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Where is the happy transit rider? Evaluating satisfaction with regional rail service using a spatial segmentation approach

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ABSTRACT

Public transit agencies are delivering transport services in a rapidly changing and highly competitive transportation market. Ensuring rider's satisfaction in such an environment has led several public transit agencies to adopt different marketing strategies. For example, market segmentation analyses are commonly employed by transit agencies to identify groups of users, which are subsequently used as a base for developing policies and strategies aimed at improving customer satisfaction. However, previous studies adopting this market segmentation approach have predominantly ignored spatial and contextual factors related to the transit network and the built environment of where a user resides, resulting in network-wide policies that are difficult to implement especially for agencies with scarce resources. This study presents a new segmentation approach that incorporates spatial and contextual factors in addition to other rider's preferences and satisfaction levels with commuter rail service in the Greater Toronto and Hamilton Area, Canada. Including these factors in a market segmentation analysis has enabled us to recommend service interventions at a local and finer scale compared to previous studies, while at the same time providing the greatest impact on a specified segment of riders. This research provides transit planners and policy makers with a spatial segmentation approach, which can be used to maximize the benefits of service improvements intended to increase satisfaction with public transit among certain groups of users in a region.

1. Introduction

Delivering high quality, affordable, and efficient urban public transport service that is equally beneficial to all residents is a major feat that cities are striving for globally. Transit agencies are continuously determined to achieve a balance between economic efficiency of the provision of service and delivery of a desired level of service. The success of a transit agency can be measured by the number of satisfied passengers using the service and who will continue to use the service in the future (de O na et al., 2013). Accordingly, regular monitoring of customers' perception of service through the collection of customer satisfaction surveys is one of the most widely used and recognized tools in the industry to directly capture the customers' perception of service quality (Davis and Heineke, 1998; Hensher et al., 2003). Customer satisfaction is a subjectively measured quality of service indicator, which is perceived as an important determinant of a users' travel demand (Prioni and Hensher, 2000). Improvements in passengers' satisfaction is generally associated with higher levels of consumer loyalty (Olsen, 2007), and customers who are satisfied with the service are more likely to continue to use transit at the same or a higher level of frequency, and positive experiences with service are likely to be communicated to friends and family (Davis and Heineke, 1998).

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In order to design and prioritize transport strategies that can improve service quality, considerable research has been conducted to identify which service attributes have the strongest influence on the overall assessment of service quality (de Oña et al., 2013; Eboli and Mazzulla, 2007, 2015; Hensher et al., 2003; van Lierop and El-Geneidy, 2016). However, transit agencies must acknowledge that there are different groups of transit riders, who have different needs and expectations (Beirão and Cabral, 2007; Bordagaray et al., 2014; dell'Olio et al., 2010). Traditionally, transit market research has categorized transit users as either captive or choice riders according to their vehicle access and travel behavior (Beimborn et al., 2003; Jacques et al., 2013; Krizek and El-Geneidy, 2007). While more recent research started to segment the market further by incorporating additional factors such as attitudes and personal motivations, travel behavior and trip details and socio-demographic information in order to develop more specific policy recommendations targeted towards each group (Beirão and Cabral, 2008; De Oña et al., 2016a, 2016b; van Lierop and El-Geneidy, 2017). Yet such an approach to market segmentation leads to the generation of system-wide policies that require an abundance of resources to implement, while only the targeted segment of the market will benefit from this policy.

Transit agencies with scarce resources need to prioritize strategies in certain areas in the region that can target concentrations of certain segments of riders, or to allow agencies to prioritize service interventions in areas where high proportions of socially vulnerable individuals that are dependent on transit service. Accordingly, this study builds off the current practice of public transit market segmentation by incorporating spatial and contextual factors, related to where each user lives and the service they frequently use, in addition to satisfaction levels and personal characteristics. This approach generates geographically sensitive segments of users where policies can be applied to target a certain segment of the transit market either due to its need or due to its level of satisfaction. This study uses customer satisfaction survey data collected from commuter train users in the Greater Toronto and Hamilton Area (GTHA), Canada to demonstrate this new geographically sensitive public market segmentation approach. It also shows the value of implementing such an approach through recommending service interventions at a local and finer scale compared to previous studies.

The following section of this paper provides a detailed review of literature relevant to customer satisfaction and market segmentation approaches. Next, the case study and data included are described, which is followed by an outline of the statistical methods applied to geographically segment users in our sample. This is followed by the results of the geographically sensitive segmentation analysis. Lastly, a discussion of policy recommendations specific to each segment is demonstrated in an effort to show how a transit agency with scarce resources can increase satisfaction through targeting policies in certain areas in a region that are dominated by a specific group of users.

2. Literature review

Various public transit agencies are trying to be competitive in the rapidly changing transportation market through applying market-oriented strategies. Market-oriented strategies are employed by these agencies to ensure ridership retention through increases in customer satisfaction (Molander et al., 2012). Customer satisfaction as defined by Anderson (1973) is the difference between a customers' perceptions and expectations of the service they received. Accordingly, high customer satisfaction results when service performance meets or exceeds the customers' expectations or desired standard of service. However, developing valid and accurate constructs of service quality is complicated by the fact that a customers' evaluation of quality is a rather elusive concept to measure, which is particularly complicated by intangible service attributes (Parasuraman et al., 1985). Intangible service attributes in the public transit market include safety, comfort and cleanliness, whereas factors such as service reliability or on-time performance are more tangible measures of service quality. Accordingly, the measurement of service quality remains challenging for public transit agencies (Hensher et al., 2003), which is exacerbated by research that indicates that the perception of service quality and the relative importance of service attributes vary among groups of users (dell'Olio et al., 2010). The heterogeneity among individuals and the differences among attitudes towards transit or personal desires requires the use of segmentation analyses that accounts for travelers attitudes and behaviors (Beirão and Cabral, 2007).

Segmentation analyses are employed by transit agencies to identify different types of users who have similar characteristics, and the resulting segments of users can serve as a base for future marketing strategies (Weinstein, 2004). At its most basic, segmentation analyses categorize people according to socio-demographic variables and transport use, however these measures have been found to oversimplify the market (Anable, 2005). Psychological factors, such as perceptions, attitudes and habits, have shown to be important factors for understanding travel behavior (Fujii and Kitamura, 2003), and users' perception of service quality has been linked to continued use of a service (Lai and Chen, 2011). Building off this knowledge, Krizek and El-Geneidy (2007) employed a market segmentation approach to uncover groups of both users and non-transit users that have similar travel habits and preferences towards public transit. The authors identified captive and choice transit riders who were distinguished by their frequency of use and identified recommendations for how to market transit service most effectively to increase satisfaction among each group. Tyrinopoulos and Antoniou (2008) segmented respondents by their sex to evaluate differences in perceptions and the relative importance of service attributes between these groups. More specific to satisfaction levels among users of a suburban commuter rail service, De Ona et al. (2015) categorized types of users according to their frequency of use and travel time in a typical day. Following the identification of groups of users, the authors applied a classification and regression tree approach to identify which service characteristics have the most significant influence on overall service quality. This approach to evaluating the relative importance of service characteristics among stratified groups of users has been applied in other contexts (de Oña et al., 2016b).

Lastly, Abenoza et al. (2017) segmented current and potential public transit users across Sweden according to socio-demographics, travel patterns and accessibility measures (job accessibility and accessibility to amenities). Then the authors determined the proportion of each segment found regionally and the relative importance of key service attributes specific to each segment, and satisfaction levels with public transit performance. Similar to research by Diana (2012) who considered population density when

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