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1. REPORT NUMBER	2. GOVERNMENT ASSOCIATION NUMBER	3. RECIPIENT'S CATALOG NUMBER
CA13-1230		

4. TITLE AND SUBTITLE

Tool Development to Evaluate the Performance of Intermodal Connectivity (EPIC) to Improve Public Transportation – Phase 2B

5. REPORT DATE

08/29/2012

6. PERFORMING ORGANIZATION CODE

7. AUTHOR

Allison Yoh, Michael Smart, Norman Wong, Hiroyuki Iseki, and Brian D. Taylor

8. PERFORMING ORGANIZATION REPORT NO.

N/A

9. PERFORMING ORGANIZATION NAME AND ADDRESS

UCLA Institute of Transportation Studies
Luskin School of Public Affairs
3250 Public Affairs Building
PO Box 951656
Los Angeles, CA 90095-1656

10. WORK UNIT NUMBER

11. CONTRACT OR GRANT NUMBER

TA-65A0267

12. SPONSORING AGENCY AND ADDRESS

California Department of Transportation
Division of Research and Innovation
P.O. Box 942873, MS-83
Sacramento, CA 95814

13. TYPE OF REPORT AND PERIOD COVERED

Final Report
4/30/2008 - 3/31/2012

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

None

16. ABSTRACT

In previous phases of this research, we developed a methodology for surveying transit riders about their levels of satisfaction and how important they find various attributes at transit stops and stations. We applied an Importance-Satisfaction Analysis to identify improvements that matter most to riders. In this phase of research, we developed an online tool that allows transit agencies in California and across the U.S. to replicate our survey methodology and analysis. The online application allows planners and analysts to download a copy of our survey, to receive guidelines for administering the survey at transit stops and platforms, and to enter and upload their collected survey data. The tool then provides an individualized analysis of the data so that transit agencies can evaluate the performance of their own stations, and identify the most effective improvements needed to improve their riders' satisfaction. This research-based program is ground-breaking in that it provides an analysis of the relative importance of various improvements, using community-based input. The research methodology and its online interface is important in three ways: (1) The analysis is scalable, meaning that it can be performed on a single transit stop, or on multiple transit stops to evaluate performance at an aggregated, system-wide scale. (2) The analysis is intuitively clear and its policy implications are tractable – the model provides a graphical representation of users' levels of importance juxtaposed on top of users' satisfaction levels, and includes a number of attributes that are within the direct control of transit agencies. (3) The tool can assist transit agencies in evaluating which amenities and service qualities are of greatest importance to riders and most in need of improvement. In short, it provides a clear indication of how best to invest increasingly scarce transit resources to improve customer satisfaction in attributes that matter most to transit customers.

17. KEY WORDS	18. DISTRIBUTION STATEMENT
transit improvements, station design, bus stop improvements, transit service frequency, interconnectivity, online toolkit, importance-satisfaction analysis, effectiveness of station/stop improvements, rider satisfaction, user surveys	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161

19. SECURITY CLASSIFICATION *(of this report)*	20. NUMBER OF PAGES	21. COST OF REPORT CHARGED
Unclassified	72	

Tool for Analyzing Station Characteristics (TASC): Evaluating the Performance of Intermodal Connectivity

Under Contract 65A0267: Tool Development to Evaluate the Performance of Intermodal Connectivity (EPIC) to Improve Public Transportation – Phase 2B

Submitted September 28, 2012

UCLA Institute of Transportation Studies
Luskin School of Public Affairs
3250 Public Affairs Building
PO Box 951656
Los Angeles, CA 90095-1656
www.its.ucla.edu

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Preface

This document is the final report for Phase 2B of the Research Technical Agreement (RTA) between the California Department of Transportation (Caltrans) and the University of California at Los Angeles (UCLA). The RTA is entitled "Tool Development to Evaluate the Performance of Intermodal Connectivity (EPIC) to Improve Public Transportation – Phase 2B." Caltrans's primary interest in this research was interconnectivity among transportation modes in California, the identification of a method to evaluate performance of intermodal stations and stops, and the development of a widely accessible application that transit agencies can use to improve passenger transit trips. This last and completed phase of the RTA built upon a previously-developed methodology (Phase 2A) to produce, test, and finalize an online "toolkit" that transit agencies could access and use to analyze any stations and stops – not just those serving intermodal transfers.

This report includes a summary of previous phases of the EPIC project and how the online Tool to Assess Station Characteristics (TASC) was built to extend the reach of the project's methodology and analysis to a broader range of transit agencies. In Phase 1, we attempted to understand the relative importance of various transit station and stop amenities on users' experiences in making transfers. That phase of work included a survey of 750 riders at 12 stations and stops in Los Angeles County, and a survey of 175 transit operators nationwide. Phase 1 made substantive progress toward determining the connectivity of transit systems, its influences on travelers' satisfaction with transit services, and ways that public transit systems can reduce the burdens of time spent out-of-vehicles to help make public transit more attractive both to current and new riders. Analysis from Phase 1 found that the most important determinant of user satisfaction with a transit stop or station is frequent, reliable service in an environment of personal safety. We also found that transit managers understood precisely their riders' concerns, and in planning their services, focused on safety- and security-related factors over other attributes at transit stops, stations, and transfer facilities.

In Phase 2A of this study, we expanded our user survey from 750 riders in Los Angeles to 2,240 riders in Los Angeles, Orange County, San Diego, the San Francisco Bay Area, and Santa Barbara. The goal was to increase our sample size to boost the robustness of our analysis, particularly with respect to increasing representation of riders in different geographic regions, and increasing the diversity of combinations of station/stop attributes. We confirmed (with a significantly larger dataset) that our original findings held true – that safety and security rank high among transit riders' needs, as do operational enhancements such as on-time performance and frequent service. With a larger sample, we were able to conduct additional analyses showing that safety and security, as well as frequent service, was important to riders regardless of their wait times. With longer waits, we found that amenities such as the availability of restrooms, seating, and food/drink vendors – become increasingly more important. Also in this phase of research, we validated the use of an Importance-Satisfaction (IS) Analysis that

can identify station/stop features that are most *effective* at improving transit riders' levels of satisfaction with their trip experiences.

In the final phase of this project (Phase 2B), we developed an online tool that allows transit agencies in California and across the U.S. to replicate our survey methodology and IS analysis. The online application allows planners and analysts to download a copy of our survey, provides guidelines and instruction for administering the survey at transit stops and platforms, and allows agencies to enter and upload their collected survey data. The tool provides an individualized analysis of the data – available for download – so that transit agencies can evaluate the performance of their own stations, and identify the most effective improvements needed to increase their riders' satisfaction.

