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Assessing NJ TRANSIT's Mobile App for Users' Receptiveness to Geotargeting

FINAL REPORT
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16. Abstract

NJ TRANSIT customers can use a smartphone application ("app") to purchase tickets and access transit information. Most smartphones are equipped with technology that can determine the user's location; however, this feature is currently used in a limited capacity in NJ TRANSIT's app. By knowing a customer's location, NJ TRANSIT could potentially provide customized information directly to passengers based on their location, which is referred to as geotargeting. The objective of this research project is to assess NJ TRANSIT passengers' receptiveness to geotargeting in NJ TRANSIT's mobile app. A three-part method was used. First, an industry scan of transit smartphone apps was conducted by downloading publicly available apps from four peer transit agencies. The results reveal that most of the peer transit agency apps are location aware; however, this functionality appears to be used in a limited number of features within the app, such as detecting a user's location when they request nearby real-time vehicle arrival information. In the second part of the research, focus groups of NJ TRANSIT passengers were conducted, and the results of this qualitative research were used to guide the third part of the project, in which an online survey of NJ TRANSIT customers was conducted. The results of the survey reveal that most customers understand that their smartphone can detect their location, and most respondents find it acceptable for NJ TRANSIT's app to detect their location. After providing specific examples of potential geotargeted features in NJ TRANSIT's app to survey respondents, the most desired feature was targeted transit service alerts. Examples of targeted coupons and advertising were also presented to survey respondents; however, these received mixed feedback from participants. In summary, the results suggest that NJ TRANSIT passengers find it acceptable for NJ TRANSIT's app to know their location, and they are particularly receptive to receiving targeted transit information relevant to their NJ TRANSIT trip.

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The authors are very grateful to the City College of New York students who worked as research assistants on this research project. City College graduate student Subrina Rahman made substantial contributions to the survey design and analysis, and she assisted with the focus groups. City College undergraduate student Nahla Ali took a leading role in conducting the industry scan of transit smartphone applications, and she also assisted with the focus groups. David Shapiro, an undergraduate student at City College, and Marion Touret, an exchange student from the ENTPE in France, also assisted with the industry scan of transit smartphone applications. Thank you to these motivated students.

Finally, we would like to thank the many NJ TRANSIT customers who participated in this research. Eighteen NJ TRANSIT passengers participated in the focus groups, and over five thousand NJ TRANSIT riders completed the online survey questionnaire. Although these research subjects are anonymous in the following report, we would like to acknowledge their time in providing valuable feedback about NJ TRANSIT's smartphone application.

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

GLOSSARY

App: “App” is an abbreviation for application. An application is a software program, and for this study, it refers specifically to software that can be downloaded onto smartphones. For example, NJ TRANSIT has an app that enables users to purchase tickets and access transit information directly on their smartphones.

Geotargeting: Geotargeting refers to the practice of providing customized content, such as information or advertising, to a person based on their location. This can be done using smartphones that are able to detect a user’s location.

Location services: Location services is a term that refers to the ability of a smartphone to detect the user’s location. If a user gives permission to detect his/her location, the phone will be able to identify the user’s location utilizing GPS or a similar technology.

Mobile ticketing: Mobile ticketing allows transit passengers to purchase tickets directly on their smartphones using a credit card, debit card, or other electronic payment. The ticket is typically displayed directly on the smartphone, and it can then be shown to a conductor for visual validation or be scanned using a QR code for validation.

Screenshot: A screenshot is an image of the visual display on an electronic device. In this study, screenshots of NJ TRANSIT’s mobile app were captured, and some were reproduced with minor modifications.

Smartphone: A smartphone is a mobile phone that includes many functions typical of computers, such as providing internet access and having an operating system that can run applications. The most commonly used smartphones in the United States are iPhone and Android devices.

EXECUTIVE SUMMARY

NJ TRANSIT customers can use a smartphone application ("app") to purchase tickets directly on their phone and access transit information. Most smartphones are equipped with technology that can determine a user's location; however, this feature is currently used in a limited capacity in NJ TRANSIT's app. By knowing a customer's location, NJ TRANSIT could potentially provide customized information directly to passengers based on their location, which is referred to as geotargeting. The objective of this research project is to assess NJ TRANSIT passenger receptiveness to geotargeting in NJ TRANSIT's mobile app.

A three-part method was used to conduct this research. In the first part of the project, an industry scan of transit smartphone apps was conducted by downloading publicly available apps from four peer agencies to NJ TRANSIT. All of the apps included the capability to purchase a transit ticket, which is referred to as mobile ticketing. The results reveal that most transit agency ticketing apps are location aware; however, this functionality appears to be used in a limited number of features within the apps, such as detecting a user's location when they request nearby real-time vehicle arrival information.

In the second part of the research, focus groups of NJ TRANSIT passengers were conducted. Two focus groups were conducted with a total of eighteen participants who use NJ TRANSIT's app. The focus groups began with a structured discussion, and based on this discussion, it was found that most participants were aware that their smartphone can detect their location. Next, the focus groups contained an exercise in which participants were shown mock-up screenshots of NJ TRANSIT's app with potential geotargeting features. A key finding from this exercise was that the most desired potential feature in NJ TRANSIT's app is targeted transit service alerts, such as in the event of a train delay. The results of this qualitative research were used to guide the third part of the project, which was a survey.

In the third part of the project, more than five thousand NJ TRANSIT passengers participated in an online survey about NJ TRANSIT's mobile app. The results of the survey reveal that most customers understand that their smartphone can detect their location, and most respondents find it acceptable for NJ TRANSIT's app to detect their location. After providing specific examples of potential geotargeted features in NJ TRANSIT's app to survey respondents, the most desired feature was targeted transit service alerts. Examples of targeted coupons and advertising were also presented to survey respondents; however, these received mixed feedback from participants.

In summary, the results suggest that NJ TRANSIT passengers find it acceptable for NJ TRANSIT's app to know their location, and they are particularly receptive to receiving targeted transit information relevant to their NJ TRANSIT trips.

BACKGROUND

In the last few years, there has been a push toward utilizing new fare payment technologies in the transit industry, particularly mobile ticketing applications in which passengers purchase tickets directly on their smartphones.[1,2,3,4,5] Numerous transit agencies in the United States have launched mobile ticketing applications (or "apps"), and NJ TRANSIT was one of the first agencies in the United States to do so.[1,2,3] In the spring of 2013, NJ TRANSIT launched its mobile ticketing application called MyTix to customers on the Pascack Valley rail line, and over the next year and a half, the app was expanded to ticket sales on all NJ TRANSIT rail lines and parts of the bus network.

Since then, NJ TRANSIT has expanded the functionality of the app beyond ticketing, and NJ TRANSIT's app is now a comprehensive mobile platform for both iPhone and Android smartphones with many features.[6] Screenshots of these features are shown in Table 1. The top left section of Table 1 shows MyTix, where users can purchase and display NJ TRANSIT tickets. The center top of Table 1 shows the train schedules feature of NJ TRANSIT's app, and the right top displays DepartureVision, which provides real-time train departure information. Bus riders can check real-time bus information using MyBus, which is shown in the bottom left of Table 1. Users can get a-to-b transit directions using the trip planner, which is shown in the bottom center of Table 1, and they can report any suspicious activities to the police using the feature shown in the bottom right of Table 1. Two important notes should be made about these features. First, the trip planner can utilize the phone's location services, which refers to the ability of a smartphone to detect the user's location. Beyond this, there is limited, if any, use of location services within NJ TRANSIT's app. Second, there is advertising shown at the bottom of some screens in the app, as can be seen in Table 1.

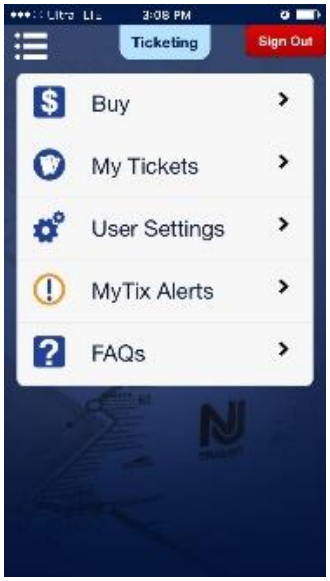
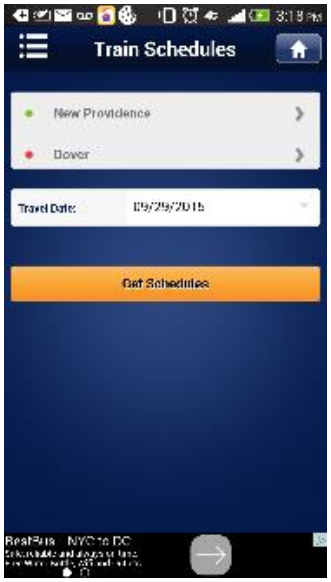
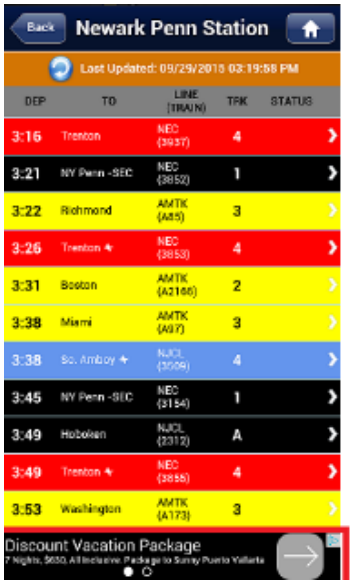
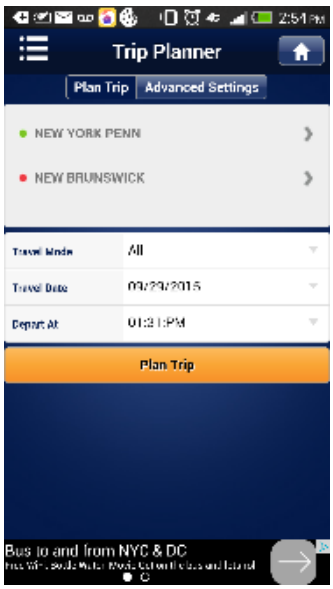
NJ TRANSIT's mobile app is frequently updated to incorporate new or improved features, and then new versions are released to NJ TRANSIT customers. As part of this continual improvement process, NJ TRANSIT would like to assess user reactions and receptiveness to geotargeting in NJ TRANSIT's app. Geotargeting refers to the practice of offering customized content to users based on their location. This research aims to investigate acceptance of geotargeting in NJ TRANSIT's app, and the specific research objectives are discussed in the following section.

OBJECTIVES

The overarching goal of this project is to assess NJ TRANSIT passengers' receptiveness to geotargeting in NJ TRANSIT's mobile app. Specific objectives include:

1. conducting a literature review on the practice of geotargeting, including privacy concerns;
2. assessing current uses of geotargeting in comparable transit smartphone apps;
3. conducting focus groups and carrying out a survey of NJ TRANSIT passengers to identify differences in receptiveness to use of geotargeting for transit-related purposes versus advertising;
4. performing statistical analyses of the survey data; and
5. developing recommendations specific to NJ TRANSIT based on the research findings.

Table 1 - Screenshots of NJ TRANSIT's App

 MyTix	 Train Schedules	 DepartureVision
 MyBus	 Trip Planner	 Police

INTRODUCTION

This report is organized in the following manner. First, relevant literature is reviewed, and the key findings from prior research are summarized. Next, the results of this research project are summarized in three parts. The first part is an industry scan that examines comparable transit smartphone apps. The second section summarizes qualitative research in the form of focus groups of NJ TRANSIT customers. The third part presents quantitative research in which a NJ TRANSIT customer survey was conducted. Finally, conclusions and recommendations are discussed.

LITERATURE REVIEW

There is a large literature pertaining to transit fare collection, particularly with respect to automated fare collection systems that utilize contactless smart cards. This includes numerous reports from the Transit Cooperative Research Program (TCRP) of the Transportation Research Board.[7,8,9] However, because mobile applications are a recent innovation in transit fare collection, there is limited literature specific to transit mobile ticketing. Therefore, this literature review goes beyond fare collection to understand the use of geotargeting (and more broadly, location services) in mobile apps outside of public transit. This review focuses on two key areas, which are (1) privacy concerns associated with the use of smartphones and other location-aware devices and (2) the use of location-based advertising on mobile devices. These two areas are summarized in the following sections, beginning with the literature pertaining to privacy.

Literature Review of Privacy for Mobile App Users

Since this area of research is rapidly changing, the focus of this literature review is the most relevant privacy studies that were published within the last ten years. Some of these studies are transportation-specific, and these are discussed in the following subsection in chronological order. The second subsection summarizes studies that more generally address privacy concerns with location-aware devices. Last, the privacy-related studies are summarized in Table 2.

Transportation-Specific Studies of Privacy for Mobile App Users

The first selected transportation-specific study pertaining to privacy was a 2014 study conducted in Greece.[10] The authors conducted a stated preference survey of 105 people in Athens, and participants were posed with trade-off questions between loss of privacy when using mobile devices versus improved driving information. Ordered logit models were then estimated using the survey data to estimate the participants' willingness to give up privacy in monetary terms. The results reveal that the average amount for a user to forego one level of privacy was equivalent to 2.2€/month (approximately $2.42 @$1.10/euro). A market segmentation analysis further revealed that women participants were willing to give out less personal information relative to men.

The second transportation-specific study was conducted in the United States and published in 2014.[11] A stated preference survey was conducted by recruiting participants through Amazon's Mechanical Turk (MTurk) marketplace (n=120). The survey included questions pertaining to the use of navigation apps, transit apps, transportation service apps such as taxis, and other location aware apps. Then, participants were asked about their attitudes towards privacy and trust when using these location aware apps. The results reveal that many respondents are concerned about privacy; however, in many cases, they are willing to trade privacy and personal information for the benefits of using these apps.

The third transportation-specific study was published in 2015 and aimed to assess attitudes and actions towards privacy.[12] The authors conducted a web-based survey using a convenience sample (n=382), and the responses were used in various statistical

models, including an order probit model and an ordinary least squares regression model. The results reveal that although participants believe sharing data through mobile devices can pose privacy risks, they generally do not take actions to address these risks. Another key finding was that participants' willingness to trade their private travel data depends on numerous factors related to their personal characteristics, the expected benefits, and their degree of trust in the collecting agency.

General Studies of Privacy for Mobile App Users

This section summarizes several studies that more generally address privacy concerns with location-aware devices, and all three studies were conducted by the Pew Research Center. The first study is a 2012 Pew Research Center report on privacy and data management on mobile devices.[13] A nationwide survey of 2,254 adults (age 18 and older) in the United States was conducted. The results reveal that more than half (57%) of app users have uninstalled or decided not to install a mobile app due to concerns about sharing their personal information. Another key finding was that some cell phone owners take steps to protect access to their personal information and mobile data, such as turning off location tracking on their phones.

Another 2012 survey conducted by the Pew Research Center focused on the use of location-based services by smartphone owners.[14] Similar to the previous study, a nationwide survey of 2,253 adults was conducted. The results show that almost three quarters (74%) of smartphone owners get location-based information on their phones. Additionally, nearly one in five smartphone owners (18%) use geosocial services like Foursquare. The survey also revealed that younger adults with smartphones are more likely than older adults with smartphones to use location-based information and geosocial services.

The last study in this section is a 2016 Pew Research Center report examining privacy and information sharing in a more general context.[15] A nationwide survey of 461 adults (ages 18 or older) living in the United States and nine online focus groups with a total of 80 people were conducted. The results reveal that many Americans will agree to share personal information, but it depends on the level of benefits they will receive and how much risk they may face in doing so. The authors noted that a reoccurring theme in open-ended responses from participants was that location data are particularly precious in the age of the smartphone, and respondents often had negative reactions to sharing their personal location data.

Literature Review of Location-Based Advertising

Smartphones have the ability to offer advertisements and other messages based on the current location of the user's mobile device. The focus of this section is to summarize location-based advertising (LBA) literature. Since this area of research is rapidly changing, the focus of this review is studies that were published within last ten years. It should be noted that none of the references cited in the following paragraphs are transportation-specific; instead, they primarily come from the fields of marketing, management, and computer science. This literature review is organized chronologically based on the year of publication, and it is summarized in Table 3.

