User-centered design of passenger information systems.

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Abstract - For reducing environmental pollution, ridership in public transport has to be increased. Hence, a modernization of this sector and an improvement of its image are necessary. Professional communication in terms of usable passenger information systems can make valuable contributions in this context. These systems are promising means to increase passenger comfort and also user acceptance. This paper presents an empirical study, which is the first step of a larger project dealing with the design of an intermodal passenger information system. The study itself deals with stakeholders' feedback about the quality of existing passenger information to identify information gaps, shortcomings in visualization and potential for innovation. 15 bus drivers and service clerks were interviewed. The data was interlaced with results from an earlier passenger survey. It was found that passengers appreciate self-service applications for informational, and particularly for confirmatory reasons. Thus, the benefit of using passenger information systems must be increased, which could be achieved by implementing further features such as social media. Finally, trust-related aspects have to be explored in future studies.

Index Terms - Electromobility, information quality, passenger information system, passenger travel assistant, stakeholder requirements

INTRODUCTION

In times of an increasing ecological awareness, greenhouse emissions caused by transportation are regarded as a serious problem. Furthermore, it is an industrial sector in which emissions are still growing [1]. One approach to mitigate the pollution is to reduce private transport and simultaneously enlarge the public one. To achieve this promising emission decrease ridership must be raised significantly, while various challenges have to be faced [2].

One important issue seems to be the improvement of the perceived comfort of public transportation. According to Caulfield and O'Mahony [3], people show high levels of frustration when riding a train or a bus because of gaps in the professional communication of transit agencies. Passengers often have problems in understanding timetables. Also, they are uncertain when the vehicle will arrive or whether it has already passed the station. Therefore, passenger information systems with real-time passenger information (RTPI) are a popular passenger request. Realized as information and communication technologies (ICT), such as smartphone applications and web portals, they enable information access easily. Soon, these systems rise to the position of passengers' daily companions [4].

Crucial for the success of these services is their information quality and their usability. As a consequence, user requirements with regard to these aspects have to be detected, which must be considered in the systems' iterative development. Moreover, determinants of the transport system and specialties of the site provide technical requirements, which must be harmonized with user requirements for achieving the best user experience for passengers.

I. Project econnect Germany

Project econnect Germany is one measure of the German government to foster alternative drives and public transportation to reduce environmental pollution. In particular, it is an interdisciplinary research project whose objective is to promote electromobility. The research deals with sustainable and smart electromobile transportation systems and the linking to electric power grids. For ensuring a successful launch of this alternative

drive, new infrastructure is required. In this context, ICT is of major importance. Charging stations at car parks or (mobile) passenger information systems are seen as valuable infrastructural parts to increase user acceptance.

The research goals within econnect Germany can be divided in short-term and long-term objectives:

In the long term a passenger information system will be realized as a web platform (for average desktops) and also for small screen devices to be a helpful and supportive tool for mastering challenges of public transportation. It will combine data from all transportation systems (train, bus, car sharing) and facilitate an intermodal connection search. Especially, the use of electro cars and of electro busses will be fostered.

For a successful realization of this passenger information system, it is necessary to achieve certain short-term objectives according to the EN ISO Norm about 'human-centered design for interactive systems' [5]. First, the context of use has to be investigated. Future user groups must be explored. Use cases and technological setting (e.g. hardware specification) must be defined. Second, user and also organizational requirements must be identified. Especially, the site and its transportation systems have to be analyzed to consider local specialties. Also, gathering information about the transferability of familiar display formats is important. Third, initial prototypes have to be designed and evaluated in user tests at a usability laboratory as well as in the field.

II. Objective of this paper

This paper presents an empirical study which is part of the larger design project econnect Germany (HUB Osnabrueck). The study deals with gathering stakeholders' feedback about information quality of existing passenger information. This feedback will be helpful for designing the described passenger information system: Established, usable presentations formats (e.g. layout of print timetable) can be adopted while established, but unintelligible presentation formats can be improved before being adopted or even replaced.

Considered stakeholders are passengers and public transport personnel. The feedback of the former is presented by data of an earlier passenger survey [6], the feedback of the latter in an interview study exclusively executed for this paper.

Regarding the particular subjects dealt with, the focus is on the sufficiency and comprehensiveness of the provided passenger information. Main tasks in data analysis were identifying information gaps, shortcomings in visualization and potential for innovation.