This research-based program is groundbreaking in that it provides planners an analysis of the *relative* importance of various improvements and uses community-based input. The development of this methodology and its online interface is important in three ways. First, such an analysis is *scalable*, meaning that it can be performed on a single transit stop or station to provide an analysis unique to that stop, or on a set of transit stops or stations to evaluate performance at an aggregated, system-wide scale. Second, the IS analysis is intuitively clear and its policy implications are understandable and tractable – the model provides a graphical representation of users' levels of importance juxtaposed on top of a graphical representation of users' satisfaction levels and includes a number of attributes that are within the direct control of transit agencies (e.g. availability of seating, frequency of service, quality of lighting, etc.). Third, the IS tool can assist transit agencies with evaluating which amenities and service qualities are of greatest importance to riders and most in need of improvement. In short, it provides a clear indication of how best to invest increasingly scarce transit resources to improve customer satisfaction in *attributes that matter* to transit customers.

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Introduction

Travel by public transit involves much more than moving about on buses or trains. A typical door-to-door trip entails walking from one's origin to a bus stop or train station, waiting for one's vehicle to arrive, boarding the vehicle, traveling in the vehicle, alighting from the vehicle, and then walking to one's final destination. In many cases, the trip involves transfers; travelers frequently alight from one transit vehicle, move to a new stop or platform, wait for another transit vehicle, and board that vehicle. Transit travelers thus expend a great deal of time and energy outside of the vehicle, walking and waiting, and this plays greatly into their transit experience, and indeed in the overall burden they perceive for the transit trip. Despite the importance of out-of-vehicle transit travel, however, the in-vehicle travel experience has tended to garner the lion's share of attention from transit providers and managers. Accordingly, this study focuses on the out-of-vehicle segments of transit travel and on ways to reduce the burdens of walking, waiting, and transferring – with the ultimate goal of improving the attractiveness of public transit.

This project addresses the following questions:

- What are the best ways to reduce out-of-vehicle travel burdens?
- Are some approaches to improving the interconnectivity among transit lines, modes, and systems more cost-effective than others?
- Can improvements be made in a stand-alone fashion, or do they need to be implemented in concert with other improvements?
- Do different types of transit travelers tend to perceive the burdens of walking, waiting, and transferring differently?

The goal of the project is to improve the attractiveness of public transit services by reducing travelers' perceived burdens of walking, waiting, and transferring. Tasks in this project identify the factors that influence transit riders' levels of satisfaction with their transit experiences, and analyze the relative burdens of out-of-vehicle travel times in order to make transit more convenient and attractive. Particular attention is paid to both transit service (in terms of service reliability and frequency) and the physical attributes of stops, stations, and intermodal transfer facilities on the supply-side. Specifically, the quality of services at transfer facilities importantly contributes to how the traveling public perceives and experiences the transfer process, and plays a key role in understanding the quality of system interconnectivity on a local, regional, or interregional basis. This research will enable increased customer satisfaction among current users to maintain current levels of transit use. Additionally, if research-based service improvements are significant enough to attract current private vehicle drivers to use transit, these improvements can benefit transit operators and bring societal benefits. The tools of this research will also prove to be valuable resources in the planning for and design of new facilities or enhancement modifications to existing transit stops and stations. Collectively, these will translate into direct economic benefits through more efficient and more effective use of available funding.

In the course of this project, we conducted three phases of research and development. The following sections summarize Phase 1, Phase 2A, and Phase 2B accomplishments, challenges, and primary findings.

Methods of Investigation: Previous Phases of Research

What we did in Phase 1

The EPIC project is comprised of a series of research tasks and activities that started in 2004. The overall research objective is to develop a statistical analysis formula or set of formulas (tools) that can reliably predict the most effective design for an intramodal and/or intermodal transfer facility.

In order to learn more about how wait times at stations and stops are perceived, and how they can be made better, we surveyed approximately 2,247 transit passengers at 34 different transit stops and stations throughout California (which ranged from adjacent corner bus stops with minimal levels of amenities to large enclosed multi-modal transit facilities) – in Los Angeles, Orange County, Santa Barbara, San Diego, and the San Francisco Bay Area. Specifically, we asked respondents to assign a level of importance to each of a list of attributes, and then to tell us how satisfied they were with each attribute. These attributes were grouped into the following five conceptual categories:

- **Facility Access**: *The management of passenger flow control and directional information*
- **Service Information**: *The provision of service information, such as availability of transit options, and where and how to use services*
- **Safety and Security**: *Station/stop equipment, infrastructure, or personnel that provide passengers with a safe and secure environment*
- **Connections and Reliability**: *Distance and time to make connections, on-time performance, and frequency of bus/train service*
- **Amenities**: *Treatments that increase comfort, provide weather protection, and cleanliness of the station/stop*

Specifically, waiting riders were asked to rate on a scale of 1 to 4, both their levels of satisfaction with various stop/station attributes at that stop/station, and to rate how important these attributes were to them.

- Station cleanliness
- Availability of seating
- Availability of food/drinks for purchase
- Availability of restrooms
- Protection from sun/rain
- Adequate signage
- Ease of finding platform or bus bay from the street
- Short wait
- On-time performance

- Availability of schedule/route information
- Ease of getting around the station
- Sense of security during daytime
- Sense of security during nighttime
- Presence of call boxes or help lines
- Adequate lighting
- Presence of security guards
- Ease of transfer overall
- Overall satisfaction with the station/stop

The survey also solicited demographic information and trip information (e.g. trip purpose and frequency, and other means of travel that had been available to the respondent for making the trip). Our objective was to provide an accurate portrait of transit riders at the system-wide level, by service-type, by time of day and day of week, and by location. Our survey asked for the following demographic characteristics of our respondents:

- Age
- Gender
- Income
- Ethnicity
- Car availability
- Modal preference
- Trip characteristics, including trip purpose, pre- and post-trip mode, and transfer rate
- Time of day and day of week and
- Frequency of transit use

Users were also asked to provide information about their waiting times including: (1) how long they had been waiting and (2) how much longer they expected to wait; these two responses were added to calculate total expected wait time.

The survey was available in English and Spanish, and we obtained approximately 700 usable rider surveys in Phase 1. For a complete discussion about our response rates and rider demographics, please see Deliverable 3 from the EPIC 1 project reports. Following the completion of our survey administration, we performed three major analytical activities in this phase of research:

1. Drawing from our user survey responses, we examined reported levels of satisfaction with individual station/stop attributes and determined their influence on *overall* satisfaction. Combined with an Importance-Satisfaction Analysis, this analysis produced the Hierarchy of User Needs in Transit (Figure 1).

2. We interviewed and conducted surveys of transit operators to compare their perspectives with those of transit users' levels of importance placed on various attributes. This analysis produced a comparative study and revealed that in general, transit managers and operators generally understand their riders' needs and wants.