Table 2 - Summary of Privacy Literature

Transportation-Specific Studies				
Year	**Title**	**Authors**	**Method**	**Conclusion**
2014	How Likely are Travelers to Give up Information in Exchange for Better User Information Services	Antoniou & Polydoro-poulou	• Stated preference survey of 105 people in Greece • Survey data used in ordered logit models to estimate willingness to give up privacy in monetary terms	• The average amount for a user to give up one level of privacy was equivalent to 2.2€/month (approximately $2.42 @$1.10/euro) • Women participants were more sensitive to privacy compared to men
2014	Considering Smartphones: User Attitudes Towards Privacy and Trust in Location-Aware Applications	Cottrill	• Online survey of 120 people in the United States recruited through Amazon's MTurk Marketplace • Participants were asked about attitudes towards privacy and trust when using location aware apps	• Many respondents are concerned about privacy; however, they are often willing to trade privacy and personal information for the benefits of using these apps
2015	Location Privacy Preferences: A Survey-based Analysis of Consumer Awareness, Trade-off and Decision-Making	Cottrill & Thakuriah	• Web-based survey of 382 participants (convenience sample) • Statistical analysis of survey responses included an ordered probit model and ordinary least squares regression	• Although participants believe sharing data through mobile devices can pose privacy risks, they generally do not take actions to address these risks • Willingness to trade private travel data depends on numerous factors related to personal characteristics, expected benefits, and degree of trust in the collecting agency
General Studies				
2012	Privacy and Data Management on Mobile Devices	Boyles, Smith & Madden	• Nationwide survey of 2,254 adults (age 18 and older) in the United States	• 57% of app users either uninstalled or decided not to install an app due to concerns about sharing personal information • Some respondents took steps to protect their personal information; for example, 19% of phone owners had turned off location tracking
2012	Three-quarters of Smartphone Owners use Location-based Services	Zickuhr	• Nationwide survey of 2,253 adults (age 18 and older) in the United States	• 74% of smartphone owners get location-based information on their phone • 18% of smartphone owners use geosocial services like Foursquare
2016	Privacy and Information Sharing	Rainie & Duggan	• Nationwide survey of 461 adults in the United States • Nine online focus groups of 80 people	• Many respondents would agree to share personal information, depending on the level of benefits and how much risk they faced • Location data are particularly precious in the age of the smartphone

Table 3 - Summary of Location-Based Advertising Literature

Year	Title	Authors	Method	Conclusion
2007	Attitude toward location-based advertising	Bruner & Kumar	• Two surveys were conducted • The first survey had 120 student participants • The second was an online nationwide survey with 789 participants	• The results suggest that, on average, attitudes toward LGA were slightly negative.
2007	Perceived effectiveness of push vs. pull mobile location based advertising	Unni & Harmon	• Survey of 153 college students in a designed experiment	• Overall, the perceived benefits of LBA are low • Pull LBA was received more favorably than push LBA
2008	Mobile advertising: does location-based advertising work?	Banerjee & Dholakia	• Survey of 351 collect students in a designed experiment	• The type of location (public versus private location) and what the recipients are doing (context) affect perceptions of usefulness of the advertisement
2015	Customization in location-based advertising: Effects of tailoring source, locational congruity, and product involvement on ad attitudes	Lee, Kim & Sundar	• Survey of 115 students in Korea participating in a designed experiment	• Customized advertisements were generally perceived more positively
2016	Measuring the effectiveness of location-based advertising: A randomized field experiment	Molitor, Reichhart, Spann & Ghose	• A randomized field experiment in which there were 354,662 observations from 3,965 unique users • 3,218 different coupons were offered to the users for 3,544 different stores in 372 cities in Western European countries over 14 weeks	• Increasing the distance to a store by one kilometer decreased mobile coupon response rates by 2.0% to 4.7% • The effort of scrolling down on the screen led to a reduction in coupon response rates

The first selected study was published in 2007, and it aimed to assess attitudes toward location-based advertising.[16] The authors conducted two surveys; the first survey had 120 student participants and the second was an online nationwide survey with 789 participants. The results suggest that, on average, attitudes toward LGA were slightly negative.

The second study was from 2007, and the objective was to evaluate the perceived effectiveness of push versus pull mobile location-based advertising.[17] First, the authors differentiated between push versus pull approaches to LBA messages; a push LBA approach refers to advertisements being sent to a user based on their device's location, whereas pull advertising is when the user requests the advertisement. A designed experiment was conducted in which 153 students participated in a survey about LBA. The results suggest that overall, the perceived benefits of LBA are low. The authors also concluded that pull LBA was received more favorably than push LBA.

The third study was published in 2008 and aimed to assess users' reactions to advertising on their mobile phones.[18] The authors conducted an experiment in which 351 students were asked a series of questions about their perceptions of the usefulness of mobile advertisements and their reactions to the advertisements. The results suggest that the type of location (public versus private location) and what the recipients are doing (context) affect perceptions of usefulness of advertisements.

A 2015 study explored user attitudes toward location-based advertising on mobile devices.[19] An experiment was conducted with 115 students at a university in Seoul, Korea. Participants viewed a monitor with a simulated smartphone that displayed advertisements, and then they were asked a series of survey questions. The results suggest that customized ads were generally perceived more positively.

The last study was published in 2016 and aimed to measure the effectiveness of two key aspects of location-based advertising.[20] The first was the provision of distance information and the second was the search costs. The method was a randomized field experiment in which there were 354,662 observations from 3,965 unique users and 3,218 different coupons offered to the users for 3,544 different stores in 372 cities in Western European countries over 14 weeks. A key finding from this study was that increasing the distance to a store by one kilometer decreased mobile coupon response rates by 2.0% to 4.7%. Additionally, the effort of scrolling down on the screen led to a reduction in coupon response rates.

Summary of Literature Review

The following section provides a brief summary of the literature review. Based on the review of privacy-related studies, it can be concluded that many people are concerned about privacy when using location services on their smartphones. However, the previous literature generally suggests that privacy concerns do not stop people from using location aware devices, if there are perceived benefits. The review of the location-based advertisement (LBA) suggests that there may be mixed levels of receptiveness to LBA by mobile phone users.

SUMMARY OF WORK PERFORMED

The work performed in the research project is divided into three parts. The first section is a scan of transit smartphone apps that summarizes the current state of the industry. The second part is qualitative research that presents the results of focus groups of NJ TRANSIT customers. The third piece is quantitative research in the form of a NJ TRANSIT customer survey.

Part 1: Industry Scan of Transit Apps

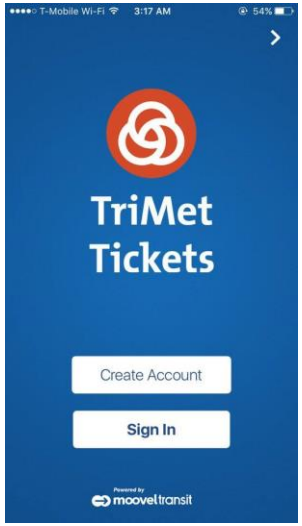
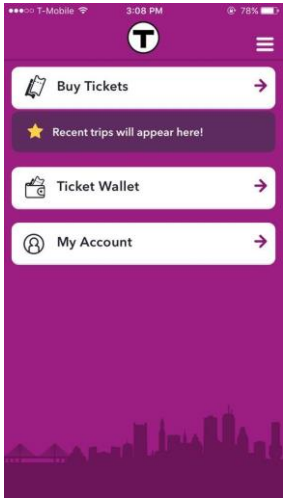
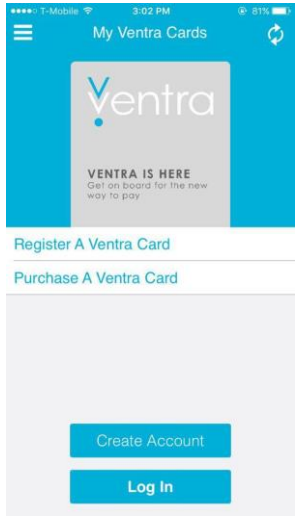
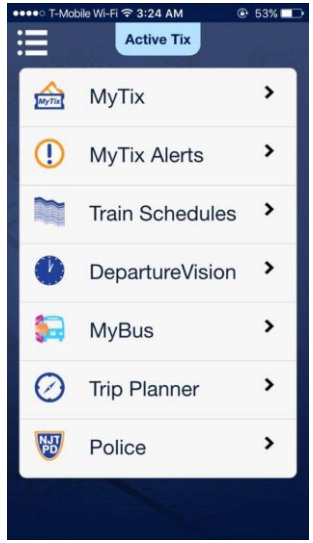
This section summarizes the industry scan of transit smartphone apps. The overarching goal of this task was to assess how geotargeting (and more broadly, location services) is currently being experienced by transit passengers in the United States who use smartphone apps. The scan was conducted by downloading publicly available transit mobile ticketing apps and cataloguing if (and how) location services are used. The apps were downloaded from iTunes and analyzed on an iPhone 6. It should be noted that this scan was conducted in the fall of 2016; because smartphone apps are frequently updated, the specific version of each app is noted.

Four American transit agencies were selected for comparison with NJ TRANSIT: TriMet (Tri-County Metropolitan Transportation District of Oregon) in Portland, the MBTA (Massachusetts Bay Transportation Authority) in Boston, CapMetro (Capital Metropolitan Transportation Authority) in Austin, and the CTA (Chicago Transit Authority) in Chicago. These agencies were chosen from the largest forty transit providers in terms of size (unlinked passenger trips) from the American Public Transportation Association (APTA) fact book.[21] These agencies can be considered peers of NJ TRANSIT, and they all have mobile ticketing apps. The apps were compared on several dimensions. This included compiling background information, use of location services, other transit features included in the app (such as real-time information or trip planning), and their privacy policies. The findings are presented in the following sections, and additional information can be found in Ali et al. (2017).[22]

Background Information on Transit Apps

Table 4 provides background information about each app. First, the home screen is shown, and there are some similarities between the features displayed on each app's home screen. For example, Austin's app and New Jersey's app include numerous additional features on their home screen, such as trip planning and departure information. Additionally, Portland's app and Chicago's app have a similar homepage layout, which only has an option of creating an account without revealing other features yet. Table 4 also shows the year that each mobile ticketing app was launched. Boston was the first of these agencies to launch a mobile ticketing app, and this occurred in 2012. They were followed by New Jersey and Portland in 2013, Austin in 2014, and most recently, by the Chicago in 2015.[2,3] Additionally, Table 4 shows the company that is contracted to develop each app, and the link to download the iPhone version of the app is shown. Last, the version of the iPhone app that was downloaded to conduct this analysis is also displayed in Table 4; this is included because new versions of smartphone apps are rapidly becoming available, and therefore, this information is subject to change in the future.

Table 4 - Background Information about Selected Transit Apps

Region	Portland	Boston	Austin	Chicago	New Jersey
Agency	TriMet	MBTA	CapMetro	CTA	NJ TRANSIT
Home Screen					
Launch Year	2013	2012	2014	2015	2013
Developer	Moovel	Masabi	Bytemark, HaCon	Cubic, Moovel	Xerox
iPhone App Link	https://itunes.apple.com/us/app/trimet-tickets/id687943985?mt=8	https://itunes.apple.com/us/app/mbta-mticket/id560487958?mt=8	https://itunes.apple.com/us/app/capmetro/id787315615?ls=1&mt=8	https://itunes.apple.com/us/app/CTA/id1005645256?mt=8	https://itunes.apple.com/us/app/nj-transit-mobile-app/id589549928?mt=8
Version	1.7.1	3.2.3	1.158	1.3.1	2016.2.0

Location Services and Geotargeting in Transit Apps

This section compares the use of location services and geotargeting in each of the selected transit apps, and the results are displayed in Table 5. Location services is a term that refers to the ability of a mobile app to detect the user's location. If a user gives an app the permission to detect his/her location, the app will be able to track the user's movement using GPS or a similar technology. Some users prefer to keep their location private and disable this feature from the app. Other users find it easier for the app to automatically determine their location instead of manually inputting that information. TriMet in Portland, CapMetro in Austin, CTA in Chicago, and NJ TRANSIT in New Jersey have implemented location services in their apps. The user has the option of turning location services on and off from the phone settings. Additionally, all ticket purchasing could be processed without location services for these apps. Boston's app, on the other hand, does not use location services at all.

As Table 5 shows, three of the apps (Portland, Austin and Chicago) have a similar layout for the location services pop-up window. This pop-up window shows up if the user has turned off location services on their electronic device. It re-directs the user to the phone settings in order to turn on location detection. New Jersey's app has an unblocked tab for location services, which can be 'never' or 'while using' depending on the preference of the user. On the other hand, the screenshot of Boston's app shows a blocked tab for the location, which says 'never,' confirming that this app does not use any location detection.

Other Features in Transit Apps

In addition to the ability to purchase tickets, many of these transit apps have additional features for customers, and the results are summarized in Table 6. Most of these features can be accessed directly in the app, except Portland and Boston's apps, which direct the user to a web browser, as shown in the screenshots in Table 6.

There are many similarities that were found in the features. The most common transit app feature is real-time information. Real-time information provides up-to-date information about vehicle departure and arrival times. Real-time information is called 'Next Departure' in Austin's app, 'Transit Tracker' in Portland's mobile website, 'DepartureVision' in New Jersey's app, and 'Transit Tracker' in Chicago's app. Another useful feature found in many of these apps is trip planning. Trip planners typically ask for the user's location and desired destination to find the fastest route between the two locations. A trip planner was found in Portland's mobile website, Austin's app and New Jersey's app. Two of the apps (Portland and Boston) include 'service alerts,' which contain transit announcements about delays, detours, or sudden changes in the transit system that may affect the user; these can be accessed through the agencies' mobile websites. There are also unique features found in only a few transit apps. Austin's app provided maps for the routes it serves. Boston provides a 'social media' tab which contains access to the agency's Facebook, Twitter, and Instagram. Portland has an option of 'More Rides Nearby' that detects the user's location in order to provide transportation alternatives, such as bike-sharing (BIKETOWN), ride-hailing (Lyft) and car-sharing (car2go).

Table 5 - Comparison of the Use of Location Services in Selected Transit Apps

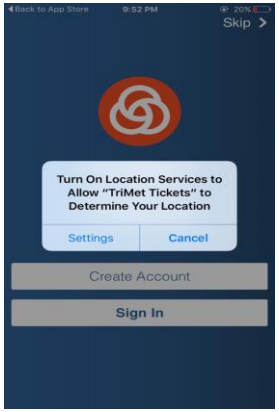
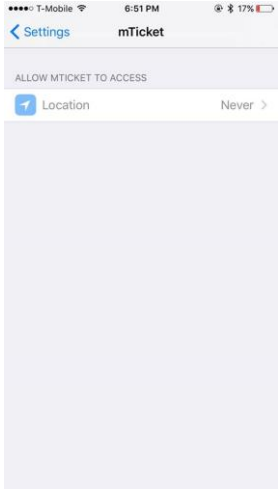
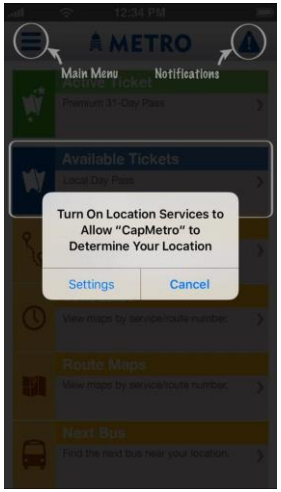
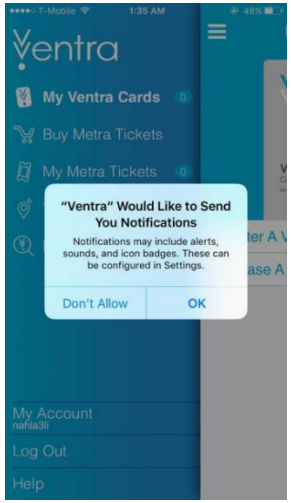
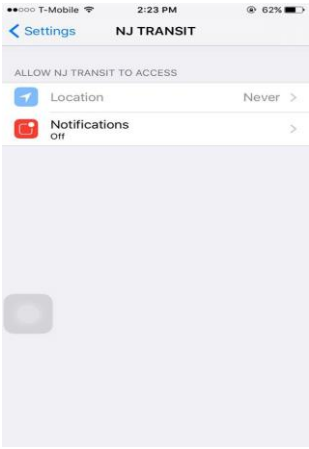
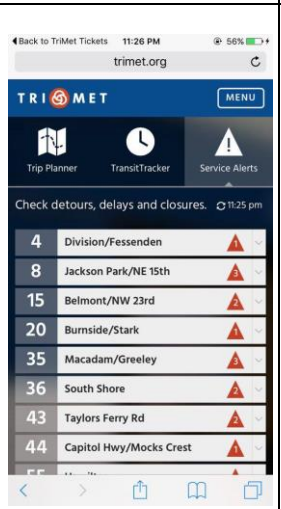
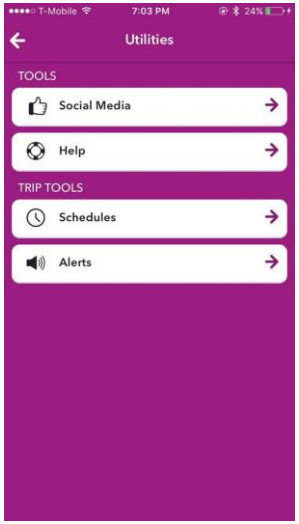
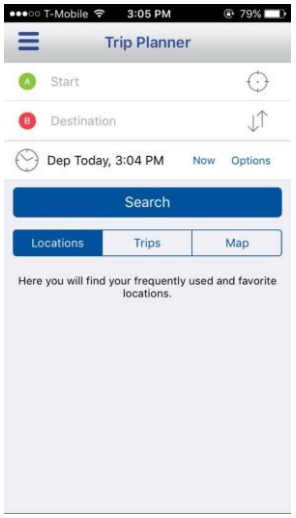
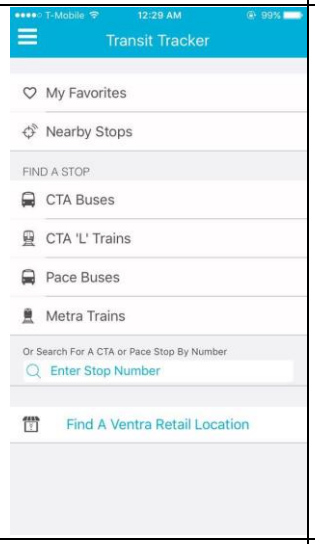
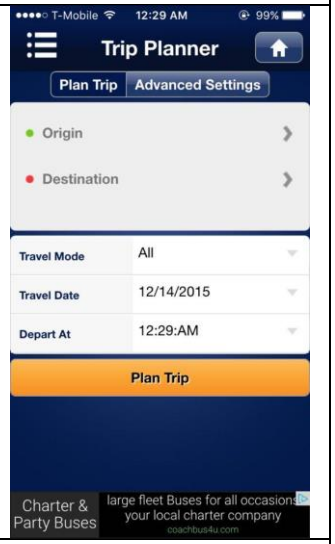
Region	Portland	Boston	Austin	Chicago	New Jersey
Agency	TriMet	MBTA	CapMetro	CTA	NJ TRANSIT
Location Detection Screen-shot					

Table 6 - Comparison of Additional Features in Selected Transit Apps

Region	Portland	Boston	Austin	Chicago	New Jersey
Agency	TriMet	MBTA	CapMetro	CTA	NJ TRANSIT
Screen-shots of selected features					
Trip Planner	Yes, on agency website	No	Yes	No	Yes
Service Alerts	Yes, on agency website	Yes, on agency website	No	No	No
Police/ Emergency	No	No	No	No	Yes
Real-time Info	Yes, on agency website	No	Yes	Yes	Yes
Offers	No	No	No	No	No
Maps	No	No	Yes	No	No
Other	More Rides NearbyMore	Social Media	None	None	None

Privacy Policies from Transit Apps

This section compares the privacy policies of each selected transit app, and the results are summarized in Table 7. The first row of Table 7 shows how one can access the privacy policy. The second row shows if the privacy policy includes some form of reassurance for users; the CTA in Chicago and NJ TRANSIT in New Jersey assure the user that the personal information is kept safe and private. However, they also state that hacking and fraud activity is possible, for which they cannot take any responsibility. Portland, Boston, and Austin have similar statements regarding responsibility for hacking and security in their privacy policies. Table 7 also shows the types of data that may be collected from the apps, which vary between agencies. One last noteworthy item is that Chicago's privacy policy states that it may share aggregate information with third parties, which is used for statistical purposes without exposing any personal information (not shown in the table). Last, the privacy policy specific to Boston's app could not be found; however, the MBTA has a general privacy policy on their website, and this is summarized in Table 7.

