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Improving service quality in public transportation systems using automated customer feedback

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ABSTRACT

In this paper the necessity for standardised automated information exchange between travellers and transportation company is evaluated to improve the service quality of public transport. Therefore the needs and expectations of transportation companies and travellers are defined and the usage of a novel approach for bidirectional information and communication systems in public transport is proposed. As a result, application scenarios for the usage of customer information are described and the advantages of this novel approach, especially for dispatching processes, are highlighted. Furthermore, the benefits for customers and transportation companies in regard to service quality are pointed out.

1. Introduction

Public transport serves the society by providing cheap and fast mobility services. Due to long term experiences over decades, the provided services are highly reliable and affordable. Traditionally, routes, intervals and vehicles are planned top down based on a priori knowledge about the traveller flows and desired interchanges. Due to the slow changing nature of traveller flows and a huge basis of domain knowledge, this planning process works reasonably well when every actor involved is on time. However, in case of short term interruptions, delays or even cancellations ad hoc dispatching is necessary to counteract the disruption. In those situations, two factors limit the service quality. First, the dispatcher only has a priori knowledge about the local situation. Thus, it is impossible to make optimal dispatching decisions for all travellers. Second, the dispatcher's reactions to interruptions are not disseminated efficiently to the affected travellers. This often creates uncertainty (Cambridge Systematics, 1999), which limits the travel experience and the perceived service quality (EN 13816, 2002).

In former times, it was impossible to gather and process individual journey information for each traveller in a timely manner. However, this has changed due to the wide availability of modern communication systems like smartphones, mobile data plans and high performance servers. Having today's communication and data processing capabilities, it is possible to collect, process, and include in situ information from all travellers within the operational decision processes and to disseminate timetable changes in real time. Informing the traveller about dispatching decisions or timetable changes

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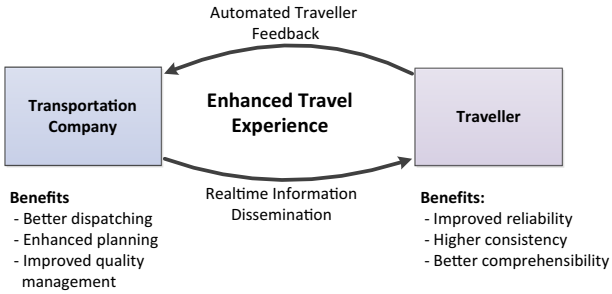

Fig. 1. Benefits gained by enhanced communication facilities between traveller and transportation company.

reduces the uncertainty, increases the consistency and causes a better comprehensibility for the traveller. This gives the passengers the feeling of being well informed and thus increases the quality of service (VDV, 2014) (c.f. Fig. 1).

Unfortunately until today, traveller information is not transmitted to transportation companies and their dispatchers in a noteworthy amount nor in a way which permits an automatised processing of this information.

Thus, an beneficiary integration of automated customer feedback is missing until today. In extension to Stelzer et al. (2014), in this paper, we show how to integrate and use customer feedback to improve service quality in public transport. For this, we first present an overview of related work in Section 2. We then derive the need for automated information exchange between the transportation company and the traveller in Section 3. In Section 4 we present technical constraints and a novel framework to build systems which permit a broad exchange of customer information in a standardised way. In Section 5 benefits of and possible application scenarios for automated standardised information exchange are pointed out. We hereby not only focus on traveller benefits but also on models for transportation companies to improve their service quality. The findings are discussed in Section 6 where we will also highlight the difference between the described approach and the actual situation in public transport.

2. Related work

Currently, the disruption management cares mainly about timetable adjustment, rolling stock and crew rescheduling (Jespersen-Groth et al., 2009). Customer information sometimes is indirectly integrated by staff reports and is then displayed towards the dispatcher (Informationssystem Transportleitung Personenverkehr). The notification of customers in a timely and consistent manner, is currently not a highly prioritized aspect in disruption recovery. Taking direct feedback of customers into consideration is not part of the process at all. Suhl et al. (2001) defines a customer oriented dispatching by taking the delays of travellers into consideration. However, the data is derived from models and simulation and not directly transmitted by the traveller. Currently, the planning phase of disruption management also does not consider data of direct customer feedback (Chu and Oetting, 2013).

In addition, research in the area of public transport and social media is rather focused on services to connect travellers among each other or to provide entertainment for the traveller during the different phases of the trip (Foth et al., 2013). Actual research concerning traveller feedback directly to the transportation company using social media is rare. Austin (2011) mentions the problem of reacting to customer input, via social media, which in generally cannot be processed in an automatised way. Deutsche Bahn, the main railway operator in Germany, uses social media to communicate with its customers and also reacts to the feedback of the customers (Deutsche Bahn Facebook page, 2014). However, this feedback generally cannot be used to influence operations. Social media as well as traditional ways of communication do not allow a transmission of structured information (Bregman, 2012). Therefore, the information cannot be easily evaluated and thus cannot be used to enhance operations.

In another approach information derived from travellers is displayed in customer information systems (Gruber et al., 2012). The information is not transmitted to and not used by traffic operations, though. Another community approach permits passengers to inform other travellers about vehicle occupancy. Here as well, the information is solely provided in passenger information systems (Crawford, 2013). An integration for operational improvement is not documented.

In Dollevoet et al. (2012) an approach to solve connection conflicts is presented, which postulates the knowledge of origin–destination-pairs of travellers. Even today, this information is generally not available (Mayas et al., in press). Therefore, a suitable approach is needed which enhances the service quality in public transport enabling customers to provide this information and the transportation companies to use the information.

The use of customer feedback and information, as part of e.g. public transport information, planning and dispatching systems, raises challenges on both sides. Based on the definition of service quality in EN 13816 (cf. Fig. 2), an approach to enhance the service quality has to consider the traveller view and the service provider view as well (EN 13816, 2002). Traveller aspects and provider aspects have to be equally analyzed and parameters for an increase of service quality have to be identified. Therefore, we describe the different views on the necessity for automated customer feedback in the following Section 3.