3. We attempted to conduct an analysis of riders' overall satisfaction as explained by built environment characteristics, but this analysis was limited due to low variance among station attributes and small sample sizes (rider surveys and stations/stops).

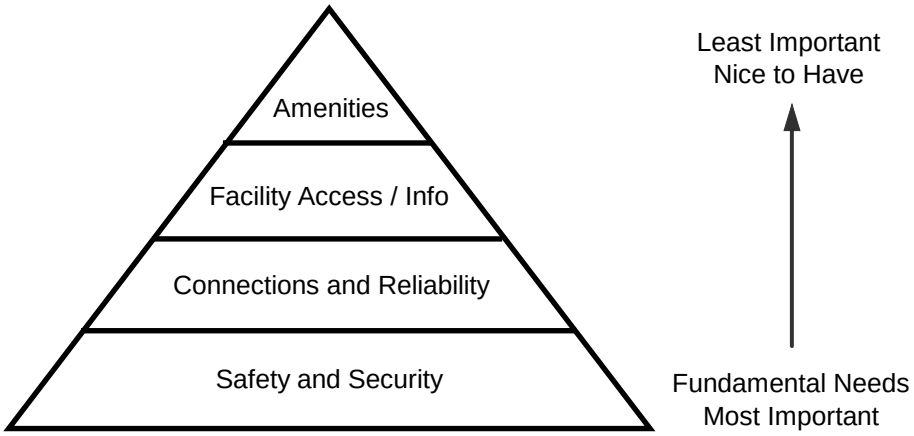


Figure 1: Hierarchy of Transit Users' Needs

What we did in Phase 2A

Phase 2A was designed to further develop the analyses performed in Phase 1, by expanding our data collection effort to increase both our user survey and station sample sizes. Though the 12 stations in Los Angeles (surveyed in Phase 1) represented a diverse set of stations and stops, the group of facilities did not exhibit sufficient variability in the attributes we were examining. For example, stations that had park-and-ride lots also had good lighting and little graffiti – and such correlations made it impossible for us to test the independent influence of individual attributes on users' experiences at (or overall satisfaction with) these stops and stations. To make the findings of this effort more generalizable to cities and transit operators around California, our principal objective was to increase the number of user surveys (to improve robustness), and to include stations/stops in areas beyond Los Angeles County (to allow a wider variety of transit stops and stations to be analyzed in a broad array of settings).

Phase 2A consisted of an expanded series of transit user surveys performed throughout California, assessing users' levels of customer satisfaction with various amenities and attributes of transit stops and stations. Phase 2A also consisted of a station inventory of amenities and attributes at 37 transit stations in California.

After data collection, we performed four analyses (the details of which can be found in our final report on EPIC Phase 2A):

1. An analysis examining how importance ratings for various attributes and amenities changes as wait times increase.

2. A simple ordered logit regression analysis to ascertain whether satisfaction levels with individual facility attributes influences riders' overall satisfaction with the station/stop.

3. A multivariate regression analysis to evaluate relative importance of the quality of built environment attributes (from our station inventories) in determining users' overall satisfaction of the facility.

4. An Importance-Satisfaction Analysis to demonstrate a method for identifying the most critical areas of need for transit stations, by comparing transit riders' levels of satisfaction with and levels of importance attributed to various station/stop amenities. This model – the "Importance-Satisfaction (IS)" model – forms the basis of next steps proposed in Phase 2B and will be discussed in further detail.

From these analyses, a few principal findings stand out loud and clear:

- *The most important determinant of user satisfaction with a transit stop or station is frequent, reliable service in an environment of personal safety. In other words, most transit users would prefer short, predictable waits for buses and trains in a safe, if simple or even dreary, environment, over long waits for late-running vehicles in even the most elaborate and attractive transit station, especially if they fear for their safety.*

- *Indeed, Safety and security are important to users regardless of wait times, and our analysis suggests that safety- and security-related attributes are considerably more important to users than are most other attributes.*

- *The provision of real-time information at stops/stations can have a considerable impact on overall user satisfaction, though the effects of service quality are significantly larger.*

- *Some amenities, such as restrooms, food and drink vendors, and seating, etc.., become more important as users' wait times grow longer. This provides an important guideline to transit managers: certain amenities may be more important when managers are unable to improve service frequencies (due, for example, to lack of operating funds).*

While this finding will come as no surprise to those familiar with past research on the perceptions of transit users, it does present a contrast to much of the descriptive, design-focused research on transit stops and stations.

Findings from Phase 2A work demonstrated that our last model, the "Importance-Satisfaction analysis," described above *is* robust and usable, and provides many advantages and applications that may be of interest to transit agencies. First, such an analysis can be performed on a single transit stop or station to provide an analysis unique to that stop, or on a set of multiple transit stops or stations to evaluate performance at an aggregated, system-wide scale. Second, the IS analysis is intuitively clear and its policy implications are understandable and tractable –

the model provides a graphical representation of users' levels of importance juxtaposed on top of a graphical representation of users' satisfaction levels and includes a number of attributes that are within the direct control of transit agencies (e.g. availability of seating, frequency of service, quality of lighting, etc.). Third, the IS tool can assist transit agencies with evaluating which amenities are of greatest importance to riders and most in need of improvement – in other words, the IS analysis provides a clear indication of how best to invest increasingly scarce transit resources to improve customer satisfaction in *attributes that matter* to transit customers.

Developing TASC in Phase 2B: Accomplishments and Challenges

Following Phases 1 and 2A, it became clear that we needed a much larger sample size to analyze the effect of individual attributes on riders' overall satisfaction. It also became clear that the IS analysis provided a potentially useful tool that transit agencies could use to evaluate their unique stations and stops. To support both our need for more observations and to bring the benefits of the IS tool directly to a wider audience, we developed an online system that makes available our user survey and station inventory forms to agencies that want to participate but for which we were not able to survey ourselves as part of Phase 2A research. By allowing agencies to collect their own data and upload it to our online resource tool, we could potentially increase our sample size and add to the robustness of our data at no increase in cost to the research effort. In this sense, we have created a "living tool" that can grow the user survey responses and station inventories that we started in Phases 1 and 2A. At the same time, transit agencies could obtain community-based survey results (i.e. transit rider responses) that would allow them to make cost-effective investment decisions at the level of individual stops/stations, or across their system as a whole.

This application is especially important given the scarce dollars available for transit improvements. By making an IS analysis readily available to transit agencies, planners and practitioners will have a user- and community-based tool to assess the most critical areas in need of improvement – improvements that will provide the greatest "bang for the buck" from transit investments.