Summary of Industry Scan Findings

This section compared transit apps offered by the following five American transit agencies: TriMet in Portland, the MBTA in Boston, CapMetro in Austin, the CTA in Chicago, and NJ TRANSIT. An important finding from this analysis is that four of the apps utilize location services, and therefore have the ability to know where the user is at any given time. The different features in each app were also compared, and most apps had at least one feature beyond mobile ticketing, which typically included some form of transit information such as real-time information or trip planners. These transit information features often utilize location services to locate nearby transit stops or stations based on the user's current location. Last, the privacy policy that accompanies each app were compared, and there was significant variation in these written policies. In summary, there was variation between the transit agency provided smartphone apps in regard to the use of location services, apps features offered to users, and the privacy policies accompany each transit app.

Table 7 - Comparison of Privacy Policies from Selected Transit App

Region	Portland	Boston	Austin	Chicago	New Jersey
Agency	TriMet	MBTA	CapMetro	CTA	NJ TRANSIT
How to view the privacy policy	Go to the app store, download the app, read through the Terms of Service, and then find the link for the privacy policy	Found on MBTA's Customer Support website	Privacy policy can be accessed from the app store, before even downloading the app	Privacy policy must be browsed online; it is not accessible from the app or the app store	Privacy policy is available at every point that personally identifiable information may be requested
Reassuring the app users	None	None	None	"We do not sell your personal information" "We carefully protect the personal data you provide" "We do not request location data when you're not using the app"	"NJ TRANSIT maintains the following Privacy Policy to protect the personal information, including the information you upload to the App"
Respon-sibility for hacking or fraud to the user's personal information	"However, given the nature of the Internet and the fact that network security measures are not infallible, we cannot guarantee the security of your information."	"We cannot provide, and disclaim, assurance that the information you provide to us will remain free from loss, misuse"	"We cannot promise that your use of our sites will be completely safe"	"The Ventra Agencies are not responsible for any data obtained in an unauthorized manner"	"NJ TRANSIT is not responsible or liable for the security of information transmitted via the Internet."
Data collected	GPS location and the device's unique identifier	Location of use, cookies, email address, phone number	Phone number, email address, gender, age, credit card information, and GPS location	Device ID, the IP address, the type of mobile operating system	The smartphone's URL, IP address, and cookies
Privacy policy link	http://trimet.org/legal/privacy.htm	http://www.mbta.com/customer_support/privacy_policy/	https://www.bytemark.co/privacy-policy	https://www.ventrachicago.com/privacy-policy/	http://www.njtransit.com/tm/tm_servlet.srv?hdnPageAction=CopyrightTo#MYT

Part 2: Focus Groups

This section summarizes the focus groups. The purpose of the focus groups was to understand NJ TRANSIT customers' reactions and receptiveness to geotargeting in NJ TRANSIT's app, and the results of this qualitative research were used to guide the design of a survey, which is discussed later in this report. The first part of this section describes the methodology used to carry out the focus groups, and the second part presents the focus group findings.

Focus Group Methodology

Two focus groups of NJ TRANSIT passengers were conducted. Both focus groups followed the same format. First, each focus group began with an hour-long discussion about NJ TRANSIT's mobile app. Then, participants were asked to partake in an exercise in which they provided input to several mock-up screenshots of NJ TRANSIT's app with potential new geotargeted features. The procedure of conducting the focus groups is described in the following sections, beginning with the development of focus group topic guide.

Development of the Focus Group Topic Guide

The topic guide for the focus groups had two primary parts. The first part of the focus group was a structured discussion. To facilitate the discussion, a list of questions was developed, and two themes were explored. The first theme for the discussion questions pertained to the use of NJ TRANSIT's app and other similar apps that can be used for travel. The second theme for the discussion questions pertained to location services and geotargeted features. The second part of the focus group was an exercise in which mock-up screenshots of potential changes to NJ TRANSIT's app were presented to participants. In total, twelve mock-up screenshots were shown to participants to ascertain their feedback. The topic guide for both parts of the focus group was reviewed by the staff at NJ TRANSIT and the City College of New York to assure clarity, lack of ambiguity and quality of information gained from the responses.

Logistics

The focus groups were held at NJ TRANSIT's headquarters in Newark on April 12, 2016. The first group was moderated by a NJ TRANSIT staff member, and the second group was moderated by a City College of New York faculty member. Both portions of the focus group, which included the structured discussion and presentation of mock-up screenshots, were held in a meeting room that had an adjacent observation area. Additional members of the research team sat in the adjacent room and took notes.

Recruitment

There were two conditions for participation in the focus groups: first, all participants were current NJ TRANSIT riders and second, all participants had previously used NJ TRANSIT's mobile app. Recruitment was done using internal NJ TRANSIT email lists, including the Customer Satisfaction Survey and the MyTix mobile ticketing email list. In total, eighteen NJ TRANSIT passengers participated in two focus groups, with nine participants in each focus group. Incentives were provided to each participant in the

form of a $100 gift card, and participants were also provided with refreshments since both focus groups were conducted in the evening.

The demographic profile of the focus group participants is presented in Table 8. The ratio of male and female was the same in each focus group. There were no major differences between age compositions of the participants in both groups. However, there were some differences in income level between the two focus groups; for example, most participants in Group 1 had an annual household income above $70,000 (7 of 9 participants) whereas most participants in Group 2 had annual household incomes below $70,000 (7 of 9). Caucasian / Whites were prominent in both groups. It should be noted that the remainder of this report presents the combined results of the two focus groups together (n=18).

Table 8 - Demographic Profiles of the Focus Group Participants

		Group 1 (Count)	Group 2 (Count)	Total Percent
Gender	Male	4	4	44%
	Female	5	5	56%
Age	18-34 Years Old	3	4	39%
	35-49 Years Old	2	3	28%
	50-65 Years Old	3	2	28%
	66 Years Old & Over	1	0	6%
Annual House-hold Income	Below $15,000	1	1	11%
	Between $40,000-$69,999	1	6	39%
	Between $70,000-$99,999	3	0	17%
	Between $100,000-$124,999	2	0	11%
	Between $150,000-$199,999	1	1	11%
	Greater than $200,000	1	1	11%
Race	African American / Black	2	2	22%
	Caucasian / White	6	4	56%
	Latino	1	0	6%
	Mixed Latino	0	1	6%
	Mixed Race	0	1	6%
	Other	0	1	6%

Results from the Focus Group Discussion

Once the focus groups were conducted, the responses were analyzed by creating spreadsheets with the responses to each question. Key themes were then identified, and the results are summarized in the following paragraphs, beginning with the introductory questions about NJ TRANSIT's app and other similar smartphone apps.

Discussion Questions about NJ TRANSIT's App and Other Similar Apps

The focus group discussion started with the introduction of participants. Several simple, introductory questions were asked to warm up the participants and let the discussion start. The participants were asked to introduce themselves, state which NJ TRANSIT service they usually ride, and how long they had been riding NJ TRANSIT.

After the introductions, participants were asked a series of questions about NJ TRANSIT's smartphone app. First, they were asked how long they have had NJ TRANSIT's app on their smartphone. The majority of respondents (16 out of 18) stated that they had been using NJ TRANSIT's app for about 2 years. Then, participants were asked how often they use NJ TRANSIT's app; most participants (15 out of 18) stated that they use NJ TRANSIT's app every day. Third, participants were asked if they have read the privacy policy / terms of service for NJ TRANSIT's app. All respondents (18 out of 18) agreed that they never read the privacy policy / terms of service; one customer explained this by saying, "I just want to use the app." After this, participants were asked if they have noticed banner advertisements that are shown on the bottom of some screens within NJ TRANSIT's app. Numerous participants (12 out of 18) stated that they had noticed the banner ads. When discussing the banner ads, one participant said, "They are annoying. They have nothing to do with my lifestyle." It should be noted that the current advertisements shown within NJ TRANSIT's app do not change based on the user's location.

Focus group participants were then asked a series of questions about other apps similar to NJ TRANSIT's app. First, they were asked, "Are there similar apps that you have used when you travel?" Common responses included apps from Amtrak, airlines, and Uber. Second, participants were asked, "Are there similar apps you use for other activities – such as paying for something?" Responses varied between participants and included apps such as Amazon and PayPal. Last, participants were asked, "Do you use social networks on your smartphone? Do you use them to get information about NJ TRANSIT service?" More than half of the (10 of 18) participants said they use social network apps on their smartphone; however, 5 out of 18 customers did not answer this question.

Discussion Questions about Location Services and Geotargeting

The next part of the focus groups included a series of discussion questions about location services and geotargeting to assess customer understanding of these concepts and receptiveness to their use. First, participants were asked, "Do you understand that your smartphone has a GPS device in it and that when your phone is on, your location can be identified?" Nearly three quarters of participants (13 of 18) understood that their smartphone has a GPS device in it and their location could be identified if the phone is on (shown in Table 9). One participant explained, "I look at each app and am careful about this. I think about it because of the battery drain, not because of the privacy policies. I pick and choose which apps to let know where I am." Another respondent said, "For NJ TRANSIT, it's not a problem. There might be an issue so they need to know where I am."

Focus group participants were then asked, "Does it make sense that transportation apps know your location? Can you give an example of an app you use that knows your location?" Numerous respondents (8 of 18) answered in the affirmative; however, many other participants (9 of 18) did not answer this question (shown in Table 9). One customer responded "Yes, I have an app called Moovit. It gives me directions based on

where I am, similar to Google, and includes different modes of transportation. It has real-time information and uses GPS…"

Table 9 - Focus Group Discussion Questions about Location Services

Questions (n=18)	**Yes**		**No**		**No Answer**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
Do you understand that your smartphone has a GPS device in it and that when your phone is on, your location can be identified?	13	72%	0	0%	5	28%
Does it make sense that transportation apps know your location?	8	44%	1	6%	9	50%

The next question posed to participants asked, "Can you think of any way that NJ TRANSIT can give you more information through their app based on your location? What kinds of information would be helpful?" Specific examples that were probed about included transit service information and coupons. Figure 1 summarizes participants' responses to this question. Many respondents (10 of 18) desire targeted transit service alerts including information about delays and service changes. One customer responded by saying, "Number 1 item: push train delays." Another respondent said, "A loyalty program. I spend a lot of money on a monthly pass. I wish NJ TRANSIT could give me something back – a coupon or free ride."

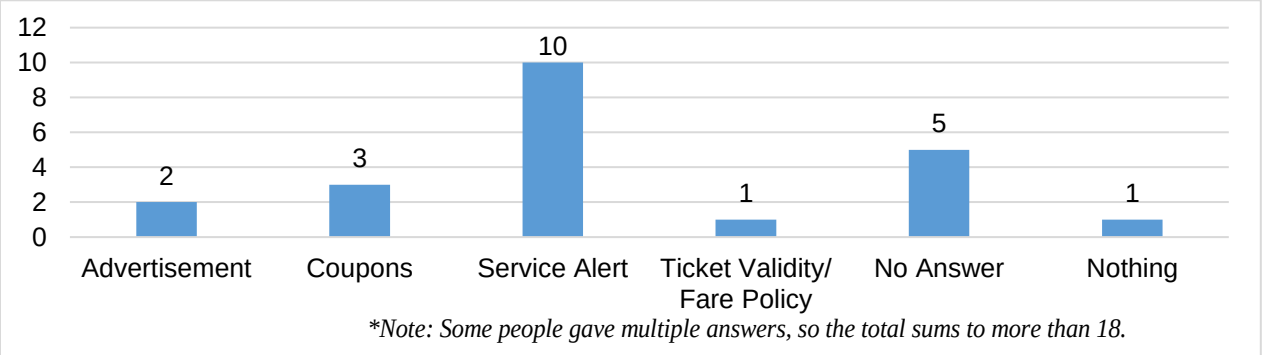


Figure 1. Helpful Types of Targeted Information

Participants were then asked, "How do you feel about NJ TRANSIT having ads in their app to generate revenue?" Most participants (13 of 18) responded in a positive manner to their question (results not shown). One customer stated that in the "Trip Planner… with promotional items for that trip. If the train is late and I'm standing in that station, then a coupon for that station is OK." However, many participants noted that they did not want to receive advertisements or coupons through the app while they were buying a ticketing or showing a ticket to the conductor. For example, one participant said, "It's stressful when I am buying a ticket. It's only OK when I'm not buying a ticket."

At the end of focus group discussion, participants were asked, "Knowing that this app is individualized to you, how else can NJ TRANSIT serve you through their app?" A few noteworthy quotations from participants are shown below and are summarized by theme:

- **Train Tracking:** “I like to see the train [in the app] when I am on the train and know what stop I am at. I am afraid I will miss my stop when I am on my train… It would be nice if I could say I am on this train and save it and it doesn’t go away until I get off.”
- **Transit Service Alerts:** “When there is a cancelation, tell us information and other ways to get home.”
- **Push Notifications:** “I would like to set up my favorite stops. It would be good if the app knows what bus routes I usually take and then provides push notifications, such as ‘your bus is coming in 10 minutes’.”

Results from the Mock-up Screenshot Exercise

The second part of the focus group was an exercise in which participants were presented with twelve mock-up screenshots of NJ TRANSIT’s app. The images used existing screenshots of NJ TRANSIT’s app with minor modifications to show how geotargeted features could be potentially incorporated in the future. Each participant was provided with a printout of the screenshots, and they were instructed to write their comments next to each of the twelve screenshots. After the participants had a few minutes to write their responses to questions about each screenshot, the group discussed each of the twelve screenshots together.

Mock-up Screenshot #1: Home Screen

The first screenshot was a modified version of the home screen of NJ TRANSIT’s app, and this included two new buttons (“Offers” and “Settings”), as shown on the left side of Table 10. The screenshot was accompanied with the following explanation: “This screenshot shows a new home screen for NJ TRANSIT’s app. It opens up automatically once you click on the app icon.” Participants were then asked, “Would the option ‘offers’ be helpful to you? What offers would you want included?” Almost all participants (16 of 18) agreed that “Offers” would be helpful. One participant wrote, “Yes, Dunkin / Starbucks, Penn Station restaurants, etc.” Next, participants were asked, “Would the option ‘settings’ be relevant to you? What would you expect settings to include?” Again, almost all participants (16 of 18) agreed that “Settings” would be helpful. One respondent said, “Yes. Push notifications, favorite stations, favorite lines, payment info, profile, password, etc.”