LITERATURE REVIEW

Various disciplines deal with passenger information systems: Engineers tackle technical problems such as

dynamic personalization in multi-channel data dissemination environments [7] or the development of primary-context models and ontologies [8]. Also the integration of real-time data is of high interest because it facilitates en-route assistance for passengers [9]. Scientists in the field of traffic management investigate traffic regulation systems for multimodal transport systems including passenger information [10]. Human factors researchers follow user-centered approaches: they focus on user characteristics and information needs and model passenger information systems according to their findings (see [11]).

When quantifying these research activities up to now, a lot of research about technical aspects has been carried out. Especially, many pilot projects present various prototypes and their features such as TUTPIS [12]. So far, only little research about information quality and user requirements exists.

In this context, the most relevant piece of work was contributed by Caulfield and O'Mahony [3]. They investigated medial preferences of passengers in a web-based questionnaire study. Participants rated information sources such as Internet, passenger information displays (PID), mobile phone technology, call centers, and paper-based information depending on four user situations which referred to stages of a trip (pre-trip, at stop, onboard vehicle, pre-trip before return). Furthermore, respondents assessed characteristics of information provision. For instance, 'real-time location of vehicle' and 'speed of connection' were rated as 'very important' characteristics of Internet-based services by 61% and 55% of participants. Though, not all attributes are still relevant for the explored information sources: since this study, many innovations revolutionized mobile phone technology (e.g., mobile Internet) – Caulfield and O'Mahony only evaluated a text messaging service. In conclusion, they contributed valuable insights into passengers' requirements depending on the user scenario, but do not refer to the technology currently available.

Further interesting contributions deal with the combination of social media and passenger information in order to increase comfort in public transport. Foth and Schroeter [13] contemplate commuters' daily journey. Their approach envisions a "digitally augmenting of the public transport environment": All types of technologies such as devices (e.g., PIDs, smartphones, sensor networks) and services (social media) are used to create special user experience for commuters during their trip. They aim at making it more enjoyable and meaningful. Camacho, Foth and Rakotonirainy [2] are focusing a similar goal. Their approach focuses on image and modernization of public transportation to increase its attractiveness. Enlarging the service portfolio is one proposed measurement (e.g. free Wi-Fi access, location-based services such as a tour guide), but they are even more visionary: they are looking forward to a

participatory culture in public transport. Passengers can benefit from provided services, but also create own content and therefore value (e.g., sharing information about seat availability). However, both approaches did not collect actual user feedback; no explorative evaluation of concepts was carried out. Only concepts' potential was discussed, specific user requirements were not mentioned.

Concerning user diversity, empirical studies about the potential of passenger information of certain user groups have been investigated. Because of the graying of societies, the elderly are increasingly considered in designing ICT-based services (see [14]). Schaar and Ziefle [15] carried out acceptance research. Their main finding was that age is a factor which influences the acceptance of electronic travel assistants significantly. Underlying this age effect is travel expertise and also technology experience. However, concrete user requirements were not named, too. Another target group-oriented approach is the BAIM project which focused on passengers with restricted mobility. Heck et al. [15] presented a concept for a hotline and a web portal to provide information about handicapped accessible routing. User profiles can be personalized; most types of physical handicaps are considered. In this paper, authentic user feedback is missing, too.

In [4], Wirtz et al. evaluate a passenger information system in user tests. In particularly, patterns and reference objects were explored. Identified usability problems were clustered in four categories: terminology, structure, visual elements, and interactive elements. Specific findings about information quality were not reported.

ACTUAL STATE OF PASSENGER INFORMATION

The research site under investigation is Osnabrueck, a city with 165,000 inhabitants in Germany's northwest. The local public transportation consists of a railway system and a bus system. Moreover, car sharing is provided. The public utilities are the transit agency, which runs the bus system. A subsidiary company manages the local car sharing.

I. Multi-media network of existing passenger information

The public utilities service their customers with a multi-media network of passenger information. Available portable print products are the timetable book, schedules of single bus lines, and several brochures about special services (e.g., 'night bus', 'leisure time bus') including information about their timetables and operation periods.

Source: Public Utilities Osnabrueck

FIGURE 1. PLAN OF BUS LINE 61 OUT OF THE PRINTED TIMETABLE BOOK.