In order to make such a tool useful and relevant to transit agencies, we developed the site with three guiding principles:

1. We designed an appropriate user interface drawing from the needs, feedback, and knowledge of transit agency representatives.
2. We developed the capability to manage and retain data on transit stop attributes and user surveys directly uploaded by transit agency staff in a standardized file format.
3. Finally, we built the TASC "back end" processor – the engine, essentially, that will conduct the analysis and convert uploaded data into graphic and tabular form.

The following sections report on our accomplishments and challenges in each of these three objectives.

Designing an appropriate user interface

At the outset of this phase of the project, we spoke with and polled a group of loosely-organized "advisory group" members consisting of transit agency officials from California. Represented were large and small, Northern and Southern California agencies, and those operating different modes. Many of these representatives were planners and analysts who, based on their professional expertise, were asked to give us feedback on the usefulness of our research application. We spoke with and presented to transit agency officials our vision for TASC – what it could do, how it might work, and the applications of the analysis that transit agencies could receive. These advisory members were consulted on the appropriateness and appeal of a "living" tool that would collect and aggregate data reported from participating agencies while at the same time providing agencies with individualized reports of their own stations/stops.

In general, responses were positive but qualified. Transit agency officials reported that their boards favored the use of "community-based" planning, and that survey research certainly played an important role in identifying needs. They particularly were interested in community inputs that were unique to stations or stops in specific neighborhoods. We also heard that transit agencies saw benefits of using this tool for providing performance measurements not only to be used for making operational or facility improvements, but also for purposes of seeking funding and building political support for projects.

Finally, from our discussions we heard that any online interface must be user friendly, and not require technical expertise or knowledge in programming or survey methodology. Many agencies' staff are pulled in multiple directions and any tool that is designed to assist transit planning should have a relatively low learning curve.

Given these valuable comments, we designed a clean, concise, and navigable web portal for accessing the TASC tools. The website's landing page (Figure 2) includes a brief introductory overview of TASC, a statement about how the site can help transit agencies, and the types of output available to users. It provides a quick-start feature (creating an account and a "Getting Started" page); a Frequently Asked Questions section; and pages that guide users through the steps of downloading the toolkit, uploading data, and analyzing results. Finally, the landing page provides a link through which users can provide feedback to assist us in refining the site and its functional features. The website is available for public use at: www.its.ucla.edu/TASC.

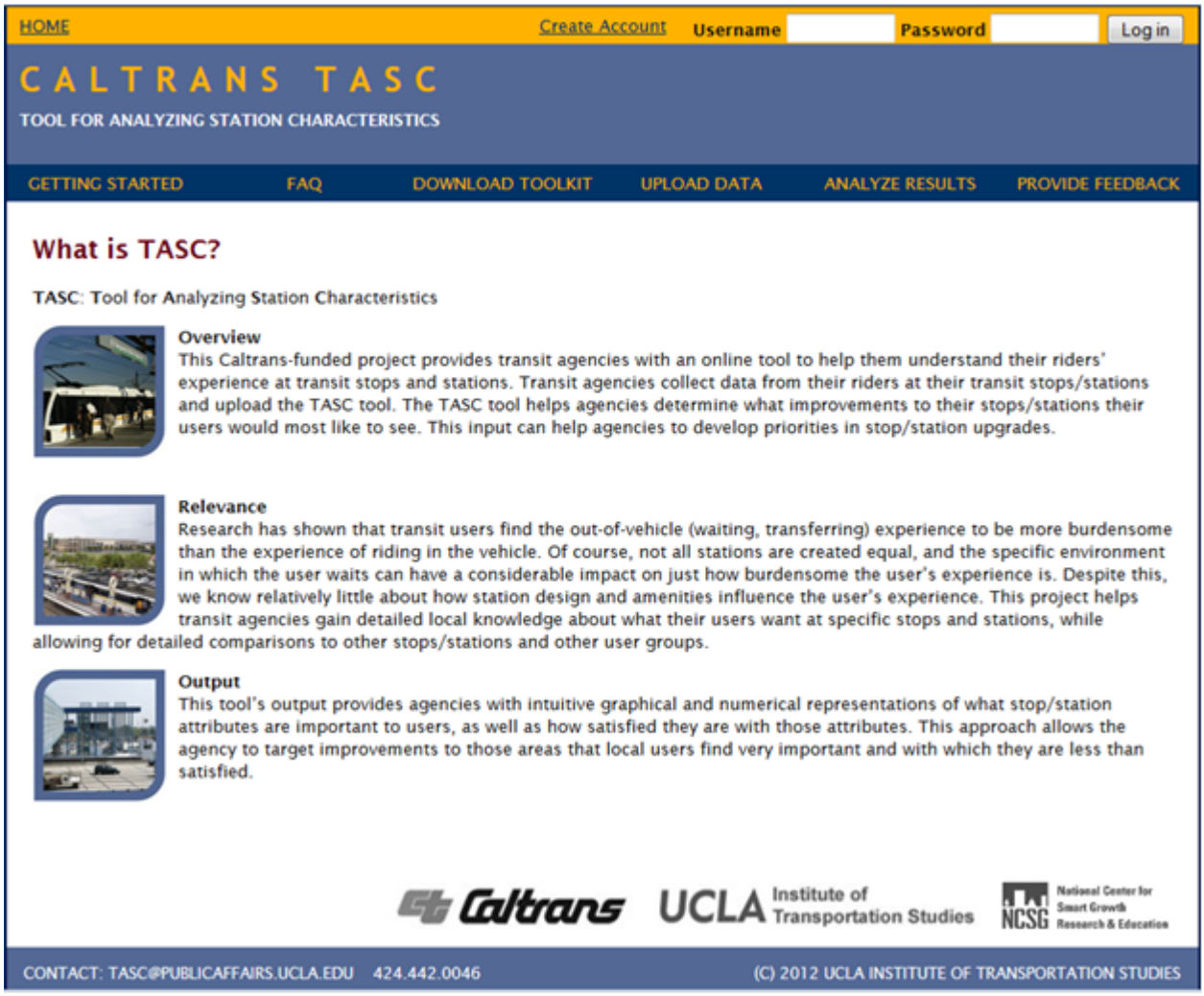


Figure 2: TASC Website Homepage

Figure 4 below provides an overview of the major steps in using the TASC website. After transit officials create a simple log-in ID and password (Figure 3), they are able to download the TASC toolkit. This kit includes copies of the survey instrument that will be administered to transit riders, a station inventory form that will be filled out by an agency official for each station or stop where a survey is administered, and an Access database in which they will enter survey and inventory data. The Access database later will also be used to export an Excel sheet that will be uploaded to our server for analysis. Transit agency officials can then download a set of customized analyses. The next sections of the report discuss in further detail the steps for uploading data and downloading results. For more detailed information and step-by-step instructions, see the "Users' Manual," included in Appendix A, and also available for download from the TASC website.