Mock-up Screenshot #2: Offers

The second mock-up screenshot was a new feature that could be added to NJ TRANSIT’s app called “Offers”. This screenshot was accompanied by the following explanation: “From the home screen, you can click on ‘offers.’ This screenshot shows the content within the ‘offers’ tab.” As can be seen in Table 10, there were four new features displayed in the “Offers” screen: “Deal of the Week”, “Coupons”, “Nearby Restaurants”, and “Nearby Shops”. Participants were then asked, “Which of the following tabs would you most likely click? Why?” Some respondents selected more than one answer, and the most common response (12 of 18 participants) was “Deal of the Week”. One participant said the following: “Deal of the week- has the sense that it’s only here for the week so is urgent!” The second most common selection was “Coupons” with 7 of 18 participants.

Mock-up Screenshot #3: Coupons
As can be seen in Table 10, the third mock-up screenshot was a new feature with coupons. This screenshot was prefaced with the following explanation: "Within the 'offers' tab, the option 'coupons' is clicked. This screenshot shows a sample of how the coupons would be displayed." Then, participants were asked, "Would you use any of these coupons?" Most respondents (16 of 18) wrote yes. Then, respondents were asked, "How do you feel about these offers?" Many respondents (13 of 18) provided some sort of positive statement. For example, one respondent wrote, "They're great, relevant to most people." Another respondent said, "I may use them all, depending on the convenience of location and expiration date. I won't go out of the way to Wawa."

Mock-up Screenshot #4: Settings
As can be seen in Table 10, the fourth mock-up screenshot was a new feature called "Settings". This was prefaced in the exercise with the following statement: "From the home screen, you can click on 'settings'. This screenshot shows the content within the 'settings' tab." Participants were then asked if they would turn on or off each of the four settings shown in Table 10. The first setting was for weather updates, and 8 of 18 respondents said they would turn weather updates on. The second was service alerts, and 17 of 18 participants would keep this setting on, which was the most popular option. The third was for advertisements, and only 5 of 18 participants said they would turn advertisements on. The last setting was for survey requests, and 14 of 18 participants would leave this setting on.

Mock-up Screenshots #5-7: Transit Service Alerts, Special Event & Weather Info
The next series of mock-up screenshots presented focus groups participants with specific examples of geotargeted information in the form of transit service alerts, special event information, and weather information. The screenshots and results from these exercises are shown in Table 11. As can be seen on the left side of Table 11, the first mock-up screenshot displayed a ***transit service alert*** in NJ TRANSIT's app. This screenshot was accompanied by the following statement: "You are at New York Penn Station, and you are planning a trip to New Brunswick. A transit service alert pops up. To get more information, you would click on the arrow." Then, participants were asked, "Is this transit service alert something you would like to receive? Why?" All participants (18 out of 18) agreed that they would like to receive this service alert. One customer wrote the following reason: "Yes – I might want to look for an alternative route depending on the severity."

The next mock-up screenshot included targeted ***special event information*** in NJ TRANSIT's app, and this is shown in the center of Table 11. It was prefaced in the exercise with the following statement: "You are purchasing a ticket for the bus to Edison. An alert for the bus service pops up stating that there may be delays near New Brunswick due to a home Rutgers football game. To get more information, you would click on the arrow." Then, participants were asked, "Is this special event information useful? Why?" All respondents (18 out of 18) agreed that this special event information would be useful. One customer supported their answer by writing, "Yes because it can cause a lot of traffic and I can call people to let them know if I'm running late."

Table 10 - Mock-up Screenshots #1-4 shown in the Focus Group Exercise

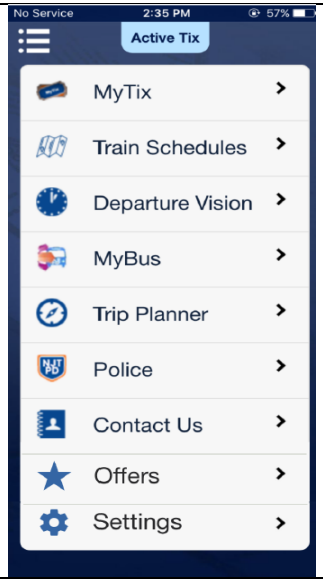
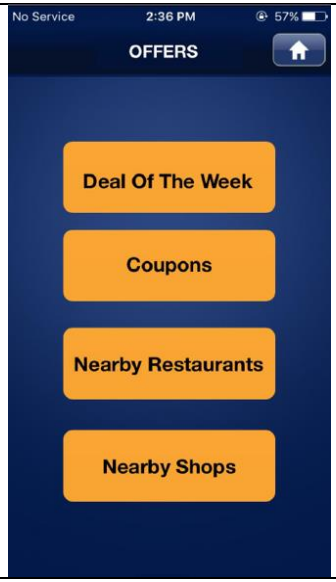
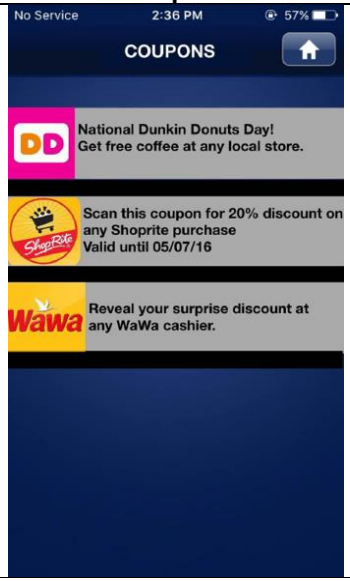
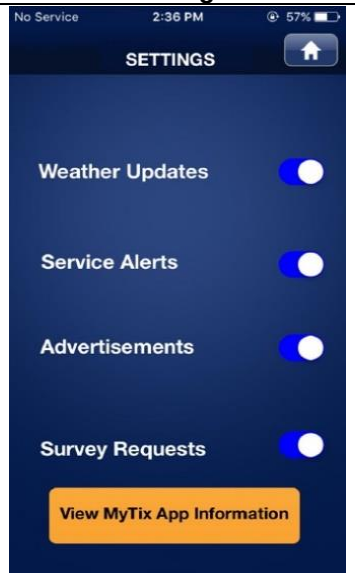
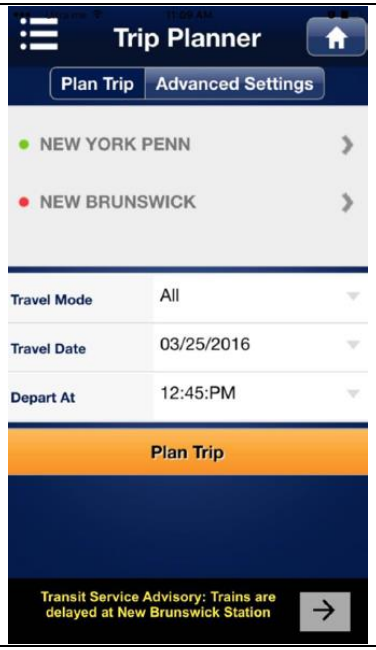
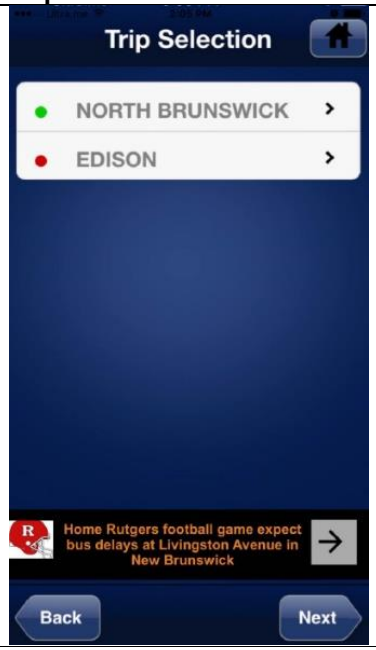
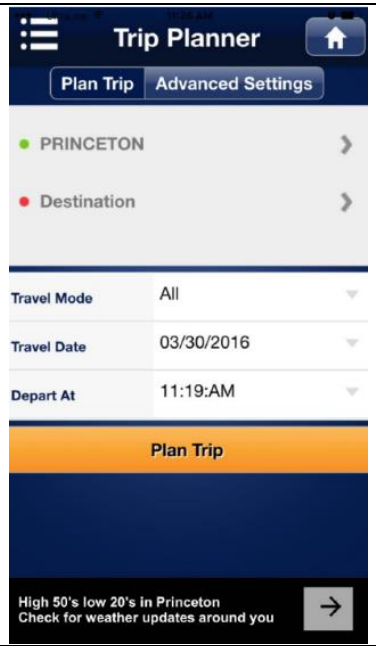
Screenshot #1: Home Screen	Screenshot #2: Offers	Screenshot #3: Coupons	Screenshot #4: Settings
			

Table 11 - Mock-up Screenshots #5-7 shown in the Focus Group Exercise

n=18	**Screenshot #5: Transit Service Alert**		**Screenshot #6: Special Event Information**		**Screenshot #7: Weather Information**	
Mock-up screenshots						
Question	**Is this transit service alert something you would like to receive?**		**Is this special event information useful?**		**Is this weather information useful?**	
Answer	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Responses	18	0	18	0	8	10
	100%	0%	100%	0%	44%	56%
Selected Quotation	"Yes – I might want to look for an alternative route depending on the severity."		"Yes because it can cause a lot of traffic and I can call people to let them know if I'm running late."		"No, unless there is a tornado headed towards me. I already know the weather before I leave my house!"	

As can be seen on the right side of Table 11, the next mock-up screenshot presented to focus group participants included targeted ***weather information***. The screenshot was accompanied by the following explanation: "This screenshot would be displayed after clicking on the trip planner. A weather alert pops up at the bottom, as shown. To get more information, you would click on the arrow." Focus groups were then asked, "Is this weather information useful? Why?" Only 8 of the 18 participants agreed that this weather information would be useful, and 10 of the 18 participants did not think it would be useful. A common theme amongst respondents who did not think this would be useful was that they have separate weather apps in their smartphone, and they do not expect weather information to be provided in NJ TRANSIT's app. One animated participant responded by writing, "No, unless there is a tornado headed towards me. I already know the weather before I leave my house!"

Mock-up Screenshots #8-12: Coupons

The last set of mock-up screenshots presented in this exercise included five examples of geotargeted coupons that could be provided via NJ TRANSIT's app, and the results are shown in Table 12. As can be seen on the left side of Table 12, the first mock-up screenshot included a ***coupon for a local bakery known as Zaro's*** on the ticket screen in the MyTix feature of NJ TRANSIT's app. This screenshot was prefaced with the following: "You are on a train from New York Penn Station to Newark Penn Station, and your mobile ticket is shown to the left. The ticket includes a Zaro's Bakery coupon. To get the coupon, you would click on the arrow." Then, participants were asked, "Is this coupon for nearby shops / businesses useful? Why?" The majority of participants (17 out of 18) agreed that this coupon would be useful. For example, one participant said, "Yes, it offers value and I won't be going out of my way." Another customer explained by writing, "Sure, as long as it does not affect loading a ticket for conductor viewing." Next, participants were asked, "Would coupons like this encourage you to go to the retail store to use the coupon?" Many respondents (10 of 18) answered yes to this question.

As can be seen in the middle of Table 12, the next mock-up screenshot included a ***coupon for the department store Macy's*** in the MyTix feature of NJ TRANSIT's app. The following explanation was provided to participants: "You are planning a trip on the bus from Port Authority Bus Terminal to Toms River Township. A coupon for Macy's appears on the screen. To get more information, you would click on the arrow." Then, participants were asked, "Is this coupon for nearby shops / businesses useful? Why?" Only 6 of 18 respondents responded to this question in the affirmative, and another 6 of 18 participants did not think that this coupon was useful. One participant wrote, "Possibly, but [I'm] not likely to divert from trip." Another participant explained their reasoning in the following manner: "It could be but it's not as much of an impulse buy as coffee or something small." Then, participants were asked, "Would this encourage you to go to Macy's?" Numerous respondents (8 of 18) answered no to this question.

The next mock-up screenshot shown in Table 12 included a ***coupon for a grocery store called Whole Foods*** in the trip planning feature of NJ TRANSIT's app. This screenshot was prefaced as follows: "You are planning a trip from New York Penn

Station to Montclair Heights. A coupon for Whole Foods in Montclair appears on the screen. To get the coupon, you would click on the arrow." Respondents were then asked, "Is this advertisement for nearby shops / businesses useful? Why?" Most respondents (12 of 18) were in favor of the Whole Foods coupon, and one respondent stated, "Possibly, I may need something for dinner to prepare for a meal." Another participant explained, "Yes, if Montclair is home." Participants were then asked, "Would this encourage you to go to Whole Foods?" As can be seen in Table 12, only 7 of 18 participants answered yes to this question.

The next mock-up screenshot shown in Table 12 included a ***coupon for a sandwich at Subway***. This was prefaced with the following statement: "You are purchasing a ticket for the Newark Light Rail. A coupon for a Subway sandwich in Newark Penn Station appears on the screen. To get the coupon, you would click on the arrow." Respondents were then asked, "Is this coupon for nearby shops / businesses useful? Why?" Most respondents (14 of 18) said yes, this coupon would be useful. One customer responded by writing, "Definitely. This could make me pick something up on my way home or for lunch." Another customer wrote, "It's better because it's at least something in my station." Participants were then asked, "Would this encourage you to go to Subway for a sandwich?" One third (6 of 18) participants answered yes.

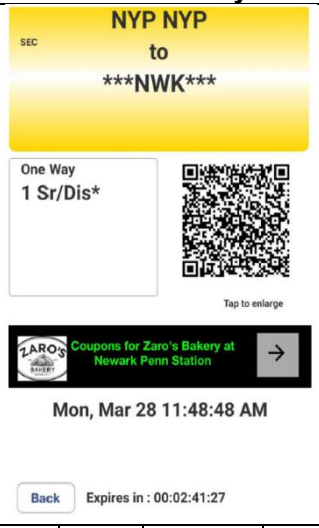
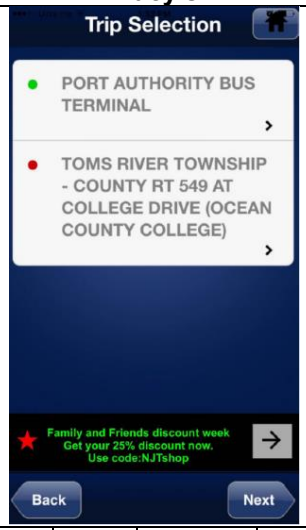
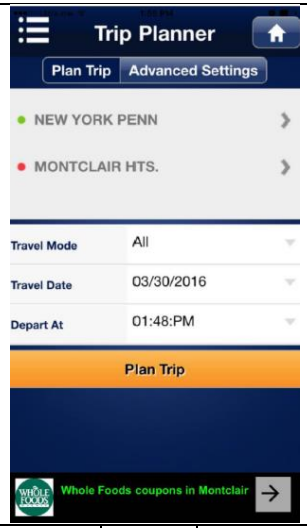
As can be seen on the right side of Table 12, the last mock-up screenshot included a ***coupon for a museum in Newark***. The screenshot was prefaced as follows: "You are purchasing a ticket for the Newark Light Rail. A coupon for the Newark Museum, which is 1 block from Washington Street Station, pops up. To get the coupon, you would click on the arrow." Participants were then asked, "Is this coupon useful? Why?" Half of respondents (9 of 18) agreed that the museum coupon would be useful, while one third of participants (6 of 18) said maybe. One respondent wrote, "Maybe, entertainment coupons need to pop up earlier as plans may already be made." Another participant said, "Only if going to that area. Would be good to be able to turn off when going to work." Last, participants were asked "Would this encourage you to go to Newark Museum?" A total of 8 of 18 respondents said yes, they would be encouraged to visit the museum after seeing the coupon.

Final Focus Group Question

At the end of screenshot exercise, focus group participants were asked to share their thoughts about what one thing NJ TRANSIT could do to use location services to make NJ TRANSIT's app more beneficial. Some select customer responses are given below and are summarized by theme:

- **Transit Service Alerts:** "Give me real time alerts on my route/location all the way through to final destination. Ongoing basis updated frequently. And allow users to input information and service alerts."
- **Customization:** "Somehow the application can recognize you as an individual and taylor [sic] your likings, stops, and destinations."
- **Reception:** "Download feature for the day so you can save your schedule and don't [need] service to update as you travel."

Table 12 - Mock-up Screenshots #8-12 shown in the Focus Group Exercise

n=18	Screenshot #8: Zaro's Bakery				Screenshot #9: Macy's				Screenshot #10: Whole Foods			Screenshot #11: Subway Sandwich			Screenshot #12: Newark Museum		
Mock-up screenshots																	
Answer	**Yes**	**No**	**Maybe**	**N/A**	**Yes**	**No**	**Maybe**	**N/A**	**Yes**	**No**	**Maybe**	**Yes**	**No**	**Maybe**	**Yes**	**No**	**Maybe**
Is this coupon useful?*	17	1	0	0	6	6	5	1	12	4	2	14	1	3	9	3	6
	94%	6%	0%	0%	33%	33%	28%	6%	67%	22%	11%	78%	5%	17%	50%	17%	33%
Would this encourage you to go to *business name*?*	10	2	4	2	4	8	5	1	7	7	4	6	3	9	8	6	4
	56%	11%	22%	11%	22%	44%	28%	6%	39%	39%	22%	33%	17%	50%	45%	33%	22%
Selected Quotation	"Sure, as long as it does not affect loading a ticket for conductor viewing."				"Possibly, but [I'm] not likely to divert from trip."				"Yes, if Montclair is home."			"It's better because it's at least something in my station."			"Maybe, entertainment coupons need to pop up earlier as plans may already be made."		