Bus stops are equipped with printed timetable notices of the regular bus lines (see Fig. 1) as well as of special bus lines, a fare zone plan, a network plan and in case of larger bus stops, a spatial site plan. In addition, a bus stop sign and a passenger information display are mounted. The information on the PID is partly based on real-time information.

Source: Public Utilities Osnabrueck

FIGURE 2. PRINTED TIMETABLE NOTICE AT A BUS STOP.

Information available on the vehicle includes a PID showing timetable data and the display at the front of the bus providing the bus line number and destination. Online information available for Osnabrueck consists of four web portals run by different carriers: (1) the public utilities themselves, (2) a cooperating transit association (vos.info), (3) a trans-regional transit agency (fahrplaner.de), and (4) German railway company. In addition, mobile applications such as smartphone apps are available only from third party suppliers who provide passenger information for all of Germany (e.g., DB Navigator of the German railway company).
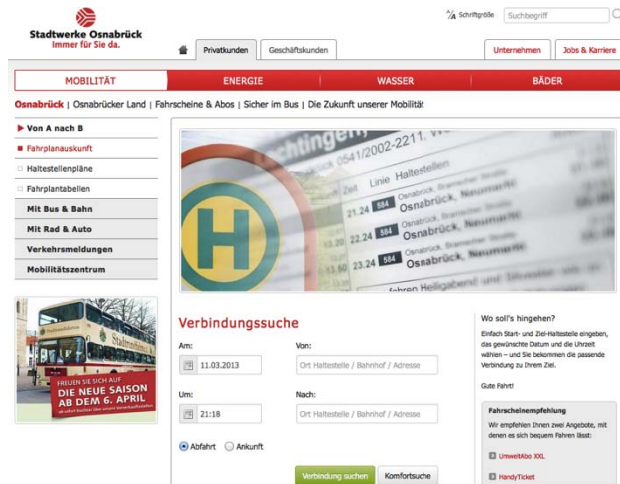
FIGURE 3. CONNECTION SEARCH MASK OF THE WEBSITE OF THE PUBLIC UTILITIES OSNABRUECK.

The public utilities are also aware of the importance of social media. A Facebook fanpage has been set up; a twitter account currently serves the purpose of reporting recent news to passengers (e.g., about a strike, weather-related delay alerts). First-hand experienced staff mentioned that an increase in the number of followers usually correlates with weather-related events.

Beyond these information media, two service centers and a service hotline are installed.

II. Related study: passenger surview of the public utilities Osnabrueck

The public utilities are the transit agency, which operates the bus system in Osnabrueck, which is the largest, and therefore the most important part of the local public transportation. The company continuously engages market research agencies to interview their passengers about several topics, e.g. customer satisfaction, for improving the quality of services, and maintaining sustainability.

The last passenger survey was carried out in May 2011 [6]. 1,267 passengers participated in standardized interviews on the bus. The interviews consisted of quantitative as well as qualitative parts. Respondents' structure is as follows:

- 1,055 respondents provided information about their gender: 62% were female, 38% male.
- 1,233 participants named their age: 42.3% were 15 to 29 years old, 41.1% belonged to the age group 30-59 years and 16,5% were 60+. Only people older than 14 years were selected.
- 1,199 passengers mentioned the purpose of their trip. About 33% were on the way to work or on a business-related trip. 21% were going to school or university. 43% used the bus for private matters or in their leisure time.

- 1,215 people of the sample explained their current job situation. Ca. 45% were employed in part-time or full-time jobs. About one third were students; 13.3% were retired.

One aim of this survey was to identify customers' information behavior, particularly, which media passengers use for information search. All 1,267 participants answered this question. The results show that 31% of the questioned passengers used printed timetables at bus stops, 36% printed timetable books, and 42% the Internet to gather information about the bus system. The option to contact staff was used, but only little (5% bus drivers, 6% personnel at a service center, 3% hotline). Using mobile devices such as smartphones was mentioned only by 1% of respondents.

Regarding participants' online information search in detail, the majority of them used the website of the public utilities Osnabrueck, of cooperating transit agencies, or third-party suppliers. Concerning mobile applications, two common applications were mentioned: (1) 'Oeffi', a German Android application for public transportation, (2) the 'DB Navigator', an app of the German railway company supplying data for several public transportation systems.