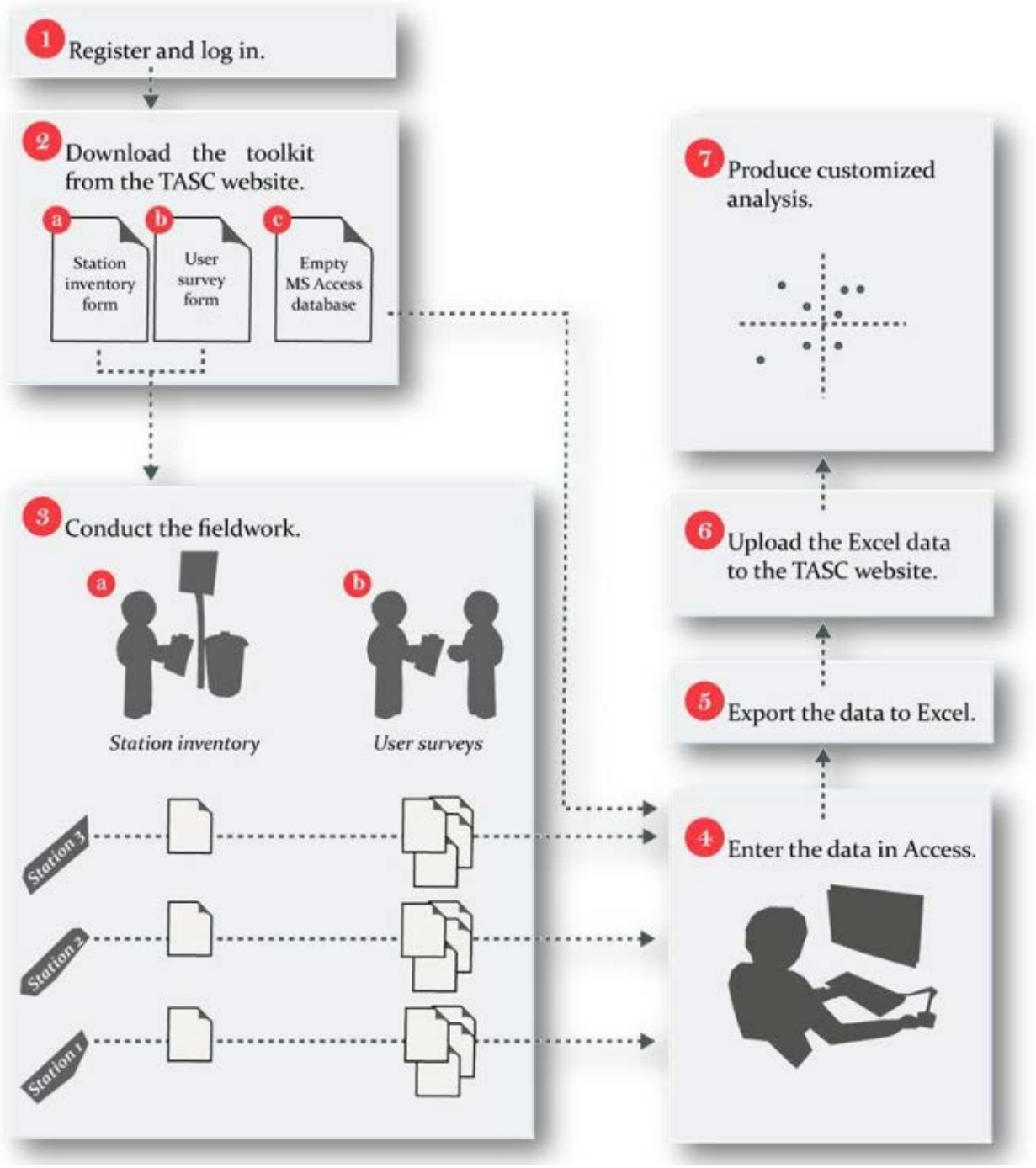


Figure 3: Overview of TASC Steps

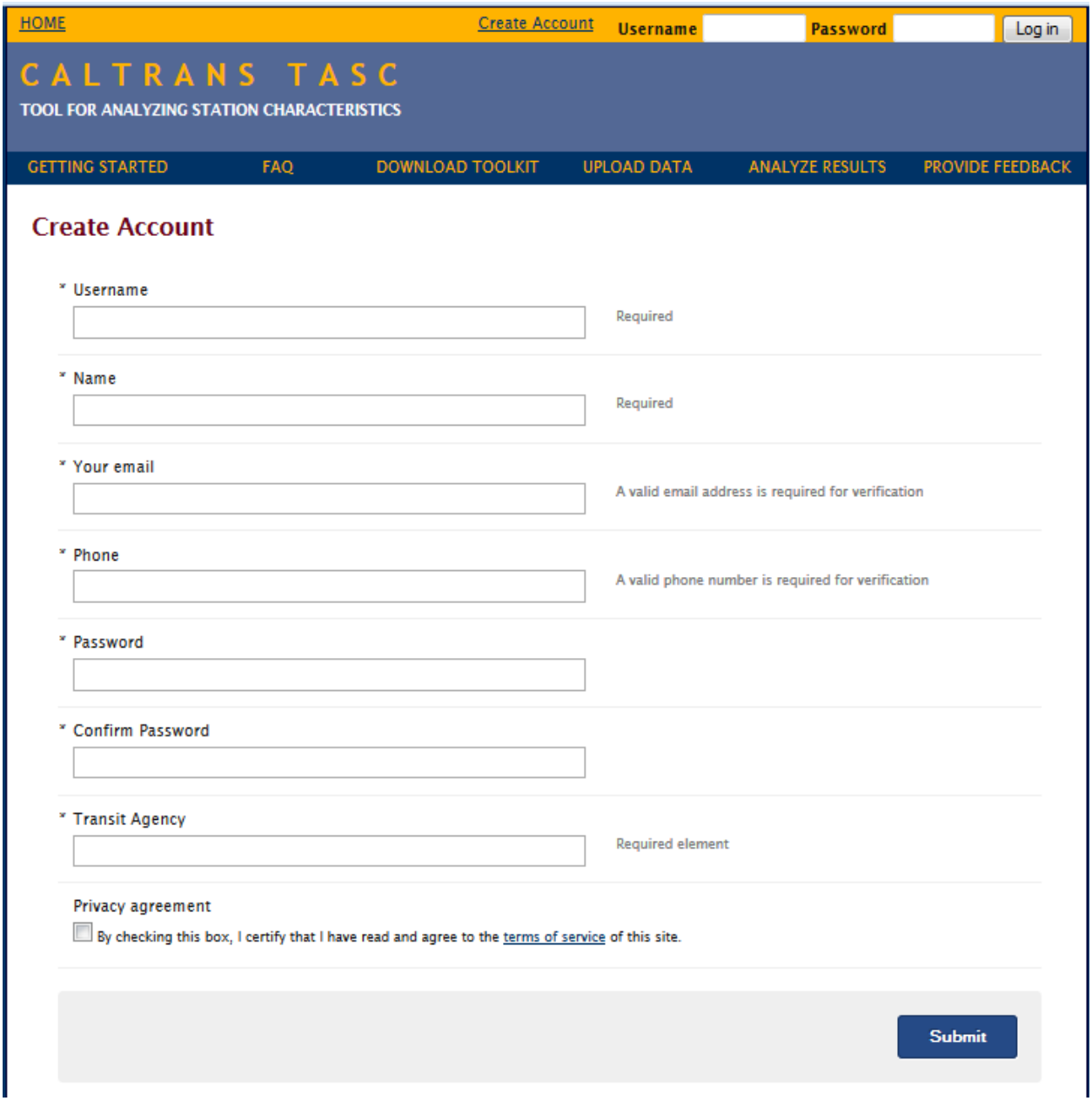


Figure 4: Creating a Login ID and Password

Entering, uploading, and transmitting data

The second major issue of development was designing a method for transit agencies to enter their data and transmit it to us in a standardized format through an upload function. Especially critical was the task of designing the control mechanisms to prevent transit agencies from inadvertently uploading invalid data (e.g. duplicate records, incomplete data, etc.) while giving them flexibility and independence in using our toolkit. We also were interested in the capability to append each agency's dataset to our master database that contained observations we collected in Phases 1 and 2A, in order to grow our original dataset and form a repository of observations reported to us.