**Question wording varied slightly between the five screenshot exercises.*

Summary of Focus Group Findings

This section provides a brief summary of the focus group findings. First, transit service alerts were the most desired potential location-based feature in NJ TRANSIT's app; all focus group participants responded in a positive manner to the mock-up screenshots containing transit service alerts. Second, targeted weather information received mixed responses from participants; many respondents noted that they already receive weather information from other sources. Last, coupons were acceptable to many focus group participants, provided that they do not interfere with purchasing a ticket and if they are relevant to their transit trip.

Part 3: Survey

This section summarizes the results of a survey that was conducted to assess NJ TRANSIT rider receptiveness to geotargeting in NJ TRANSIT's mobile app. First, the survey methodology is discussed. Next, the results showing the responses to each question are presented, and last, a summary of the key findings is provided.

Survey Methodology

The survey methodology is discussed in this section, which begins with the development of the survey questionnaire and is followed by discussions of the sampling plan, the data cleaning methodology, and the data weighting procedure.

Survey Questionnaire Development

The results of the focus groups were used to guide the design of a survey questionnaire to understand customers' receptiveness to geotargeting in NJ TRANSIT's app. The survey questionnaire was divided into six primary sections, and each section contained questions pertaining to a specific topic. The first section pertained to current levels of customer utilization and satisfaction with NJ TRANSIT's app. The second section aimed to understand how familiar respondents are with location services in smartphone apps and assess if customers are receptive to NJ TRANSIT's app using location services. The third portion of the survey included five hypothetical examples of how geotargeting could be used in NJ TRANSIT's app, and customers were asked if they would like to receive specific geotargeted messages, in a similar manner to the focus groups. The fourth section of the survey included questions about other potential new features in NJ TRANSIT's app as well as potential concerns about privacy. The fifth and sixth sections gathered socioeconomic information and travel behavior characteristics, respectively; these questions were phrased in a similar manner to previous NJ TRANSIT surveys so that they could easily be compared to prior surveys.

Survey Sampling Plan

The next step was to design the survey sampling plan. NJ TRANSIT riders who use NJ TRANSIT's app to purchase their tickets were the target population for the survey. The survey was distributed to NJ TRANSIT riders who had completed the most recent NJ TRANSIT Customer Satisfaction Survey and on that survey, they stated that they use NJ TRANSIT's mobile application. This ensured that the population of interest (mobile app users) could be easily reached.

The survey was conducted online using an off-shelf survey software, SurveyMonkey. It was launched on the morning of Monday, October 24, 2016 and was closed in the morning on Thursday, November 3, 2016. Survey responses were collected over ten full days to include weekday peak, weekday off-peak, and weekend riders. An incentive of a $100 gift card was provided to five randomly selected participants to increase the response rate.

Survey Data Cleaning

A total of 5,066 invitations were sent via email to NJ TRANSIT riders asking for their participation in the survey. Of these, 1,773 people responded to at least one question in the survey. When opening the web-based survey, respondents were first asked to agree to participating in this research study; however, 67 participants answered "no" to this question and where then dismissed from the survey via a message in the software. After agreeing to participate in the study, survey respondents were then asked if they have used NJ TRANSIT's app, and this included a screenshot of NJ TRANSIT's smartphone app. A total of 37 respondents said they never used the app before, and they were then dismissed from the survey. These two questions reduced the sample size from 1,773 to 1,669 potential responses.

Next, two additional groups of respondents were excluded from the survey. A total of 410 participants (8.09%) partially completed the survey, which means they did not answer all the required questions, and 3 participants were under 18 years old. Excluding these 413 participants, a total of 1,256 completed responses were collected, which is a final response rate of 24.79%. Additionally, the response rate by primary NJ TRANSIT mode (Rail, Interstate Bus, and Local Bus/Light Rail) were calculated, and these are shown in Table 13.

Table 13 - Survey Response Rate by NJ TRANSIT Market

Market	Completed Response	Total	% Responded
Rail	494	1,600	30.88%
Interstate Bus	411	1,600	25.69%
Local Bus/Light Rail	351	1,866	18.81%
Total	**1,256**	**5,066**	**24.79%**

Survey Data Weighting by Market

The survey was intended to be representative of NJ TRANSIT mobile app users in four markets representing primary mode of NJ TRANSIT travel: Rail, Interstate Bus, Local Bus, and Light Rail. However, the sample size for the Light Rail market was small (only 81 of the 1,256 usable responses), and therefore, the Light Rail and Local Bus data were combined into one market. NJ TRANSIT staff provided weights for each market in the survey dataset, and NJ TRANSIT staff estimated that the sampling error was +/- 4.4% at a 95% confidence level for the dataset. The weights were then applied to the raw survey data, and Table 14 presents a summary of unweighted and weighted survey data by market. All the following analyses presented in this report use the weighted data.

Table 14 - Summary of Unweighted and Weighted Survey Data by Market

Market	Unweighted		Weighted	
	Count	%	Count	%
Interstate Bus	411	33%	59,817	24%
Local Bus/Light Rail	351	28%	84,260	34%
Rail	494	39%	104,766	42%
Total	**1,256**	**100%**	**248,844**	**100%**

Results from the Survey

This section presents the results of the survey by summarizing the responses to each question. The total sample size for each figure is 248,844, which reflects the complete weighted sample. The questions are presented in sections by topic in the following manner:

1) Utilization of and satisfaction with NJ TRANSIT's app;
2) Location services in smartphone apps;
3) Examples of geotargeting features in NJ TRANSIT's app;
4) Potential new features in NJ TRANSIT's app and privacy;
5) Travel behavior; and
6) Socioeconomic characteristics.

Utilization and Satisfaction of NJ TRANSIT's App

In this section, respondents were asked a series of questions about their current experience using NJ TRANSIT's app. The first question in this section of the survey asked, "How often do you use NJ TRANSIT's App?" Figure 2 shows the results for the full sample, including all respondents in blue (weighted n=248,844), the Interstate Bus market in orange (weighted n=59,817), the Local Bus/Light Rail market in gray (weighted n=84,260) and the Rail market in purple (weighted n=104,766). As can be seen in Figure 2, nearly half of respondents (41% total) utilize NJ TRANSIT's app more than five times per week. Approximately 59% of Interstate Bus respondents use the app more than five times per week, which is the highest usage among the three markets. Rail riders use the app the least of the three markets; only 26% of Rail riders use the app more than five times per week.

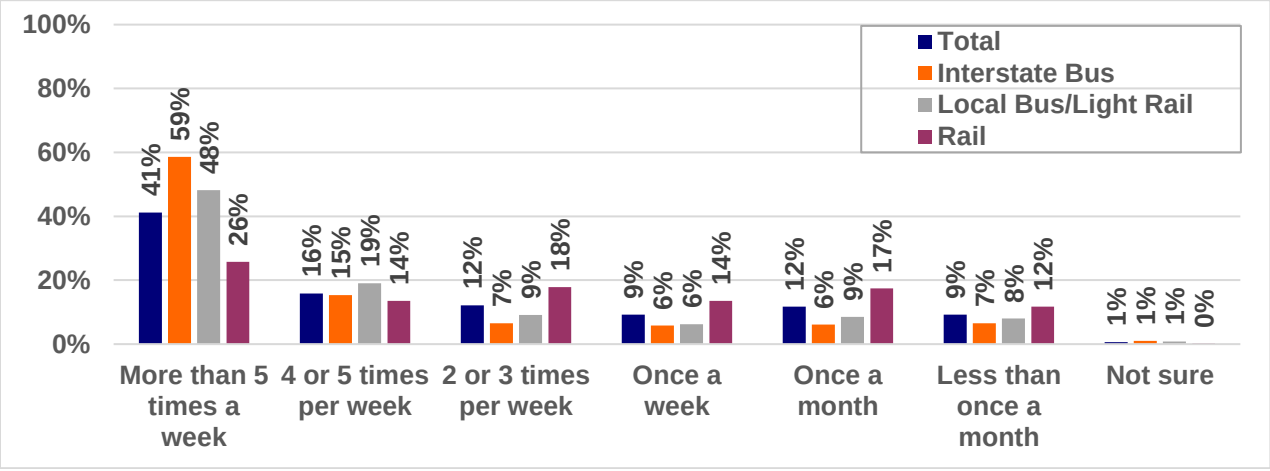


Figure 2. Usage of NJ TRANSIT's App

Next, survey respondents were asked, “How easy is NJ TRANSIT’s App to use?” The responses to this question are shown in Figure 3 for the full weighted sample. In total, approximately 84% of users reported that NJ TRANSIT’s app is easy to use (47% selecting very easy and 37% choosing somewhat easy 37%). Only 6% of all respondents find the app somewhat or very difficult to use.

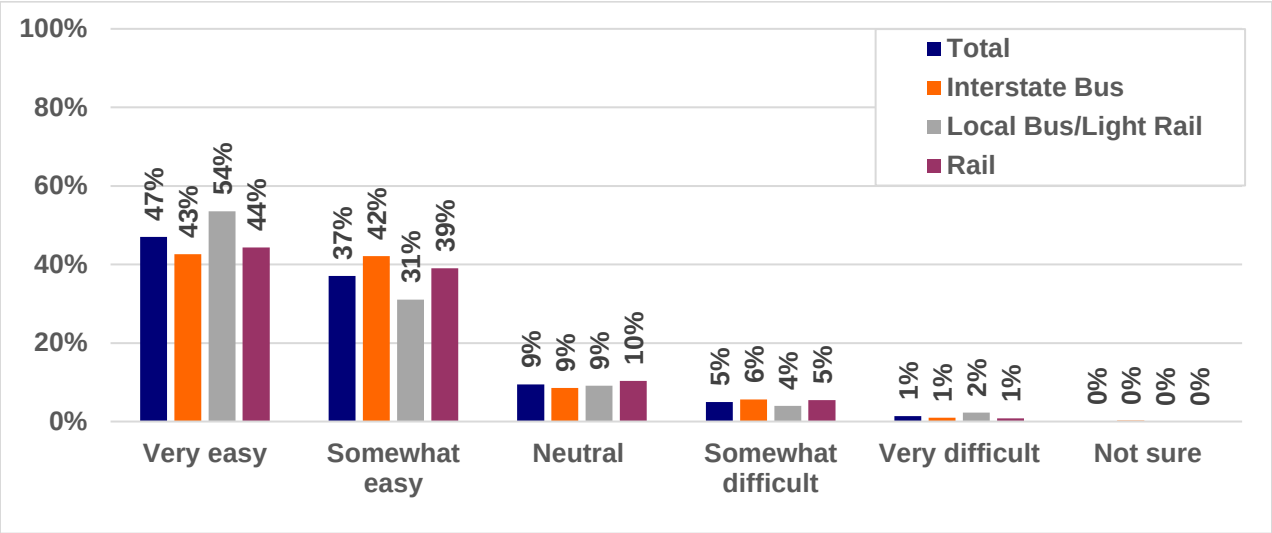


Figure 3. Ease of Use of NJ TRANSIT’s App

Figure 4 shows the results of next question, which asked respondents how satisfied they are with using NJ TRANSIT’s app. About 80% of total respondents reported that they are very (40%) or somewhat (40%) satisfied with NJ TRANSIT’s app. A small percentage of respondents (11% in total) are somewhat (8%) or very (3%) dissatisfied with the app. Levels of satisfaction are relatively similar in all three markets (Interstate Bus, Local Bus/Light Rail, and Rail).

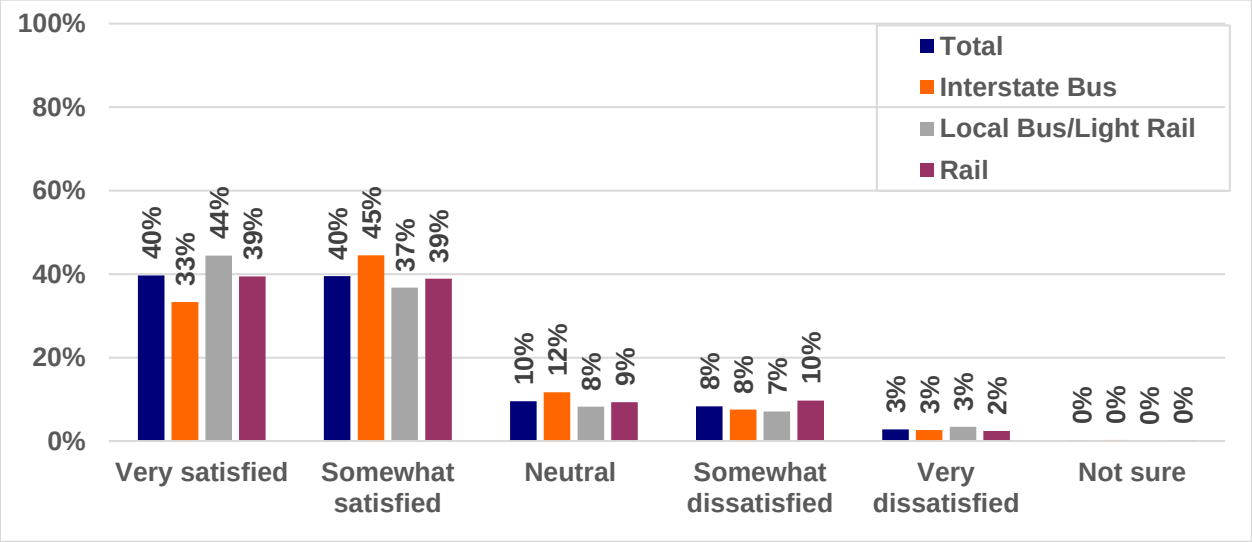


Figure 4. Satisfaction with NJ TRANSIT’s App

The last question in this section asked respondents which features in NJ TRANSIT's app they use, and participants could select more than one answer. Figure 5 shows that approximately 79% of all respondents utilize MyTix, which allows them to purchase NJ TRANSIT tickets directly on their smartphone. Train Schedules are used primarily by Rail customers (76% of the Rail market), and DepartureVision, which provides real-time train departure information, is commonly used by Rail customers (47%). MyBus, which provides real-time bus arrival information, is used primarily by Local Bus/Light Rail customers (71%) and Interstate Bus Customers (64%).

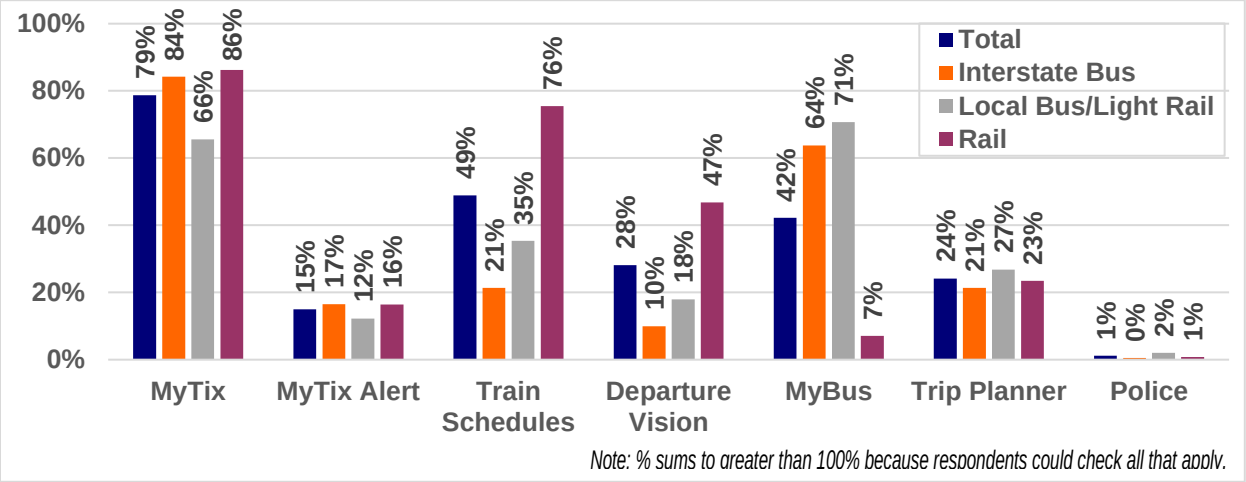


Figure 5. Usage of Different Features in NJ TRANSIT's App

Location Services in Smartphone Apps

The next series of questions on the survey pertained to location services. These questions were prefaced with a brief explanation that location services have the ability to provide customized information based on a smartphone's current location using technology such as GPS. The first question asked respondents the following: "Are you familiar with the location services features on your smartphone that allows your location to be identified?" The responses to this question are shown in Figure 6 for the full weighted sample (weighted n=248,844) and for each market. As shown in Figure 6, a total of 78% of respondents are familiar with location services.