Furthermore, passengers were interviewed about missing information. 9% of 1,155 expressed criticism: The website was assessed as confusing and too complex. Required functions were missing, e.g. 'show earlier/later connections'. Also, the design of timetables, information about delays and the topicality of information were mentioned.

EMPIRICAL STUDY

I. Methodology

With the results of the passenger survey in mind and the intention to integrate staff's perspective, remaining open research questions are: Who is asking the public transport staff which questions because of which reasons? Do transit personnel assess the provided passenger information as sufficiently detailed and comprehensive? Do the respondents see any potential for improvement? Are information gaps, and personally asked passenger requests, a reason for delays? Does the staff have any innovative ideas for reducing passengers' requests?

An interview guideline was designed, which was used to run 15 semi-structured interviews. The sample comprises two groups:

- The first group consisted of ten experienced bus drivers, which have the status of driving instructors within the company. Nine respondents were male, one female. The age ranges from 41 to 58 years (M = 49.2). Their average job tenure was 23.4 years; minimum was 11 years, maximum 31. Eight of them were

working fulltime as bus drivers, two of them part-time.

- The second group is composed of five clerks of service centers. Three were male, two female. The age ranges from 25 to 58 years (M = 33.4). Their average job tenure was 9.3 years with a wide dispersion: The eldest employee was working there for 34 years, but his three colleagues only for four years and one even for six months. Four of them were working fulltime, one part-time.

Four interviewers questioned the participants. The bus drivers were interviewed individually during a company workshop. The interview time was limited because of the schedule of the workshop. The clerks were visited in their service centers during less frequented times of day when they were not required to service customers.

Before the interview, all respondents were comprehensively informed about the purpose of the interview study and about data privacy. Participation was on a voluntarily basis. All participants signed a consent form before participating.

All interviews were digitally recorded. In total, approximately 148 minutes of verbal speech were collected, which were transcribed and anonymized afterwards. Abbreviations were used to distinguish the transcripts within the corpus: SP stands for service personnel, BD for bus driver. All transcripts were analyzed qualitatively and summarized according to Mayring's qualitative content analysis [17].

II. Results

Four main customer groups were identified who were raising personal requests: the elderly was named by 11 of 15 participants, followed by foreigners (11), university students (4), and school students (4). University students and foreigners cannot be separated clearly because lots of freshmen moved to the city to study and therefore do not know Osnabrueck in detail. The number of student requests declines with the experience they gain during their first semester.

The content-related range of requests is composed of questions about schedule information (when does the bus leave to a certain destination?), spatial information (at which bus stop does it leave?), fare rates, and features of certain tickets. At the bus, passengers also asked about traffic conjunctions (where do I have to change the bus?), its final destination as well as certain bus stops (does this bus stop at …?).

The majority of participants assessed the existing passenger information as sufficiently detailed. Mentioned shortcomings were lacking information about the border between the city and its hinterland, missing specification of direction in the line number (e.g., one bus line with two different directions), and fragmentary connection results after searching the website.

Concerning the comprehensibility of the information supply, few problems were mentioned, but it became apparent that passengers must be "willing to learn and understand" it. Mostly, the elderly were involved in problems: Some difficulties were ascribed to elderly's unfamiliarity in using online passenger information, others to shortcomings of the media (e.g., not usable search mask, missing relevant details of connections). A bus driver assumed comprehensibility problems for passengers 'with immigrant background', too.

An interesting finding to report is the motivation of passengers' requests. Several bus drivers stated that passengers were only looking for confirmation about their already gathered information:

"Yes, passengers ask questions. Some people state that they searched information on the Internet and that they would like to have it confirmed or to have an answer to their question of the bus driver." LF9

"[These questions] serve to hedge the passenger. Even if the passenger has checked the timetable in detail, some of them still ask." LF10

Concerning ideas for improvement, the availability of more self-services was contemplated. Especially, the provision of a smartphone application was often mentioned, followed by the elaboration of the website and an increase of ticket machines. The online passenger information system should provide an easy-to-understand search mask; the small screen version should guide the passenger on his/her trip and offer a routing service (actual-position-to-destination). Besides, an interactive network plan was mentioned to give foreigners a better overview of the bus system. Sending push notifications to provide news and alerts were also named.

Further ideas were to provide an overview or a summary respectively of the most frequently demanded services and their features (e.g., free transportation of children) as well as a price list of most popular ticket types at the bus. Also, existing plans for complex bus stops should be placed more prominently at the stops.

