Real-time information for South African public transport systems

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INTRODUCTION

Independent of the physical infrastructure and vehicle type, the provision of information has been identified as an important element that provides, or improves, customer satisfaction (Mitretek Systems 2001). Internationally, the trend is to provide real-time information through the implementation of Advanced Traveller Information Systems (ATIS). This article provides a summary of the ATIS system for the Jammie Shuttle service at the University of Cape Town (UCT). The idea behind the implementation of this system is to act as a demonstration project for other public transport systems in South Africa and beyond.

BACKBROUND

Mobility patterns of South African inhabitants are dependent on the level of income. While most of the urban rich are car owners, the urban poor depend on public transport. Moreover, a fair share of the population cannot afford any type of transport (Vanderschuren 2006).

The National Household Travel Survey 2003 (NHTS: DoT 2005), indicates that 40% of work trips are by public transport, while 23% of work trips are on foot. Given that the car only accounts for 32% of work trips, it is clear that public transport plays a very important role in the South African context.

The NHTS (DoT 2005) indicates that 47% of the population live within 15 minutes' walking distance from a bus stop, while close to 37.7% claim to have no access to a bus stop in their vicinity. However, less than 6% of the population use buses to

gain access to facilities, such as shops, welfare services, medical services, post offices, etc. This is in contrast to minibus-taxis, which are the second most commonly used mode of transport to access facilities.

For more than a decade now South African transport policy documents have been focused on providing mobility for all. The White Paper on National Transport Policy (NDOT 1996) indicates in its vision statement to "*provide safe, reliable, effective, efficient, and fully integrated transport operations and infrastructure, which will best meet the needs of freight and passenger customers at improved levels of service*". Government has also identified that the provision of public transport plays a crucial role in working towards this vision.

Besides the improvement of the physical infrastructure and vehicles, the provision of information has been identified as an important element that provides, or improves, customer satisfaction (Mitretek Systems 2001). Internationally the trend is to provide electronically displayed and up-to-the-minute public transport vehicle arrival information, i.e. real-time information, through the implementation of Advanced Traveller Information Systems (ATIS). The level of public transport related information provision in Africa is low, to say the least. In order to change the image of public transport, operators could start to provide real-time information. The system implemented on the Jammie Shuttle (the public transport system of the University of Cape Town), demonstrates the real-time traveller information system opportunities in the hope that other South African public transport providers will follow.

IMPROVING CUSTOMER SATISFACTION

Satisfaction measures obtained from citizens are frequently used in performance-based contracts, due to their presumed link with company performance. However, few studies have actually examined the link between traveller satisfaction measures and objective performance measures in public transport (Friman & Fellesson 2009). The ones that have, have found that an increase in supply (qualitatively or quantitatively) will not automatically lead to a corresponding increase in demand and satisfaction (Fujii & Kitamura 2003, Mackett & Edwards 1998).

The European Committee for Standardisation (2002) has adopted a comprehensive framework for analysing both functional and technical quality determinants in urban public transport. This framework also serves as a common European reference to identify quality elements in public transport. In this framework, urban public transport attributes have been classified into eight categories, i.e. availability, accessibility, **information**, time, customer care, comfort, security and environment (CEN 2002). The provision of accurate information, at various points before and during the trip, appears to be of the essence.

Transit agencies of all sizes, and even smaller agencies, are utilising real-time traveller information to increase overall customer satisfaction. In 2007, 94 transit agencies responded to a questionnaire carried out by the US DOT Research and Innovative Technology Administration (RITA). It appeared that, at the time, 61% of all fixed-route buses were equipped with Automated Vehicle Location (AVL) systems and that 27% provided real-time information. For all other transit modes the penetration was less, i.e. heavy or rapid rail has 19% of its vehicles equipped with AVL and provides real-time information in only 4% of the cases; light rail has 34% AVL and 20% real-time information; almost 50% of demand-responsive vehicles have AVL, while real-time information is only provided in 2% of the cases; 29% of commuter rail vehicles have AVL and in only 8% of the cases real-time information is provided; and, last but not least, 63% of ferry boats use AVL and no real-time information is provided by these operators (FHWA 2010).

