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Evaluation of Real-Time Transit Information Systems: An information demand and supply approach



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ABSTRACT

This study assesses current needs in the implementation of Real-Time Transit Information Systems. Web surveys are used to better understand information supply and demand, defined as the attitudes and experiences with real-time information of transit passengers and agencies, respectively. The most valued types of information demanded were found to be related to vehicle location while the least valued information relates to vehicle characteristics, like seating availability. Smartphone applications were found to be the preferred medium for receiving information followed by Internet/websites and dynamic message signs. The surveys also revealed that demographic and socioeconomic status influence preferences for real-time information. The information supply survey found that approximately 70 percent of surveyed agencies currently offer real-time information. The largest constraint to providing or improving Real-Time Transit Information Systems (RTTISs) was found to be funding, followed by staffing needs. A comparison between the survey results found that the information currently being provided by transit agencies is mostly in line with the information most valued by transit passengers. The few differences that exist are generally because agencies do not provide information on the media preferred most by passengers. To address these differences, several suggestions are made to improve the implementation of real-time information. This information can be used to better develop and prioritize investment in real-time information systems.

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Introduction

Public transportation can provide a socially and environmentally beneficial alternative to private automobiles for the mass transportation of people. One avenue to improve the transit experience is the deployment of Real-Time Transit Information Systems (RTTISs). Current research on RTTISs primarily focuses on the benefits and advantages of providing this type of information to transit users. First, having real-time information has been shown to significantly affect how users perceive waiting times for transit service. Passengers are not only more willing to wait for transit, but they perceive their wait times as being shorter and the service itself as more reliable (Transportation Research Board, 2003a; Watkins et al., 2011). Second, access to real-time transit information has been found to make transit feel safer (Ferris et al., 2010; Gooze, 2013; Transportation Research Board, 2003a). Third, these systems allow passengers to make more informed transportation

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decisions (Hickman and Wilson, 1995; Maclean & Dailey, 2002). All of these benefits have contributed to more favorable views of transit (Ferris et al., 2010; Transportation Research Board, 2003a) and, consequently, have been linked to increases in ridership and mode share (Brakewood et al., 2014a,b; Ferris et al., 2010; Tang and Thakuriah, 2012a,b). Instead of focusing on the benefits of this information, this paper focuses on how the views of stakeholders influence preferences for, and the implementation, of RTTISs.

A variety of stakeholders are involved in the development, dissemination, and operation of RTTISs. The key stakeholders influence information demand (i.e., what type of information is desired) as well as the information supply (i.e., what type of information is actually provided to transit users). For the purposes of this research, information demand refers to what transit customers want while information supply is defined as what the transit agencies provide. Unfortunately, information demand and supply have generally been treated separated in the literature.

In terms of information demand, Caulfield and O'Mahony used a web survey to gather preferences in Dublin, Ireland (Caulfield and O'Mahony, 2007), while Beul-Leusmann et al. used a passenger survey and interviews with transit employees to obtain information on preferences and challenges with RTTISs in Osnabrück, Germany (Beul-Leusmann et al., 2013). The former found most respondents used static sources of transit information. When dynamic information was sought, dynamic message signs (DMS) were the most popular method for accessing the information. The study also found that real-time information was more likely to be used as mode certainty decreased and trip complexity increased. The latter study found that most people preferred to get their information from websites, a change from the Irish paper published a few years earlier. Both papers identified criticisms with how information was provided; in each case passengers wanted to see an improvement in how information was communicated. Both papers also found that RTTISs were not likely to increase ridership, although the systems were viewed favorably. RTTISs were found to contribute more towards increasing the comfort and satisfaction for passengers. There are several limitations with the current research on information demand. First, both papers represent European perspectives which may be more favorable towards transit than U.S. perspectives (Buehler, 2005). Technology and information options have also changed significantly since both papers were published, the earliest of which is nearly a decade old. Another limitation was the use of web surveys in an age where Internet use was not ubiquitous.

On the supply side, various surveys of transit agencies have been performed regarding their implementation of RTTISs (American Public Transportation Association, 2013, 2015; Transportation Research Board, 2011). The studies found that different agency demographics, like size and modal offering, affected the provision of information, and that an increasing number of agencies are providing information over time. The biggest reasons agencies do not provide information are funding constraints or lack of technical availability (American Public Transportation Association, 2013; Transportation Research Board, 2003b; Yoo et al., 2010) while the biggest reason for providing real-time information is to improve customer service (Transportation Research Board, 2003b). Feedback on the systems suggests this has been working in favor of agencies (Transportation Research Board, 2003b). Unfortunately, these studies were limited in the scope of information considered: generally only vehicle arrival information was included while all other types of real-time information were neglected. This does not provide a full picture of current real-time information practice.

Overall, both information demand and information supply have demonstrated that technology and information preferences and availability change over time. Consequently, there is a need to identify current preferences for and implementation of RTTISs. In addition to this, previous research exploring attitudes towards real-time information was found to inadequately consider demographic and socioeconomic effects on RTTIS preferences. This is a limitation as other research in information communication has demonstrated how these differences can affect how information is perceived and understood (van der Meij and Gellevis, 2002; van Hees, 1996; Venkatesh et al., 2003). Other transit research also demonstrates that different demographic and socioeconomic differences can affect transit preferences (Arabikhan et al., 2016). There are also opportunities to expand on the types of information offered to transit customers. Finally, no research has compared attitudes and preferences of both information demand and supply together. This paper will address all of these research opportunities.

In light of this, the goal of this research is to more closely examine what real-time information transit passengers want and what real-time information agencies provide to identify ways to improve RTTISs. The following specific research objectives were defined to achieve this goal:

1. Identify the types of real-time transit information (RTTI) users consider to be important/useful.
2. Identify the media and methods through which people would like to receive RTTI.
3. Clarify how people prefer to see RTTI presented.
4. Identify the kinds of RTTI that are currently being provided by transit agencies.
5. Summarize the methods transit agencies are utilizing to relay this information to passengers.
6. Identify the constraints/restrictions preventing transit agencies from communicating RTTI.
7. Develop strategies for prioritizing the implementation of RTTI that account for what transit users want and what agencies can deliver.

The remainder of this paper describes the methodology used to gather and evaluate the information used to address each of these objectives followed by key results and a comparison of information demand and supply. The paper concludes with a discussion on potential strategies and applications that could use this information.

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