One target group-oriented suggestion was uttered: elderly-friendly passenger information should be supplied. Particularly, ergonomic aspects were addressed.

Finally, no information gaps in the existing passenger information were named as reasons for delays.

III. Discussion

In this research, stakeholders' feedback about the information quality of established passenger information is elicited. Passengers' perspective was investigated in the passenger survey of the public utilities; bus drivers' and service clerks' opinion was collected in this interview study. The interlacing of both data sets combined with findings of the literature are proposed as a sound basis for

gathering user requirements as it is recommended in the EN ISO Norm about 'human-centered design for interactive systems' [5].

According to the results of the passenger survey, many customers already use online passenger information. As mentioned by the staff, the provision of a smartphone application would be beneficial for passengers. Apparent from the content of the personal passenger requests, information about time (departure, arrival, trip duration etc.) and space (starting point, destination, stopover, direction etc.) as well as transport system-related information (fare rates, operator etc.) is required.

Some employees state that people are too lazy to grapple with passenger information and that asking a human being is the most comfortable way to gather the desired data.

A service clerk replied that some customers are afraid of finding wrong information and trusting it:

"We are looking forward to the day when customers service themselves with the website and a [smartphone] app. But people still come here or phone us because it is easier and because they feel certain when they call us [at the service center] because we are well-informed [...]. They would rather ask than searching information themselves which finally turns out to be wrong." SP1

Surprisingly, passengers do not ask questions exclusively because of a need for information rather than for confirming information they already have gathered in advance. Consequently, trust is an issue in passenger information.

This phenomenon is also referred to in the literature. Lyons states in his paper about the role of information in decision-making with regard to travel that information provision is overvalued: "The need and, hence, demand for information is much more limited. In addition, even when information is sought, it may be for confirmatory reasons than for reasons of comparison" [18]. Besides, he mentioned that changing the mode – in this case, from a private car to a public bus – is unlikely because people stick to their habits.

As a consequence, passenger information systems must not be the key solution to increase ridership in public transportation. However, they are useful contributions to enhance passenger comfort. As envisioned by [2] and [13], public transport could advance to a fashionable happening, which combines physical with virtual mobility. Physically, commuters could go to work, but on their trip social media, entertainment or infotainment services respectively could make this everyday journey a unique experience. According to [2], the proliferation of Wi-Fi in urban environments combined with the increasing prevalence of mobile devices among younger users leads to a preoccupation: these passengers enjoy interacting with ICT more than driving a private car.

Finally, providing a passenger information system with reliable content is a good first attempt to increase ridership. This will be a sound basis to implement further innovative services, which will attract (younger) customers and make public transportation more valuable.

CONCLUSION

For increasing the ridership, the image of public transportation must be modernized. Professional communication can make a valuable contribution to this field. Particularly, passenger information systems are useful applications to increase customer comfort and also user acceptance – for informational and confirmatory reasons. Implementing additional interactive services such as social media, news dissemination or entertainment features can be beneficial for passengers who finally switch from private to public transport.

FUTURE WORK

In the empirical study it became apparent that passengers have trust issues with passenger information. Therefore, further qualitative studies are requisite to elicit user requirements from prospective user groups for designing trustworthy passenger information, online as well as offline. Also, investigating concepts for passenger information system combined with social media features mentioned by [2] sounds promising.

Moreover, customer information of the car sharing provider must be analyzed and evaluated. The passenger information system, which will be developed in the econnect project, comprises information about public transportation (especially the bus system) and collective private transport (car sharing). Up to now, no application provides combined passenger information for both kinds of transportation systems. Hence, customers and service personnel of the car sharing provider have to be interviewed about the information quality of their customer information, too. Resulting from this, ideas for the passenger information system will be extracted.

Regarding the long-term goal of the project, designing this passenger information system requires focusing on two main tasks:

First, the passenger information system must be designed for two screen sizes (average desktop monitor and small screen). Personas and user scenarios must be developed as a sound basis for deriving the system's functional range. Especially, designing the intermodal connection search and displaying its results according to user groups' needs and preferences will be challenging. Also display formats have to be evaluated which should happen in a user study with paper prototypes.

Second, the application must be realized as a prototype, which has to be evaluated in usability tests at a

usability lab as well as in the field. Selection of test persons will be made according to the defined personas. Particular attention will be paid to trust-related aspects again. In addition, initial user experience must be provided as early as possible to empower passengers' confidence in the new passenger information system as well as in the modernized image of public transport.