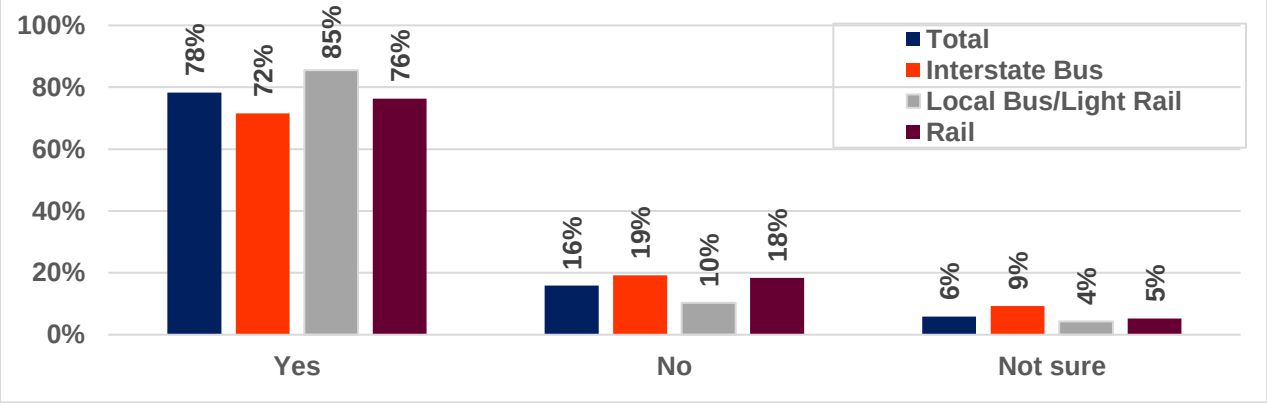


Figure 6. Awareness of Location Services

The next question on the survey asked all respondents (weighted n=248,844) if there are benefits of using location services on their phone. As can be seen in Figure 7, nearly three quarters (74%) of respondents agreed that location services are beneficial.

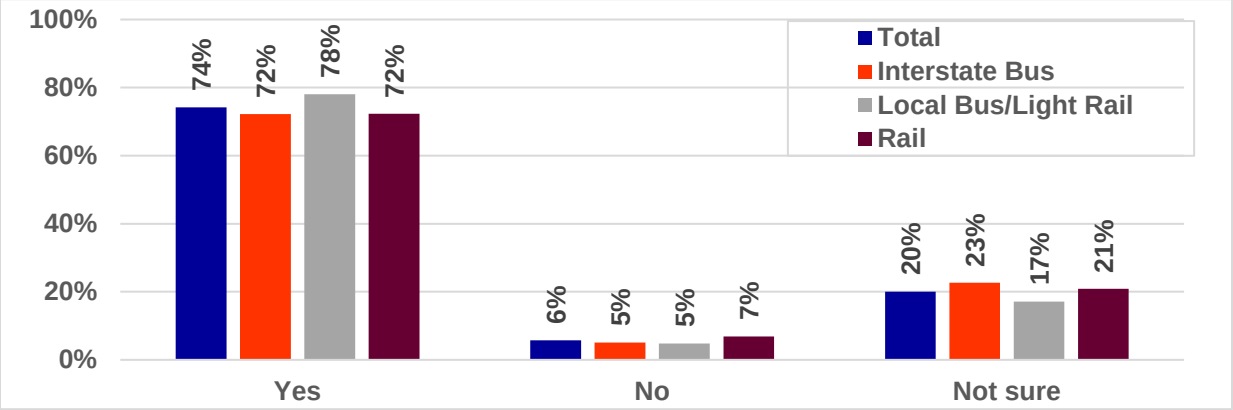


Figure 7. Are there Benefits of Using Location Services?

After this, there was an open-ended question on the survey instrument asking respondents to specify the benefits of using location services on their phone. One respondent said, “It can detect where you are, which is valuable in saving time so as to not have to enter the info (especially if you are using 1 hand) or if you're not sure where you are exactly.” Another respondent wrote, “It's very useful for getting directions as well as finding out about what interesting things may be around you.”

Next, respondents were asked another open-ended question in which they were instructed to provide an example of an app that knows their location. Common responses included Google Maps, Waze, Facebook, and Uber.

The next question on the survey asked respondents, “Should transportation apps know your location?” As can be seen in Figure 8, most respondents (71%) agreed that transportation apps should know their location. More Local Bus/Light Rail customers (81%) than Rail riders (64%) said yes to this question.

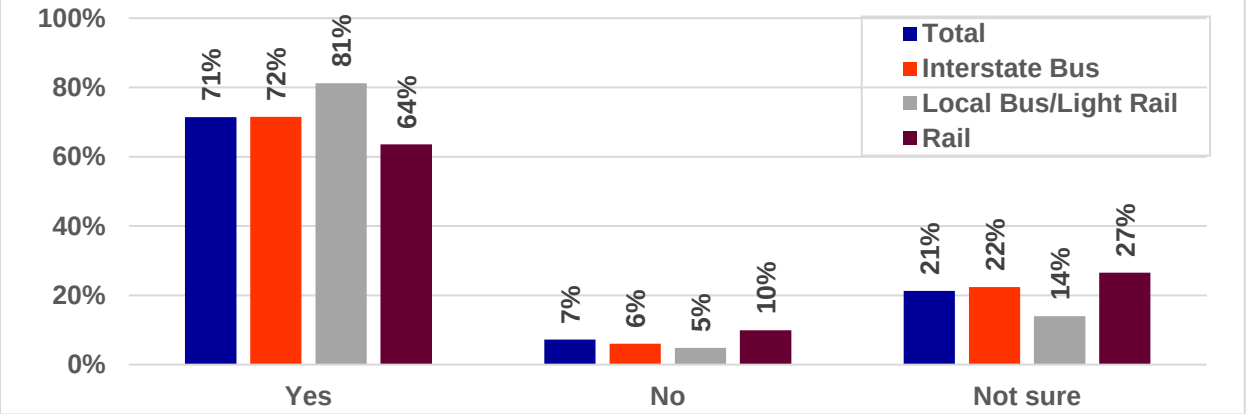


Figure 8. Should Transportation Apps Know Your Location?

The next question in this section of the survey asked participants how they feel about apps that know their current location, and the results for all respondents (weighted n=248,844) are shown in Figure 9. Approximately 60% of customers reported they are not concerned if an app knows their location. About one quarter (26%) of respondents expressed concern if apps know where they are, and Rail customers (30%) were slightly more concerned compared to Local Bus/Light Rail riders (21%).

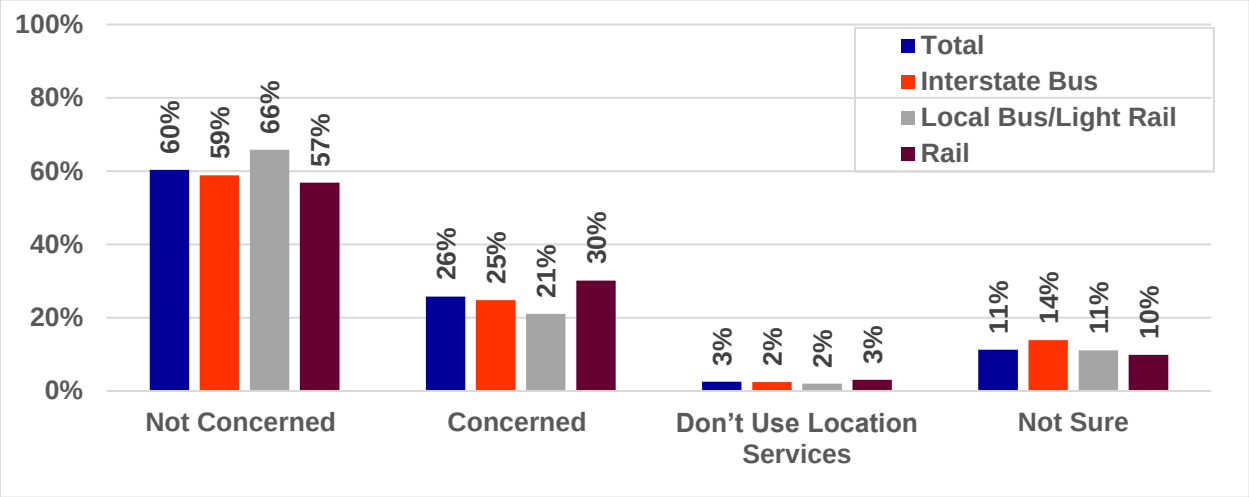


Figure 9. Feelings about Apps that Know Your Location

The last question in this section asked respondents, "Should NJ TRANSIT use the location service feature in NJ TRANSIT's App so that targeted information can be provided to you?" The results, which are shown in Figure 10, reveal that many respondents (74%) agree NJ TRANSIT's app should use location services so that targeted information can be provided to them.

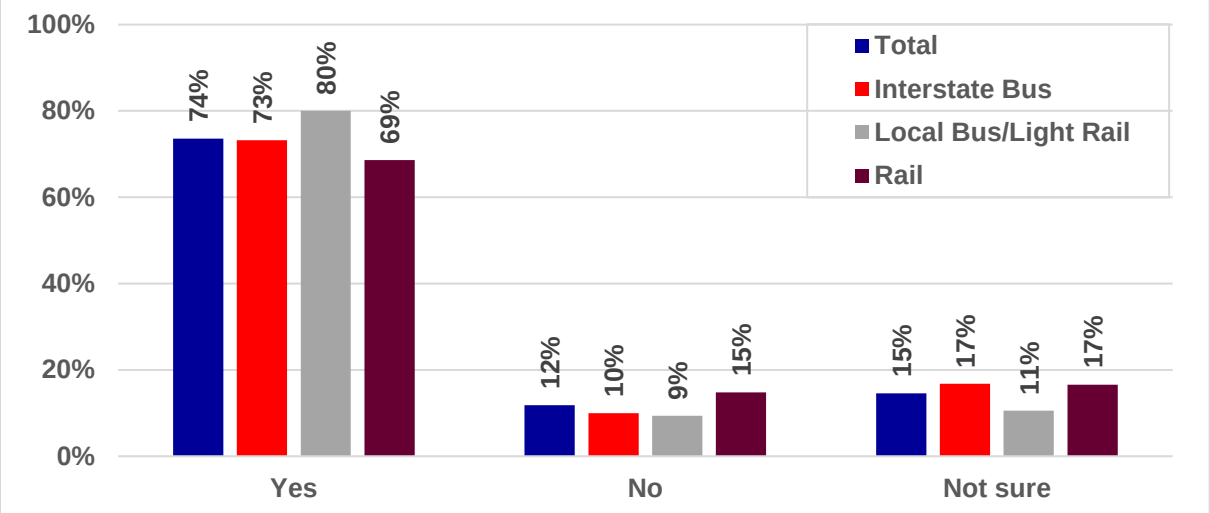


Figure 10. Should NJ TRANSIT use Location Services in NJ TRANSIT's App?

Examples of Geotargeting in NJ TRANSIT's App

Survey respondents were then shown five different mock-up screenshots of NJ TRANSIT's app that included hypothetical geotargeting features. The first three screenshots and a summary of the responses are shown in Table 15, and the second set of screenshots and a summary of the responses are shown in Table 16.

As shown in Table 15, the first mock-up screenshot displayed ***special event information*** in the Trip Selection screen within MyTix. Preceding the image of the app was a brief explanation that stated, "You are planning a trip from New Brunswick to Edison. You get an alert stating that there may be delays in New Brunswick due to a home Rutgers football game. To get more information, you would click on the arrow." Then, respondents were asked, "Is this special event information something you would like to receive?" Table 15 shows the results for the full weighted sample (weighted n=248,844). Regardless of the market, most customers (80%) were in favor of receiving special event information. After this, participants were presented with an open-ended question asking, "Why or why not would you like to receive it? Please explain briefly." One respondent wrote about special event information saying, "that little bit of information could save me a lot of hassle during my commute." Another customer stated, "I expect to get that sort of information in this day and age. I get so frustrated when I catch a train and then end up with significant delays because NJ Transit did not communicate effectively." Only 12% respondents did not want this type of information in NJ TRANSIT's app, and one of these respondents wrote, "If I need the info I will request it."

The second mock-up screenshot featured a ***coupon*** for a bakery at Newark Penn Station, which was displayed on the Train Schedules screen of NJ TRANSIT's app. The image shown in Table 15 was prefaced with the following explanation, "You are planning a trip from New York Penn Station to Newark Penn Station. A coupon for Zaro's Bakery at Newark Penn Station appears on the screen. To get the coupon, you would click on the arrow." As can be seen in Table 15, 43% of the total respondents would like to receive this coupon for a nearby business. Local Bus/ Light Rail customers (50%) responded more favorably compared to Interstate Bus (39%) and Rail (38%) customers. After this, participants were again presented with an open-ended question asking, "Why or why not would you like to receive it? Please explain briefly." One respondent wrote in favor of the coupon and stated that it is "useful if the ad is relevant to your needs." Another customer wrote, "Any coupon for food is a plus especially when using public transportation." The same percentage (43%) of total respondents answered that they would not like to receive this coupon. One customer explained this by saying, "That's super annoying. A transit app should stick to transit. It would seem messy to me to be getting additional unrelated information." Another customer said, "We're already bombarded with ads everywhere."

As shown in Table 15, the third mock-up screenshot included a ***coupon*** for a sandwich shop at Newark Penn Station found on DepartureVision page. The image shown in Table 15 was prefaced with the following explanation, "You are waiting for a train at Newark Penn Station. A coupon for Subway Sandwich at Newark Penn Station

appears on the screen. To get the coupon, you would click on the arrow." As can be seen in Table 15, only 41% of total respondents would like to receive this coupon for a Subway sandwich. There was some variation by market; for example, more than half (54%) of Local Bus/Light Rail customers were in favor of receiving this coupon (Table 15). After this, participants were again presented with an open-ended question asking them to explain why or why not. One favorable response was, "I may want a sandwich or snack. If time is available. Why not save money as well?" Another customer wrote, "Discounts and relevant ads are good". However, 45% of respondents reported that they would not like to receive this coupon. One customer explained this by saying, "No coupons on the app- I feel like everywhere you look someone is trying to cross sell you products. It is very distasteful." Another customer said, "Keep your app focused on your service. Do NOT start including advertising within your app."

As can be seen in Table 16, the fourth mock-up screenshot was an ***advertisement*** for a supermarket on the MyBus screen of NJ TRANSIT's app. The image shown in Table 16 was prefaced with the following explanation, "You are traveling from Newark to Montclair Heights. An advertisement for Whole Foods in Montclair appears on the screen. To get more information, you would click on the arrow." Only 25% of all participants stated that they would like to receive this advertisement. After this, participants were again presented with an open-ended question asking them to explain why or why not. One customer wrote in favor of the advertising stating, "Why wouldn't I want to save money. I have no problems ignoring what I do not want. I would hope that this advertising would be used towards improvements and keep the cost of my trip down." Another wrote favorably in the following manner: "If the app is able to use my data and see that I enjoy this store, I would love to see ads that would benefit me." However, many respondents (59% of the total) would not want to receive this advertisement. For example, one customer wrote the following comment: "Do not wish to have non-transit related information or offers provided. Information over-load. Interferes with the quick and expedient use of the app." Another respondent said, "We are inundated with advertising messages everywhere we go. I just want services and information."

As shown in Table 16, the last mock-up screenshot included a ***transit service alert*** on the Trip Planner screen. The screenshot shown in Table 16 was prefaced with the following explanation, "You are located at New York Penn Station, and you are planning a trip to New Brunswick. A transit service alert pops up. To get more information, you would click on the arrow." As can be seen in Table 16, a clear majority of participants (92%) responded favorably to receiving this targeted transit service alert. After this, participants were again presented with an open-ended question asking them to explain why or why not. One customer wrote, "I want to know if something is going to delay my trip so that I can make alternate arrangements or let whoever is waiting for me know that I'd be late." Another respondent said, "Information about service is always the most useful. Communication is the best thing NJ Transit can give its users." Only 4% of all respondents did not want to receive this transit service alert, and one customer explained this by saying, "The lag between alerts and up times is too long. The alert will not be real-time or accurate in most cases."