ADVANCED TRAVELLER INFORMATION SYSTEM

International experience (FHWA 2010) clearly indicates that the provision of real-time passenger information plays an essential role in improvement of customer satisfaction. Travellers can be provided with real-time information by a web-based platform (terminals-internet information), via a Variable Message Sign (VMS) or TV, and via SMS services. However, the real-time information service needs to be aligned to traveller needs in order to increase the passenger demand and/or satisfaction. Moreover, only if the quality of the information is (very) good, will customer satisfaction, and possible passenger demand, increase.

The OneBusAway (OBA) transit traveller information system has existed as a service for transit riders since the summer of 2008 (http://onebusaway.org). The current primary use of OneBusAway is to provide real-time next bus count-down information for riders of King County Metro (KCM) in greater Seattle (Ferris *et al* 2009). The results of an evaluation study by Watkins (Watkins *et al* 2011) indicate that OBA users show increased satisfaction with public transportation, as well as having a perception of decreased waiting time. It was not found to significantly increase trip frequency of travellers, nor was it found to reduce waiting anxiety or the perception of on-time performance. However, an overall transit ridership increase was witnessed, which can be translated to improved customer satisfaction.

OneBusAway uses the underlying data feed from KCM's AVL system and the prediction algorithms developed by Dailey and his team from the Electrical Engineering Department at the University of Washington (Maclean & Dailey 2002). The Jammie Shuttle traveller real-time information system also uses AVL, and an algorithm that was developed locally.

ATIS IMPLEMENTATION ON THE JAMMIE SHUTTLE SERVICE

The Jammie Shuttle system was the first recapitalised public transport system in South Africa. Before 2005, although there was a contract with a service provider, minibus-taxi type services were provided on the campus of the University of Cape Town, and the drivers behaved in the same way as the para-transit vehicles do in the rest of the country. The vehicles were often overloaded, unsafe and there was a general disregard for the law.

Since 2005, the services have become more formalised, permits were issued, drivers wear uniforms, the vehicles have a standardised colour and timetables were introduced. The daily trip rate during the semesters has increased from 16 000 person trips in 2005 to over 42 000 person trips in 2011.

South Africa is currently working on the implementation of new, improved public transport systems (Bus Rapid Transport). The implementation of ATIS systems could be one of the building blocks of improved public transport. During the pre-survey that was conducted on the UCT campus, students, staff and third parties (service providers) were interviewed. Besides the collection of valuable data needed for the design of the main survey, the opinions of users were gathered regarding the implementation of a Jammie Shuttle ATIS system. It appeared that Jammie Shuttle users are very positive and excited about the planned system

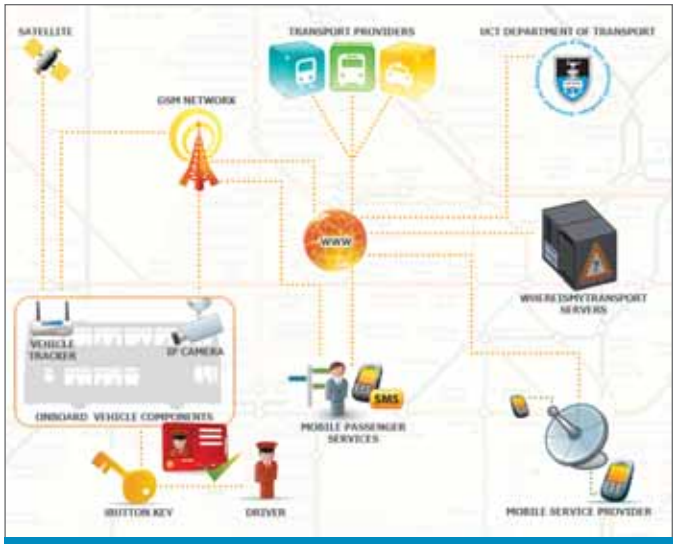

Figure 1: Jammie Shuttle ATIS system components (source: the 'Where is my Transport' team)

