usage of mobile hotel booking apps.

Scope of the Survey. This survey will investigate the usage of computational devices before and while business trips and occupational safety aspects that employees experienced on their trips. It is of high interest for our study to find possible correlations between job title / position, travel frequency and occupational safety concerns that already occurred. Also our goal is to investigate what typically causes business travelers to change their initial travel plans and how helpful computational devices, either stationary or mobile, were to solve these situations. Furthermore we set a focus on an overview on the employer's existing security tools and travel policies to gain knowledge how employee's use them and how much they know about them. The aim of this study is to gather a first set of insights to develop further research projects in the intersection of hotel booking apps and occupational safety. Regarding the use of mobile booking apps our main focus of interest is which devices are important for different types of business travelers at the various stages of their trips.

Survey Questions

1. Demographics
   (a) Age
   (b) Nationality
   (c) Gender
   (d) Education
2. Job
   (a) Job title / position
   (b) Organization type
   (c) Number of employees
3. Business travel
   (a) Travel frequency
   (b) Devices used at different stages of the trip
   (c) How often does the travel plan change?
   (d) Variation of travel destinations
   (e) Familiarity with travel destinations
4. Occupational safety
   (a) Concerns causing anxiety on business trips
   (b) Company's travel policy
   (c) Company's security tools
   (d) Security tools not offered by the company

Further Research. We expect that our survey will give us important hints on the context in which mobile hotel booking apps are being used. Furthermore it could be seen as a foundation for developing guidelines for hotel booking apps for business travelers based on the BildschArb. Also through the investigations about unplanned changes to the travel plans we will gain information about how employers can use this kind of apps to fulfill the requirements of the travel- and risk-management. Depending on our research outcomes further research could include usertests with existing applications and/or prototypes. This could lead towards more insights about the usefulness of hotel booking apps in special contexts such as specific concerns causing anxiety on business trips. Also it could deepen the knowledge about how these kind of applications could be optimized for the contexts and situations related to occupational safety.

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