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## Abstract

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Increasing numbers of users of public transport and thus the trend towards intermodality constitute new claims for the provision of traveler information. Combined with existing and proven media, new systems and applications are brought to the market by technological progress that guarantee users a pleasant and in several issues optimized travel.

In order to obtain an overview of quality and completeness of traveler information, information requirements will be determined in advance and subsequently current offers of information will be checked by means of case studies in intermodal travel chains.

In a first step, reasonable intermodal itineraries are drawn and described, acting as a basis of travelers' need for information. Since, according to the case's specifications, one stage has to be covered by train, emphasis is put on train rides and its adjoining facilities. Various Forms of private transport, like walking, using bicycles, motorcycles, and cars, various forms of public transport like trains, S-Bahn, subways, trams, busses, and cabs, railway stations, bus stops and parking lots will be taken into consideration. Intermodal travel chains can be formed in any combination.

In order to make in particular public transport possible, as well as attractive and user-friendly, consistent traveler information must be available in every part of the travel chain. According to specifications and requirements for the optic and acoustic representation / transmission, traveler information needs to be accessible, up-to-date, reliable, independent, and suitable even for first-time users.

To manage this, currently a great range of passenger information systems is available that will implement the requirements as specified. To present these systems, the information media is divided into categories such as mobile and stationary media, optic, acoustic, and physical design, electronic, print and personal submission, as well as dynamic or static information.

As mobility behavior and, therefore, information needs may differ from user to users, user groups with specific requirements concerning traveler information must be formed to provide for a clear and goal-oriented representation.

With the intension to determine significant differences within the groups of users, travelers are classified according to frequency of use of the transport concerned, according to local knowledge, as well as to network and area knowledge. Due to the fact that traveler information should be suitable for first-time users, the lower levels of the classification are defined as first-time users. For further illustration all information needs are inspired by this group of users.

First-time users can be defined in other grades by specific needs and requirements when traveling. A closer glance on specific information is given at disabled travelers, travelers with bicycles, travelers with infants, travelers with luggage, and those traveling with pets.

After having defined intermodal travel chains, having presented the available information media and having distinguished into several user groups the information needs of travelers at the respective locations of the intermodal trip chain can be identified. The information to be visualized are partly based on already available presets, but mainly oriented on existing facilities and equipment features of means of transport and railway stations. Moreover, information will be presented that isn't already applied nowadays.

At a total of 27 various locations of the predetermined, intermodal travel chains, for each user group and depending on their travel habit required and also optional information is shown. Because of the rather large complexity there are divisions and categorizations of information in order to group them; like information for travel connections, ticket purchase or routing information. For every information is illustrated, which kind of passenger information system at the appropriate place is suitable for the

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transfer. Also in view of a possible, new collection of comparable data to determine future changes in communication and information transmission.

After a separate consideration to traveler information in case of disturbances, the need for information is tested by a case study. For this purpose the current offerings of traveler information are to be mapped and compared with the projected need for information.

The contemplative environment of choice is the main train station in Frankfurt am Main as well as adjacent facilities and transportation.

After an inventory of relevant institutions of the central station, intermodal test rides take place. According to predefined scenarios, intermodal travel chains are carried out to test traveler information for its pre-established requirements.

The last section of the case study is a partial inquiry of information management in the event of delays. Trains are examined on their punctual departure. In case of failure or delay, the given information from various information media are listed, compared, and evaluated in the sequence.

The results show that, although traveler information must be to a considerable extent available, depending on travel habits and users only a very small proportion is actually accessed. The requested information meets requirements to about 75%, which is satisfactory. The remaining 25% of the retrieved information is missing or not available in sufficient quality.

This includes acoustic information that is transmitted in trains of older provenience or in old and especially high station buildings, or stationary information some travelers need on their first leg to a train station or a bus stop. Route information about train station exits are not always accessible for first-time users and in public transport, there often is no information about cross-system connection, or about delays. It was also evident that helps to transport luggage (luggage carts, luggage trolleys) at many stations are not available which travelers are unaware of in advance. Alternative offers are only occasionally seen.

The dynamic displays of transport systems (train, tram, subway, etc.) vary from station to station and, compared to the respective other systems, show more or less information.

Some of the most obvious deficits occurred in the management of delays at Frankfurt Central Station. According to the data from the survey, travelers are informed too late about delays. The incoming information is usually unreliable and is corrected only sporadically. Various information systems display different information. The internet information on significant delays is output early, while travelers, watching dynamic displays in the station, at the same time believe their train to be in time.

On the basis of the results, recommendations are presented, which will provide added value for travelers and operators after implementation. The recommendations also include concrete suggestions for possible strategies to resolve the identified deficiencies.

In the future, new opportunities and possibilities may be presented by the growing number of mobile devices. With the help of these, traveler information can be optimized and individualized or personalized. While travelers in public transport are currently still predominantly dependent on stationary information systems, smart phones and microcomputers can, under the assumption of a widespread dissemination of these devices, may soon take over a large part of the information transfer. Some users have already the necessary access to purchase travel tickets online and plan their intermodal travel. Also public transportation includes position data indicating its precise location and the estimated time of arrival to users on the internet. Several trains operated by Deutsche Bahn AG and trams in some cities in Germany can be monitored live and give travelers an available and transparent image of public transport.