We accomplished this by creating a database into which transit planners can enter their data using a pre-formatted, pre-designed user interface and form, save the data, and then send the dataset through an upload feature on our site. The database was designed and created in Microsoft Access, a commonly used database management application to which most public agencies have access through standard and professional versions of Microsoft Office packages.

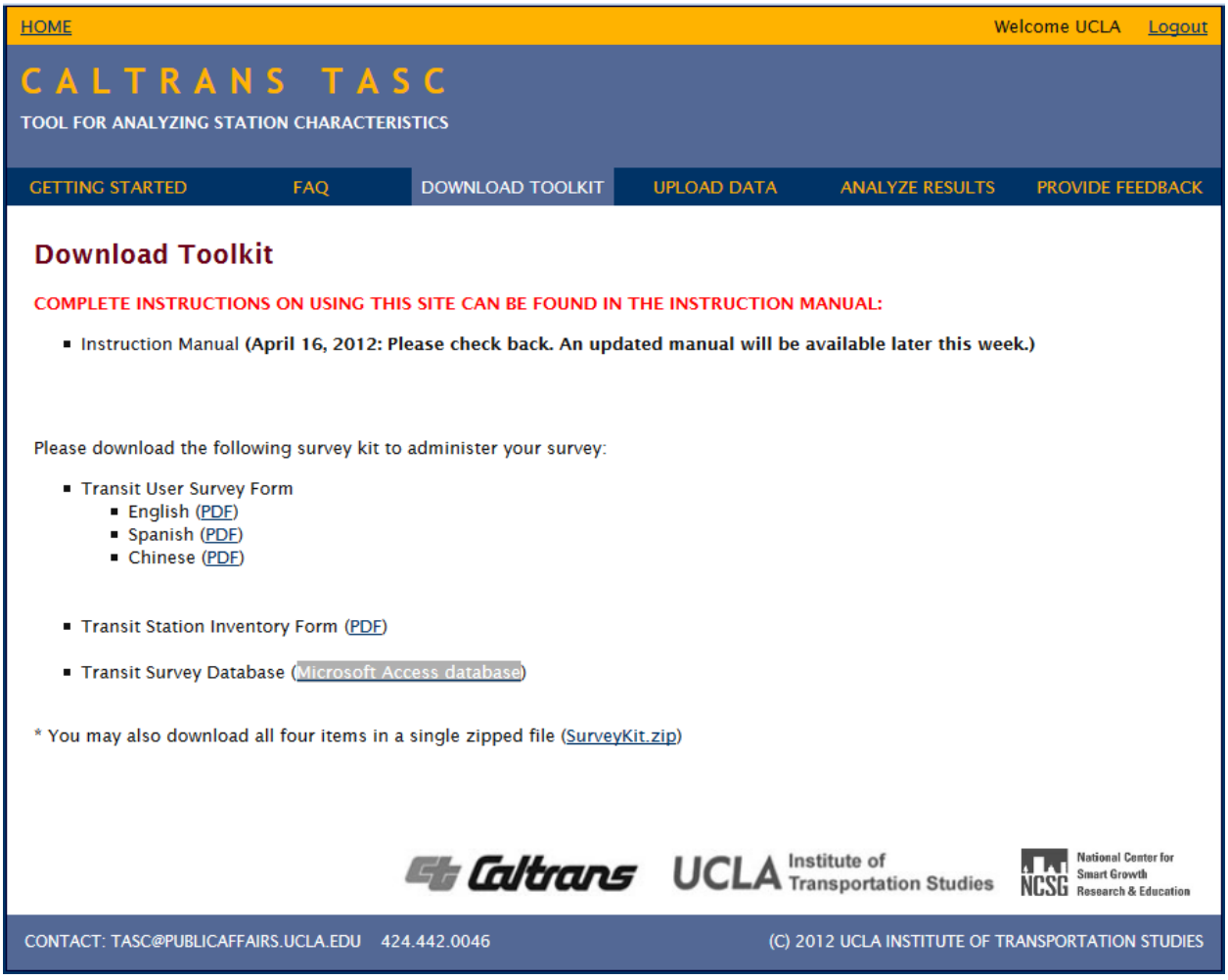


Figure 5: Download Toolkit

Analysts can download the empty Access database (Figure 5), which contains a pre-designed form that guides data entry for survey data and the station inventory (see Figure 6). During data entry, the file is maintained on the user's local drive. Once a user is finished entering data, she or he can export the data to an Excel sheet, which can then be uploaded to our website. The use of the Access form provides (1) a user interface that guides the data entry in an intuitive and clear manner, and (2) a one-click method for converting all data entered into a spreadsheet format suitable for upload.