Table 15 - Three Mock-up Screenshots of NJ TRANSIT's App with Geotargeting

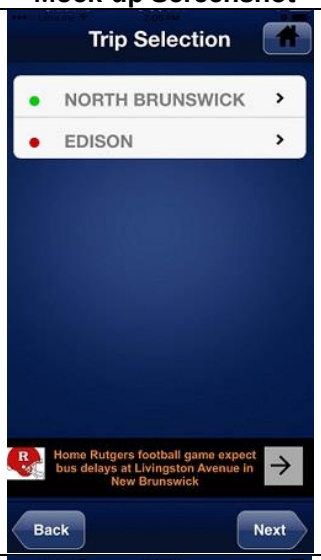
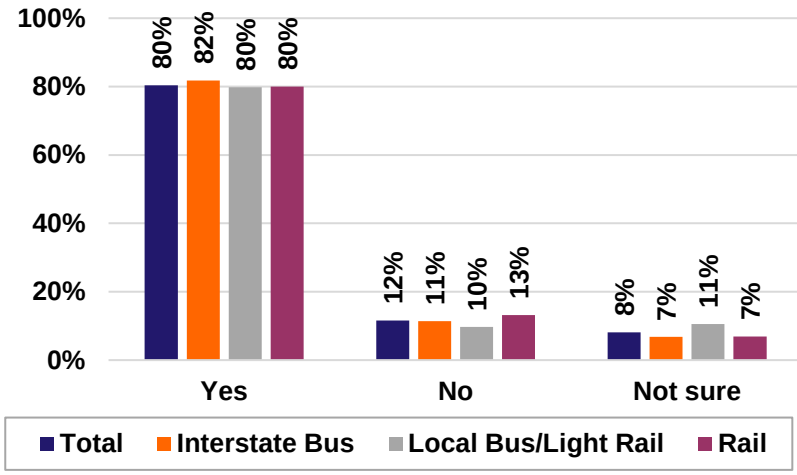
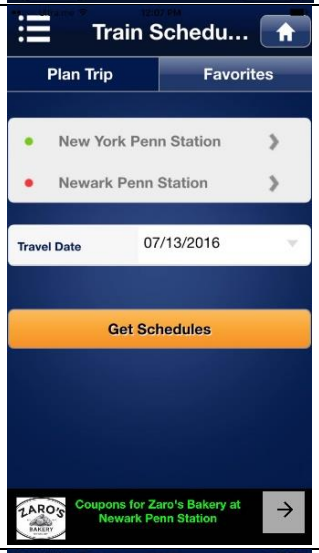
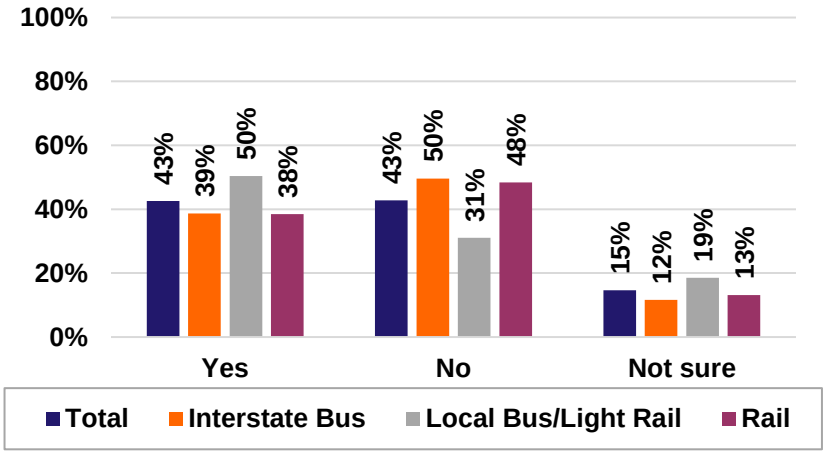
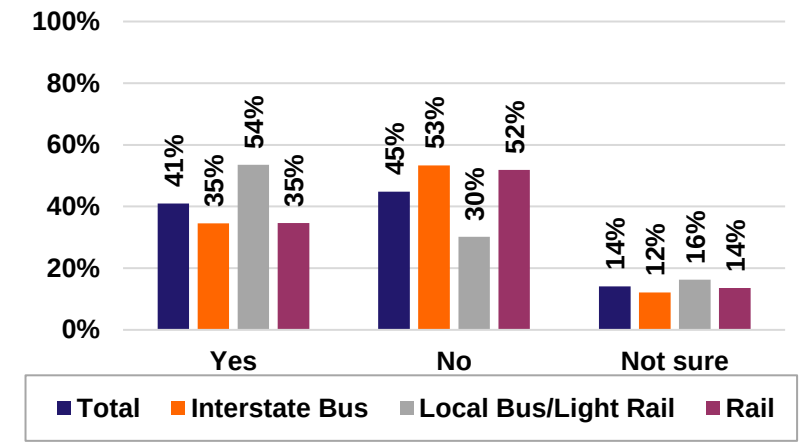
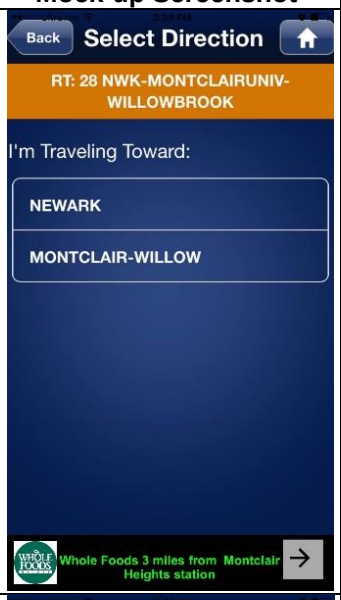
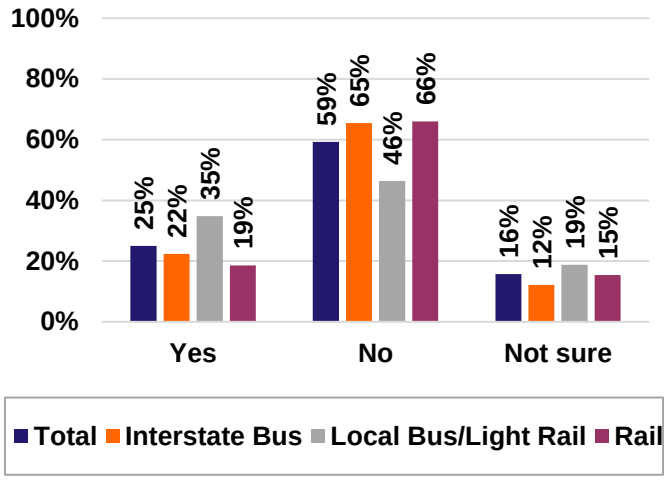
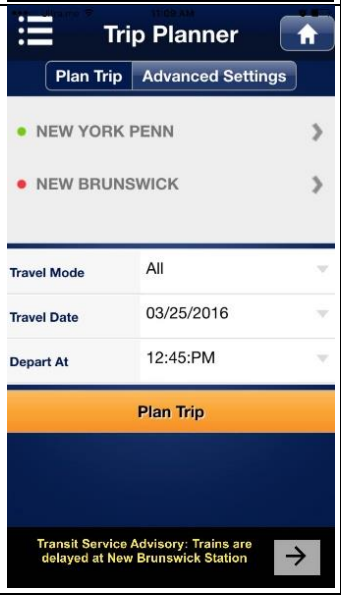
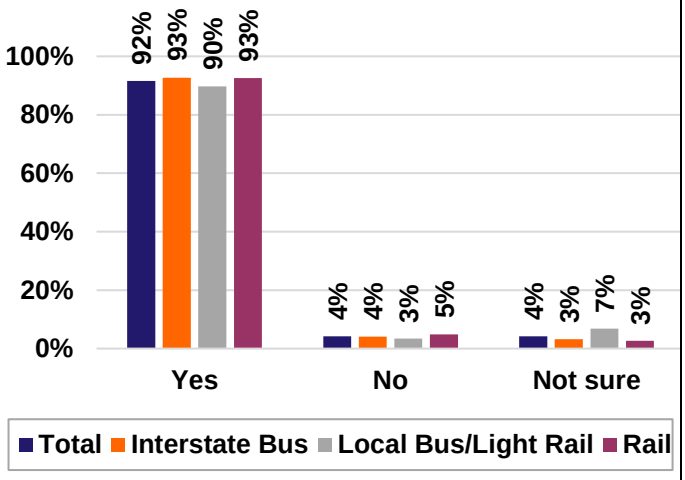
Question	Mock-up Screenshot	Survey Responses
Is this special event information something you would like to receive?		
Is this coupon for a nearby shop something you would like to receive? (Zaro's)		
Is this coupon for a nearby shop something you would like to receive (Subway)?		

Table 16 - Two Mock-up Screenshots of NJ TRANSIT's App with Geotargeting

Question	Mock-up Screenshot	Survey Responses
Is this advertisement for a nearby shop/business something you would like to receive? (Whole Foods)		
Is this transit service alert something you would like to receive?		

Potential New Features in NJ TRANSIT's App and Privacy

The next series of questions on the survey pertained to potential new features in NJ TRANSIT's app, and this was followed by two questions pertaining to privacy. First, participants were asked, "How receptive would you be to receiving location-based advertisements in the following features of NJ TRANSIT's App? These would be offers or coupons based on your location and travel patterns." The results for the complete sample (weighted n=248,844) are presented in Table 17, which shows that customer receptiveness is mixed. For example, 40% of customers are either very (21%) or somewhat (19%) receptive to receiving location-based advertisements in the MyTix feature of NJ TRANSIT's app, and there are similar trends for the other app features. However, a similar percentage (43% in total) are either somewhat (10%) or very (33%)

unreceptive to receiving location-based advertisements in the MyTix feature of NJ TRANSIT's app, and there are similar trends with the other app features.

Table 17 - Location-based Advertisements in Specific Features of NJ TRANSIT's App

App Features	Very Receptive	Somewhat Receptive	Neutral	Somewhat Unreceptive	Very Unreceptive	N/A
MyTix	21%	19%	14%	10%	33%	3%
MyTix Alerts	23%	19%	14%	8%	30%	5%
Train Schedules	24%	18%	15%	10%	28%	6%
Departure Vision	21%	18%	15%	9%	29%	8%
MyBus	23%	14%	14%	8%	28%	14%
Trip Planner	22%	20%	16%	8%	27%	7%
Police	18%	9%	16%	6%	37%	13%

The next question on the survey asked participants, "How receptive would you be to the following features using location services in NJ TRANSIT's App?" The results are shown in Table 18, and this reveals that most customers are very receptive (71%) to transit service alerts and train / bus arrival info (70%) using location services. Customers also showed strong levels of receptiveness to traffic updates (64%) using location services. A smaller percentage was receptive to using location services for coupons (22% very receptive) or information about nearby shops (17% very receptive).

Table 18 - Receptiveness to NJ TRANSIT's App Features using Location Services

Features	Very Receptive	Somewhat Receptive	Neutral	Somewhat Unreceptive	Very Unreceptive	N/A
Transit service alerts	71%	17%	7%	3%	2%	1%
Train/Bus arrival info	70%	17%	7%	2%	3%	1%
Traffic updates	64%	19%	10%	2%	3%	2%
Other transportation service info (i.e. PATH, MTA, SEPTA, Taxi, Uber, etc.)	51%	23%	14%	4%	5%	2%
Special events info	36%	25%	21%	7%	9%	2%
Coupons for nearby shops, businesses, attractions	22%	20%	16%	10%	29%	3%
Info about nearby shops, businesses, attractions	17%	17%	19%	14%	30%	3%

The following question was prefaced with the explanation, "NJ TRANSIT is considering use of location-based advertising in NJ TRANSIT's App." Then, respondents were asked to do the following, "Tell us how much you agree with the following statements about location-based advertisements that are customized to your trip in NJ TRANSIT's App." Participants were then presented with three separate statements, which are shown in Table 19. Approximately 46% of all respondents disagreed with the statement that they would like NJ TRANSIT to offer location-based advertisements (13% somewhat disagreed and strongly disagreed). Similarly, 45% of all respondents disagreed with the statement that location-based advertisement would be useful (12% somewhat disagreed and 33% strongly disagreed). Finally, 58% of respondents agreed that they would not pay attention to location-based advertisements (39% strongly agreed and 19% somewhat agreed).

Table 19 – Feelings about Location-based Advertisements in NJ TRANSIT's App

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	N/A
I would like NJ TRANSIT to offer location-based advertisements in NJ TRANSIT's app.	17%	19%	17%	13%	33%	0%
Location-based advertisements in NJ TRANSIT's app would be useful.	16%	22%	16%	12%	33%	0%
I would not pay attention to location-based advertisements in NJ TRANSIT's app.	39%	19%	18%	12%	11%	1%

The next two questions on the survey instrument aimed to assess potential privacy concerns with using location services in smartphone apps. The first question asked, "Have you read the privacy policy / terms of services in NJ TRANSIT's App?" As can be seen in Figure 11, 33% of all respondents (weighted n=248,844) reported that they had read the privacy policy / terms of services for NJ TRANSIT's app. However, there were no follow-up questions to inquire about how closely respondents read this document.

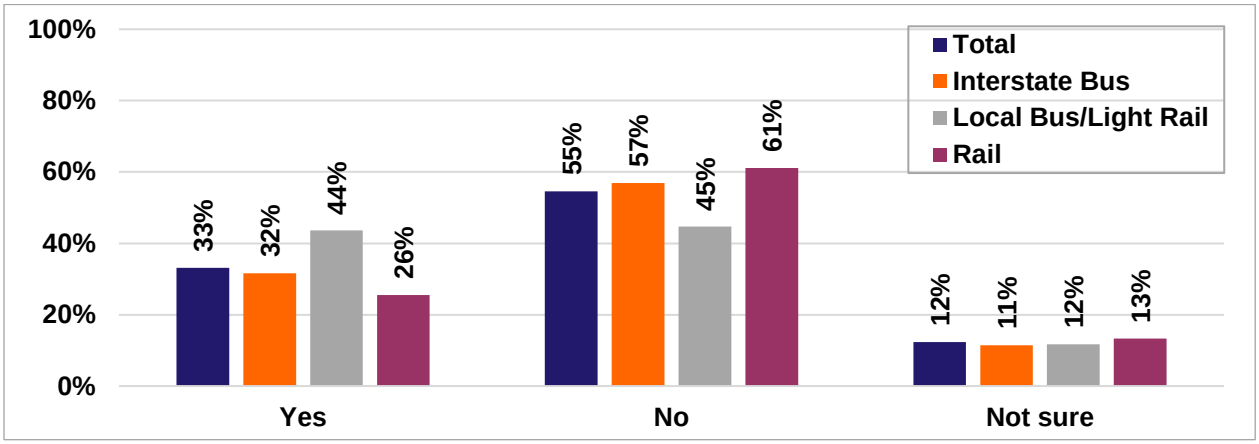


Figure 11. Read the Privacy Policy / Terms of Services

The last question in this section aimed to assess customer concern with having location information collected. Survey respondents were instructed as follows: "Please indicate your level of concerns regarding the following." The first statement was "having your location or travel information collected by a public agency (e.g. NJ TRANSIT)", and the results for all respondents are shown in light blue in Figure 12. The second statement was "having your location or travel information collected by a private agency (e.g. app developer)", and the responses for all participants are shown in dark blue in Figure 12. Next, respondents were asked about "having your location or travel data shared for a marketing purpose", and the results are shown in purple. The final statement asked about "having your location or travel data shared for the purpose of transportation efficiency (such as providing real-time traffic data or alternative routes)", and the responses for all respondents are shown in green. The highest level of concern (50% strongly concerned and 22% somewhat concerned) was when location or travel data

would be shared for marketing purposes. On the other hand, the lowest levels of concern (24% somewhat unconcerned and 27% strongly unconcerned) were when location or travel data would be shared for transportation-related reasons.

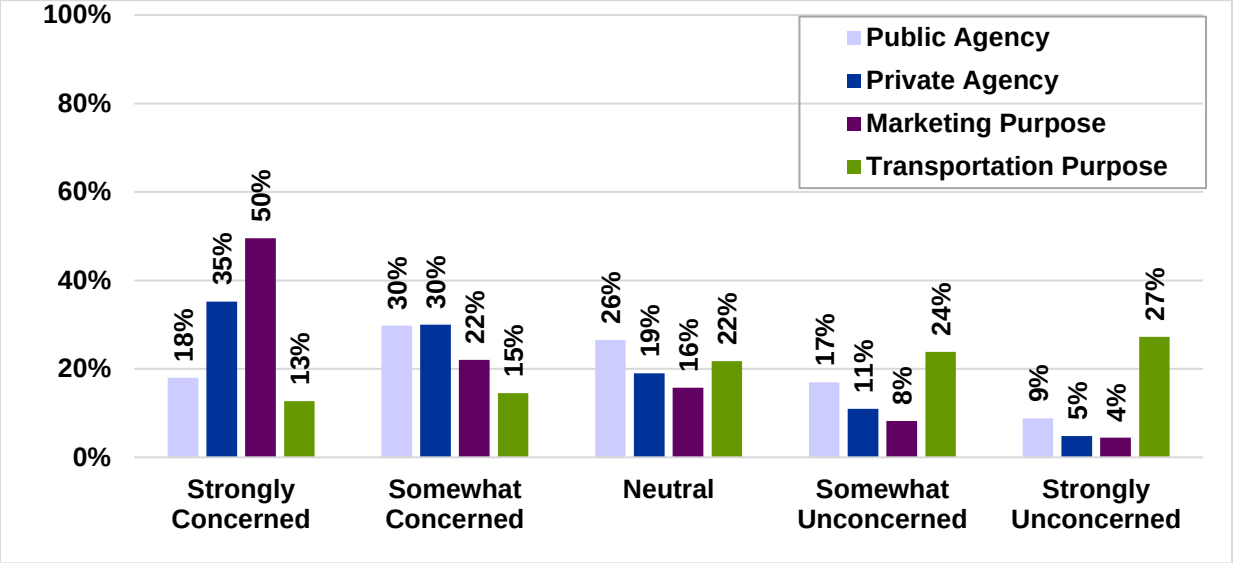


Figure 12. Level of Concern with Collecting Personal Information

Travel Behavior

The next section on the survey instrument asked a series of questions pertaining to travel behavior on NJ TRANSIT, and the question wording was modelled after previous NJ TRANSIT system-wide surveys. The first question asked respondents, "What is the main purpose of your most frequent trip on NJ TRANSIT?" Figure 13 displays the results for the complete sample (weighted n=248,844), which indicates that most trips are made for work-related purposes (73%).