REFERENCES

[1] L. Chapman, "Transport and climate change: a review", *Journal of Transport Geography*, vol. 15, pp. 354–367, 2007.

[2] T. D. Camacho et al. "Pervasive Technology and Public Transport: Opportunities Beyond Telematics" in *Pervasive Computing*, vol. 12, no. 1, pp. 18–25, 2013.

[3] B. Caulfield and M. O'Mahony, "An Examination of the Public Transport Information Requirements of Users" in *IEEE Transactions on Intelligent Transportation Systems*, vol. 8, no. 1, pp. 21-30, 2007.

[4] S. Wirtz et al. "Passenger Information Systems in Media Networks – Patterns, Preferences, Prototypes," in *Proceedings of the IEEE International Professional Communication Conference*, 2005, pp. 131–137.

[5] DIN EN ISO 9241-210, *Ergonomics of human-system interaction – Part 210: Human-centered design for interactive systems.* German version, 2010.

[6] Stadtwerke Osnabrueck (public utilities Osnabrueck), *Report on customer satisfaction.* Dresden: Probst & Consorten Marketing Beratung, 2011.

[7] K. Goto and Y. Kambayashi, "A new passenger support system for public transport using mobile database access," in *Proceedings of the 28th International Conference on Very Large Data Bases*, 2002, pp. 908–919.

[8] D. Lee and R. Meier, "Primary-Context Model and Ontology: A Combined Approach for Pervasive Transportation Services," in *Proceedings of the 5th annual IEEE International Conference on Pervasive Computing and Communications*, 2007, pp. 419–424.

[9] C. R. Garcia et al. "On Route Travel Assistant for Public Transport based on Android Technology", in *Proceedings of the Sixth International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing*, 2012, pp. 840–845.

[10] H. Ezzedine et al. "Intermodal transportation system management: towards integration of traffic management system and users information system," in Proceedings of the *IMACS Multiconference on Computational Engineering in Systems Applications,* 2006, pp. 972–979.

[11] B. Sanghoon, "An advanced public transportation systems application: feasibility study of bus passenger information systems operational test in the town of Blacksburg," in *Proceedings of the 6th Vehicle Navigation and Information Systems Conference 1995. In conjunction with the Pacific Rim TransTech Conference. 'A Ride into the Future',* 1995, pp. 408–413.

[12] M. Hannikainen et al. "Architecture of a passenger information system for public transport services," in *Proceedings of the Vehicular Technology Conference*, vol. 2, *2001,* pp. 698–702.

[13] M. Foth and R. Schroeter, "Enhancing the Experience of Public Transport Users with Urban Screens and Mobile Applications" in *Proceedings of the 14th International Academic MindTrek Conference*, 2010, pp.33-40.

[14] N. A. Karim and C. Nwagboso, "Assistive Technologies In Public Transport: Meeting The Needs of Elderly and Disabled Passengers" in *Proceedings of International Conference on Information and Communication Technologies: From Theory to Applications*, 2004, p. 69.

[15] A. K. Schaar and M. Ziefle, "Potential of eTravel assistants to increase older adults' mobility," in *HCI in Work & Learning, Life & Leisure. 6th Symposium of the Workgroup Human-Computer Interaction and Usability Engineering of the Austrian Computer Society, USAB 2010,* G. Leitner et al., Ed., Berlin, Heidelberg: Springer, LNCS 6389, 2010, pp. 138–155.

[16] H. Heck et al., "ÖPNV-Reiseassistenz für mobilitätsingeschränkte Menschen," in *Proceedings of the 1st German Ambient Assisted Living Conference.* Berlin: VDE, 2008.

[17] P. Mayring, "Qualitative Content Analysis," Forum: Qualitative Social Research, vol. 1, 2000.

[18] G. Lyons, "The role of information in decision-making with regard to travel" in *IEE Proceedings IET Intelligent Transport Systems*, vol. 153, no. 3, pp.199-212, 2006.

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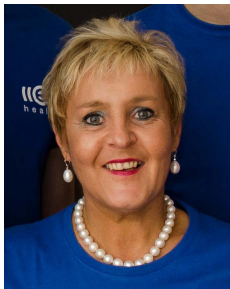
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