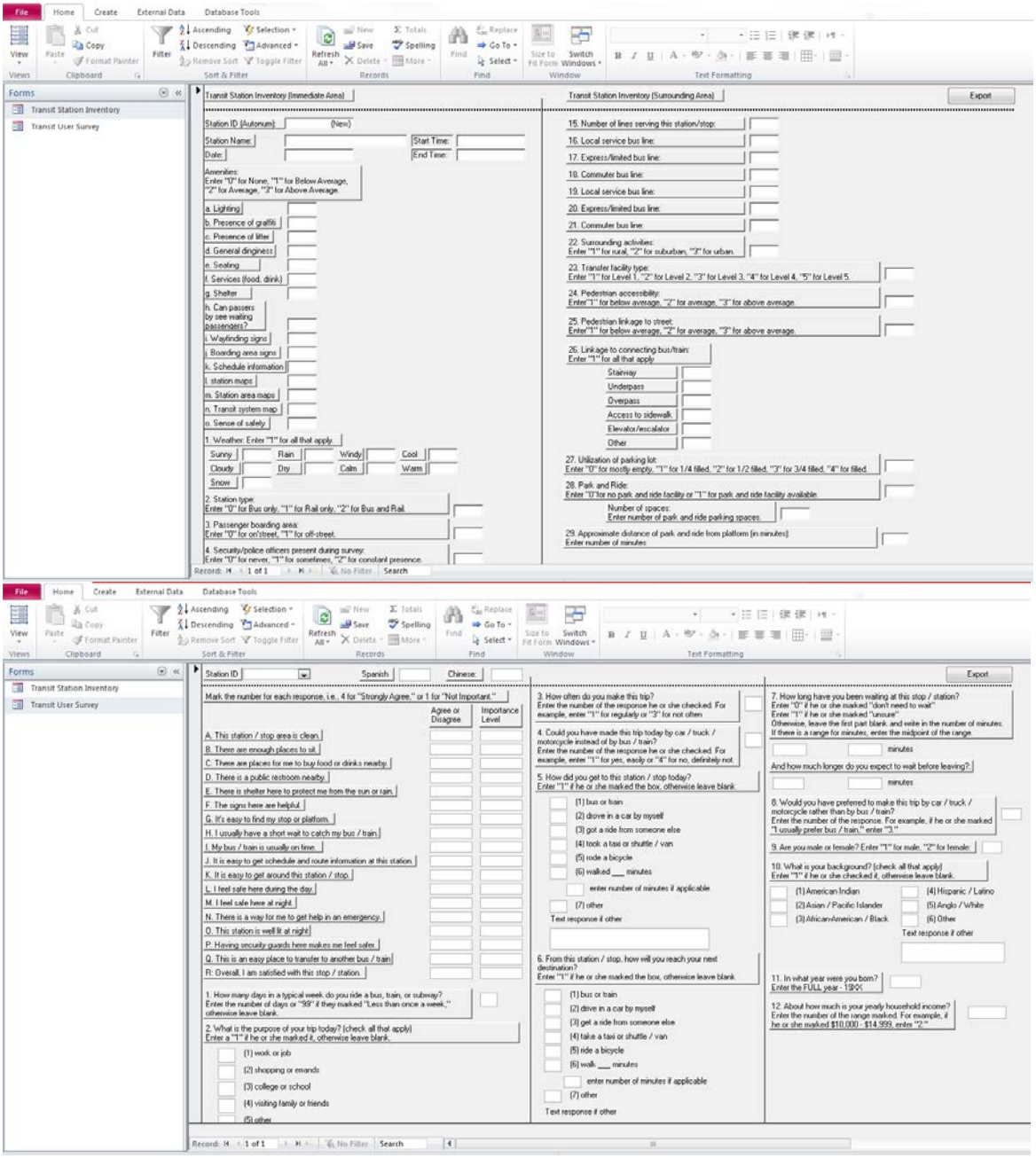


Figure 6: Forms for Inputting User Survey and Station Inventory Data (MS Access)