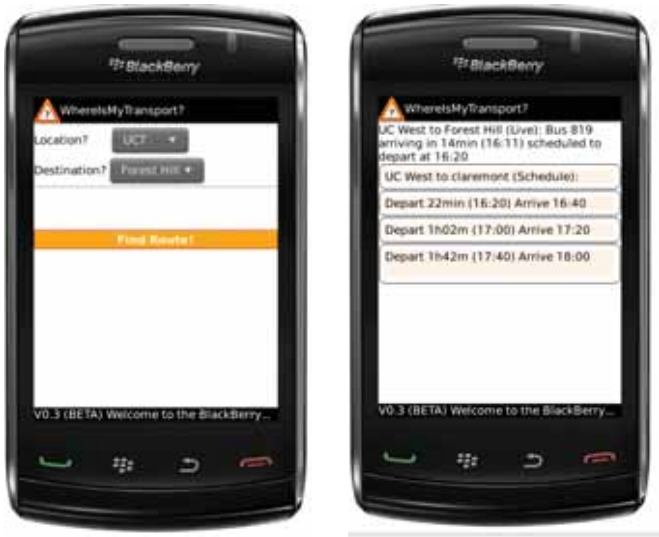

Figure 2: Real-time travel information at the push of a button

Together with the improved services on the ground, the development of an Advanced Management Systems (AMS) started to improve the system management and monitoring possibilities. The AMS includes vehicle tracking, vehicle maintenance, scheduling, reporting, driver feedback and an ATIS system.

The implementation of an improved Jammie Shuttle service came with a steep price tag. It was, therefore, of utmost importance to monitor that the expenses were warranted. The service provider, as stipulated in the contract, was required to provide up-to-date monitoring information regarding the vehicles, driver behaviour and the passenger numbers. However, it quickly became clear that the service provider was not able to provide the required detail. That was when the development of an improved management system started. Further development and improvements have happened ever since. The rollout of the ATIS finally commenced in 2011 and is still under development.

The focus of this article is the ATIS system. This system has a couple of facets which each has its own function and provides an important element to the success of the ATIS system. The facets are the following:

- Each vehicle operator is issued an Identification-Key (iButton) for each driver.
- The vehicle tracker is a device fitted with GPS.
- GPS and iButton information is communicated via GSM network to the server.
- The server stores and calculates information.
- The server provides information to various systems:
  - Web information system
  - Mobile phone information system (request via stop + route number)
  - Stop information system
  - TV information system
  - The future aim is to include all public transport services on the web and mobile phone services.

Figure 1 provides an overview of the components of the system.

In 2011 one shuttle stop was equipped with two VMSs, providing real-time traveller information from every approach to the stop. Moreover, six TVs were mounted in various buildings on the upper campus, while one TV will be tested outside, under an overhang of a building.

In 2012 the plan is to mount a TV in a local shopping centre to expose the general public to the Jammie Shuttle ATIS. One large VMS is also planned for Tugwell, the busiest Jammie Shuttle stop.

PRELIMINARY FINDINGS

Public transport systems in South Africa, generally, have a bad reputation. South Africa is currently working on the implementation of new, improved public transport systems (Bus Rapid Transport). The implementation of ATIS systems could be one of the building blocks of improved public transport.

During the pre-survey that was conducted on the UCT campus, students, staff and third parties (service providers) were interviewed. Besides the collection of valuable data needed for the design of the main survey, the opinions of users were gathered regarding the implementation of a Jammie Shuttle ATIS system. It appeared that Jammie Shuttle users are very positive and excited about the planned system.

Based on the literature review and the fact that ATIS systems are not available for bus services in South Africa yet, it was concluded that a survey is needed. As mentioned, the pre-survey was carried out in 2011. The author hopes to be able to report back on the full results of the research in 2013.

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