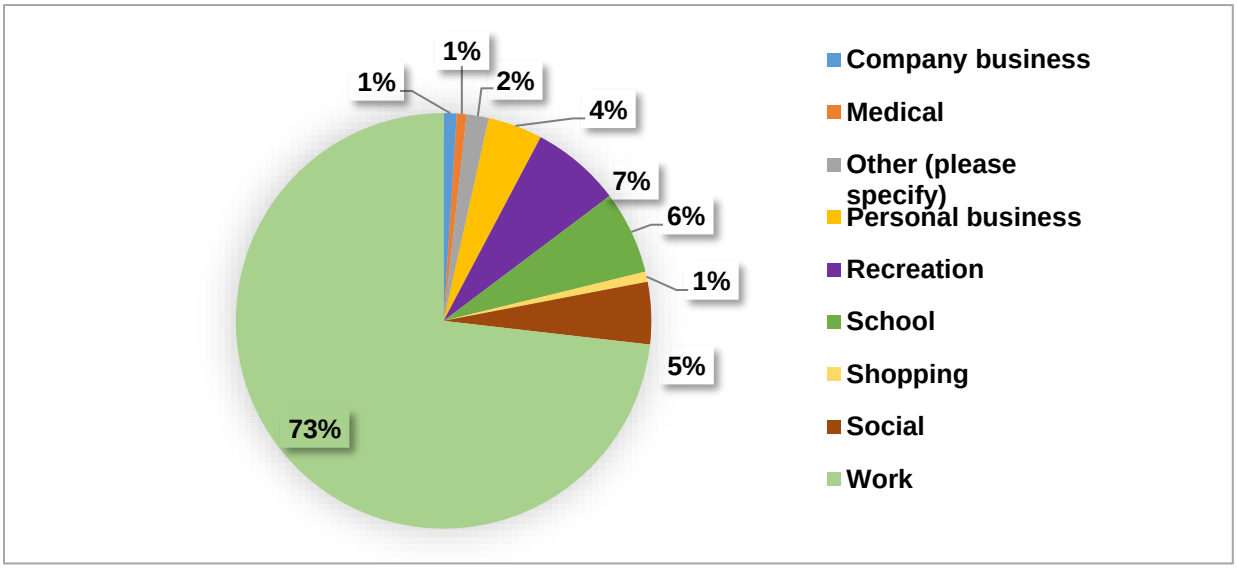


Figure 13. Purpose of Most Frequent Trip on NJ TRANSIT

The next travel behavior question asked respondents for the final destination of their most frequent NJ TRANSIT, and the results are shown for all respondents in Table 20. The most frequent destination (39% of total respondents) was Midtown Manhattan, and 70% of Interstate Bus passengers selected this as their final destination while 46% of Rail riders chose Midtown Manhattan. Following this, 14% of all respondents selected "Other", 10% chose Lower Manhattan, and 8% selected Newark.

Table 20 - Destination of Most Frequent Trip on NJ TRANSIT

Destination	Total	Interstate Bus	Local Bus / Light Rail	Rail
Atlantic City	1%	0%	4%	0%
Camden	2%	0%	7%	0%
Center City Philadelphia	1%	0%	2%	2%
Elizabeth	1%	0%	2%	0%
Hackensack	1%	1%	1%	0%
Hoboken	6%	2%	8%	6%
Jersey City	7%	1%	19%	1%
Lower Manhattan	10%	9%	6%	14%
Meadowlands Sports Complex	0%	0%	0%	0%
Midtown Manhattan	39%	70%	7%	46%
New Brunswick	1%	0%	1%	2%
Newark	8%	0%	14%	8%
Paterson	1%	0%	1%	0%
Trenton	3%	0%	6%	2%
Upper Manhattan	4%	8%	1%	5%
Other (please specify)	14%	8%	21%	12%

Survey respondents were then asked, "When do you typically travel on NJ TRANSIT?" and the results are shown in Figure 14. Most respondents (81%) reported they make their trips during the weekday peak periods of 6:00 AM to 10:00 AM or 4:00 PM to 7:00 PM. About 18% of respondents from the Rail market stated that they travel on NJ TRANSIT during weekends.

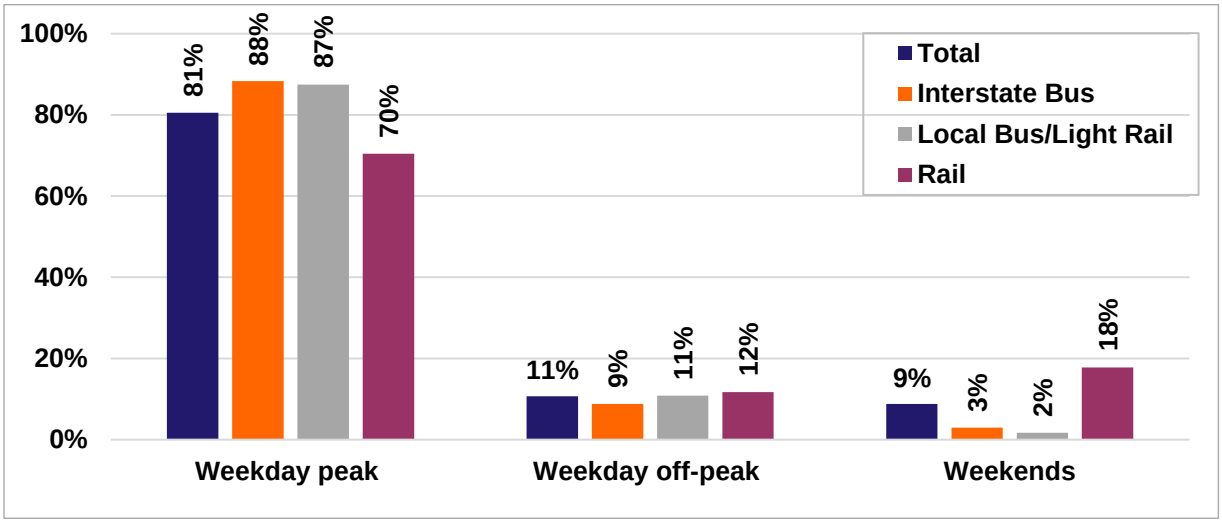


Figure 14. Time Period of Travel on NJ TRANSIT

The final travel behavior question asked, “How often do you usually ride on NJ TRANSIT?” The results are shown in Figure 15, and most respondents (67%) said that they ride on NJ TRANSIT five or more times per week. A larger percentage of Interstate Bus (82%) and Local Bus / Light Rail (79%) respondents selected the most frequent category of five or more times per week.

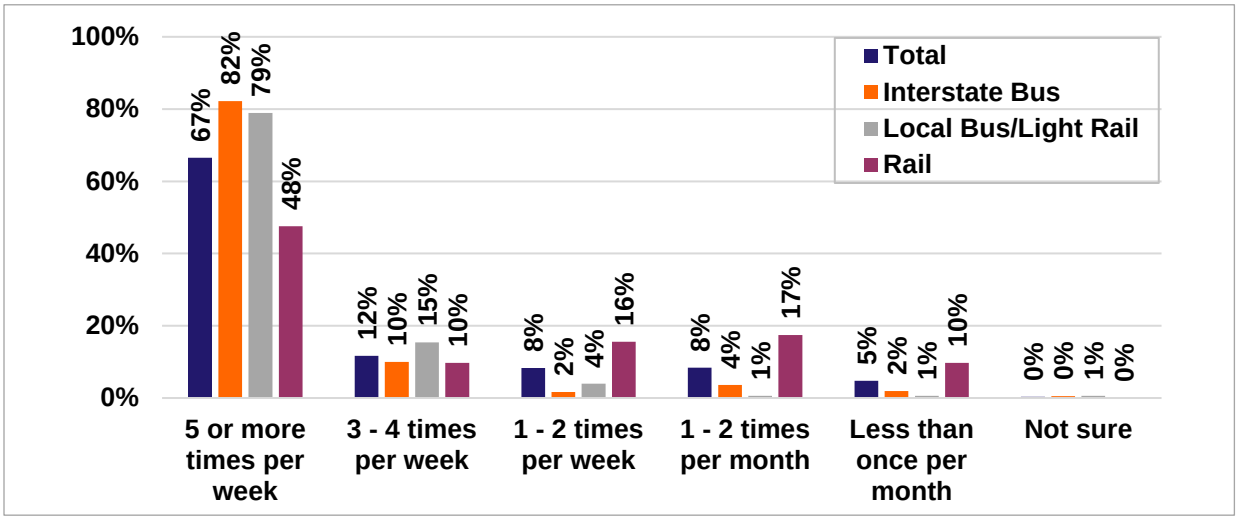


Figure 15. Frequency of Travel on NJ TRANSIT

Socioeconomic Characteristics

The final section on the survey asked a series of questions about the respondent and their socioeconomic characteristics. First, respondents were asked, “What type of smartphone do you use?” Figure 16 displays the results for the complete sample (weighted n=248,844), which indicates that most respondents (63%) use an iPhone. However, there is some variation by market; for example, the most commonly used type of smartphone in the Local Bus/Light Rail market is an Android.

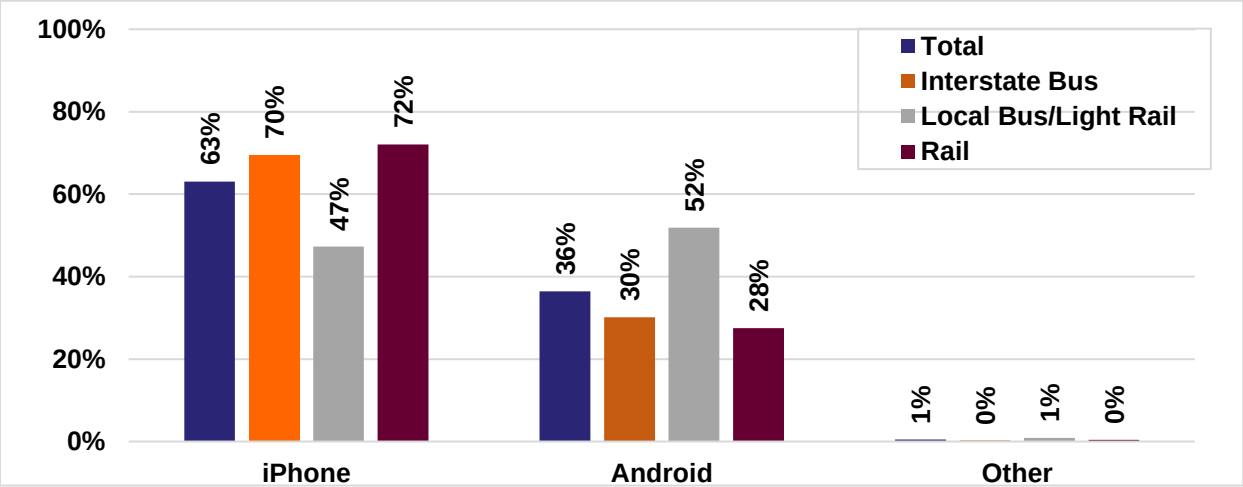


Figure 16. Type of Smartphone

Table 21 presents the socioeconomic characteristics of the survey participants (weighted n=248,844). The first category was gender; half of the respondents were male (50%) and 48% were female. The age of respondents varied; about 32% of respondents fell in the age group of 25-34 years and 30% were ages 45-64. The third characteristic shown in Table 21 reveals that 14% of respondents were of Spanish/Hispanic/Latino origin. Next, respondents were asked to identify their race. The predominant ethnicity of the respondents was white (60% of the total). However, there was some variation in race by market; for example, 28% of Local Bus / Light Rail respondents were Black or African American. The next characteristic shown in Table 21 pertains to having a disability, and 3% of respondents reported that they have a disability that makes it difficult for them to use the bus, train, or light rail. Finally, the annual combined household income of respondents is shown in Table 21, and the results show substantial variation in the income levels of survey participants, including 8% making less than $15,000 per year and 8% earning more than $250,000 per year.

Table 21 - Socioeconomic Characteristics of Survey Respondents

Demographics		**Total**	**Interstate Bus**	**Local Bus / Light Rail**	**Rail**
Gender	Male	50%	48%	44%	55%
	Female	48%	51%	54%	42%
	No Answer	2%	1%	1%	2%
Age	18-24 years	16%	14%	16%	16%
	25-34 years	32%	36%	32%	30%
	35-44 years	19%	22%	17%	18%
	45-64 years	30%	25%	33%	29%
	65 years and over	3%	2%	1%	4%
	No Answer	1%	1%	0%	2%
Spanish / Hispanic / Latino origin	Yes	14%	19%	20%	8%
	No	84%	79%	79%	90%
	No Answer	2%	2%	1%	2%
Ethnicity	White	60%	64%	44%	72%
	Black or African American	13%	6%	28%	5%
	Asian or Pacific Islander	12%	13%	12%	12%
	American Indian or Alaskan Native	0%	1%	0%	0%
	Mixed Race	7%	8%	9%	5%
	Other (please specify)	4%	6%	5%	3%
	No Answer	3%	3%	1%	4%
Disability	Yes	3%	1%	3%	3%
	No	96%	97%	96%	95%
	No Answer	1%	2%	1%	2%
Annual Household Income	Under $15,000	8%	4%	16%	4%
	$15,000-$24,999	6%	2%	11%	3%
	$25,000-$34,999	6%	3%	10%	3%
	$35,000-$49,999	9%	10%	13%	6%
	$50,000-$74,999	15%	20%	16%	13%
	$75,000-$99,999	12%	15%	10%	12%
	$100,000-$149,999	15%	17%	11%	18%
	$150,000-$199,999	10%	11%	4%	14%
	$200,000-$249,999	4%	4%	1%	7%
	$250,000 and over	8%	6%	3%	13%
	No Answer	6%	8%	5%	7%

Summary of Survey Findings

This section summarizes the key findings from the survey. In terms of current utilization and satisfaction levels with NJ TRANSIT's app, nearly half (41%) of the respondents use the app more than five times a week. Regardless of the market, approximately 85% of customers think NJ TRANSIT's app is easy to use (either somewhat or very), and only 6% customers find it is difficult to use. Similarly, approximately 80% of respondents are satisfied with the NJ TRANSIT's app.

Regarding location services, most respondents (78%) are familiar with the location services feature on their smartphone. Approximately three quarters (74%) of customers think that location services are beneficial in smartphone apps. 74% of participants agreed that NJ TRANSIT should use location services in NJ TRANSIT's app so that targeted information can be provided to them.

When specific examples of mock-up screenshots of NJ TRANSIT's app were presented on the survey, approximately 80% of respondents agreed that they would like to receive special event information. Less than half of respondents would like to receive coupons for nearby restaurants (e.g., 41% for Subway sandwich coupons). Only one quarter of customers (25%) reported they would like to receive advertisements for nearby shops or businesses (e.g., Whole Foods). Last, and perhaps most important, a strong majority of respondents (90%) stated that they would like to receive transit service alerts within NJ TRANSIT's app, and this was the most positively viewed potential new feature using location services within the app.

CONCLUSIONS AND RECOMMENDATIONS

The objective of this research project was to assess NJ TRANSIT passenger receptiveness to geotargeting in NJ TRANSIT's mobile application ("app"). A three-part method was used to conduct this research, which is summarized in the following paragraphs.

In the first part of the project, an ***industry scan of transit smartphone apps*** was conducted by downloading publicly available apps from four peer agencies to NJ TRANSIT. All apps considered for this scan included the capability to purchase a transit ticket directly in the app, which is referred to as mobile ticketing. The results reveal that most transit agency ticketing apps are location aware; however, this functionality appears to be used in a limited number of features within the apps, such as detecting a user's location when they request nearby real-time vehicle arrival information.

In the second part of the research, ***focus groups of NJ TRANSIT passengers*** were conducted. There were two groups with a total of eighteen participants who use NJ TRANSIT's app. The focus groups began with a structured discussion, and based on this discussion, it was found that most participants were aware that their smartphone can detect their location. Next, the focus groups contained an exercise in which participants were shown mock-up screenshots of NJ TRANSIT's app with potential geotargeting features. A key finding from this exercise was that the most desired potential feature in NJ TRANSIT's app is targeted transit service alerts, such as in the event of a train delay. The results of this qualitative research were used to guide the third part of the project, which was a survey.

In the third part of the project, more than five thousand NJ TRANSIT passengers participated in an ***online survey about NJ TRANSIT's mobile app***. The results of the survey revealed that most respondents (78%) were aware of location services in their smartphone, and the majority of participants (74%) were receptive to NJ TRANSIT using this feature in their app to provide them with targeted information based on their location. After providing specific examples of potential geotargeted features in NJ TRANSIT's app to survey respondents, the following conclusions can be drawn:

- The most desired feature is targeted transit service alerts; for example, 92% of participants responded favorably to mock-up screenshots of transit service alerts.
- Most respondents (80%) would like to receive special event information when it could affect their transit trip.
- Participants expressed less interest in receiving targeted coupons or advertisements. Less than half (41%) of respondents stated that they would like to receive coupons for nearby restaurants (e.g., a sandwich shop). Only about one quarter of customers (25%) responded favorably to receiving advertisements for local businesses (e.g., a supermarket).

In summary, the results suggest that NJ TRANSIT customers find it acceptable for NJ TRANSIT's app to know their location, and they are particularly receptive to receiving targeted transit information relevant to their NJ TRANSIT trips.

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