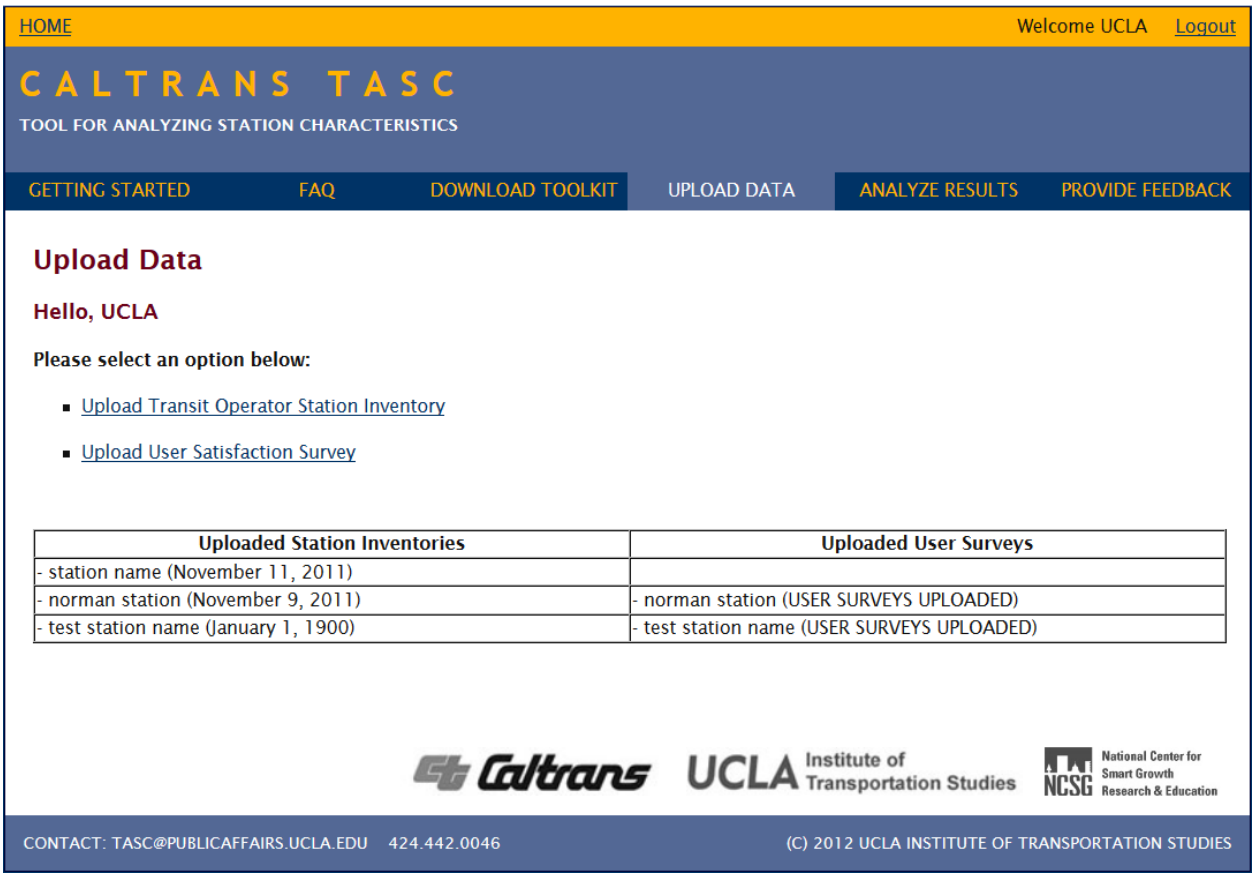


Figure 7: Uploading Station Inventory and User Survey Data

Generating and interpreting the Importance-Satisfaction (IS) analysis

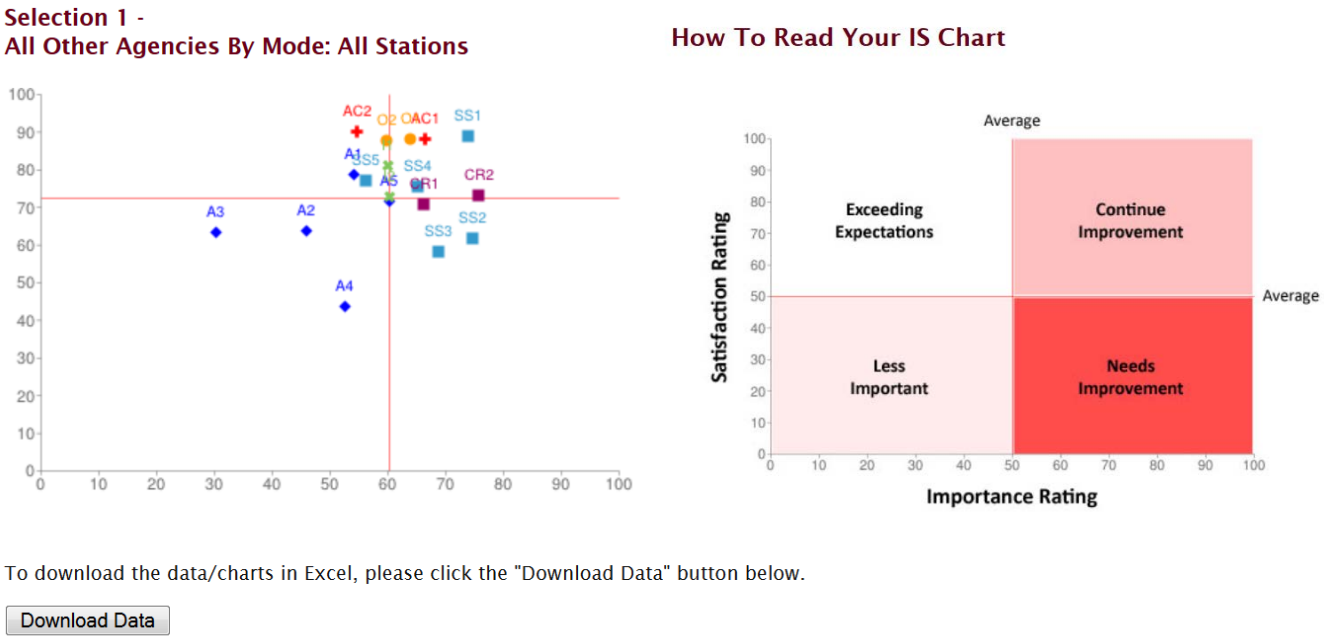
After uploading the data, an analyst can query the TASC website to produce an analysis of the data, along with some options for filtering data to include only subsets of the observations (e.g. women, specific income categories, by race/ethnicity, by trip purpose, etc.) The output is the IS analysis results, which forms the analytical foundation used in TASC. This *Importance-Satisfaction (IS) Analysis* can be a valuable tool to help transportation planners and managers evaluate the relative priority of various transportation issues (Tennessee Department of Transportation Office of Strategic Planning 2006). The IS analysis maximizes the impact that new investments have on customer satisfaction by emphasizing improvements in areas where both the reported level of customer satisfaction is relatively low and where customers' perceived importance of the issue or factor is relatively high (Tennessee Department of Transportation Office of Strategic Planning 2006).

We use IS-Analysis in our study to assess the quality of various attributes at transit stops and stations in the State of California based on users' evaluation of the quality of service at these facilities. We asked transit users to rate the level of importance and the level of satisfaction using a four-level scale. We asked users "do you agree or disagree?" and "how important is it to you?" for each attribute question, to gather their satisfaction with the attribute and importance of the attribute respectively (See Appendix B for a copy of the survey instrument and questions). To

obtain the importance rating, we calculated the proportion of survey respondents who placed the highest importance rating on an attribute (answered "Very important" in the survey) among the total number of respondents who answered a question on this particular attribute.[1] To obtain the satisfaction rating, we calculated the proportion of survey respondents who indicated a positive level of satisfaction on an attribute among the total number of respondents who answered a question on this particular attribute (answered "Strongly agree" or "Agree Somewhat" in the survey[2]). The ratings are calculated as percentages.

Importance = *[# of users "Very Important" / Total Users]*
Satisfaction = *[# of users "Strongly Agree" or "Agree Somewhat" / Total Users]*

The Importance and Satisfaction ratings are then plotted on the X-axis and Y-axis, respectively (See Figure 8). The horizontal and vertical dotted line shows the average ratings for importance levels and satisfaction levels, allowing a user to understand each attribute's rating relative to the average. By combining both satisfaction and importance ratings, attributes fall into one of the four quadrants formed by the average ratings.



To download the data/charts in Excel, please click the "Download Data" button below.

Download Data

Figure 8: IS Analysis Output

[1] The importance-satisfaction analysis as described in the literature uses responses from a survey in which users are asked to *choose* a certain number of issues that they think most important and are most satisfied with among given options. For example, the Tennessee Department of Transportation asked respondents to choose what issue about highways, such as highway congestion level, high road surface condition, water drainage on highways, signs on highways, they thought were most important and are most satisfied with (Tennessee Department of Transportation Office of Strategic Planning 2006). Then the importance rating and the satisfaction rating are calculated by summing the percentage of respondents who selected an item as one of the most importance and the most satisfactory. In this sense, our IS analysis is slightly different from the original IS analysis, although the underlying concept and calculation is the same.

Attributes fall into one of the four quadrants formed by the average ratings (Figure 8):

- **Top, Left | Exceeding Expectations**
  Attributes in this quadrant received very high satisfaction ratings, while their importance ratings are lower than the average. These attributes, in other words, are *exceeding* the expectations that riders report and transit agencies would be well-advised to focus attention elsewhere.

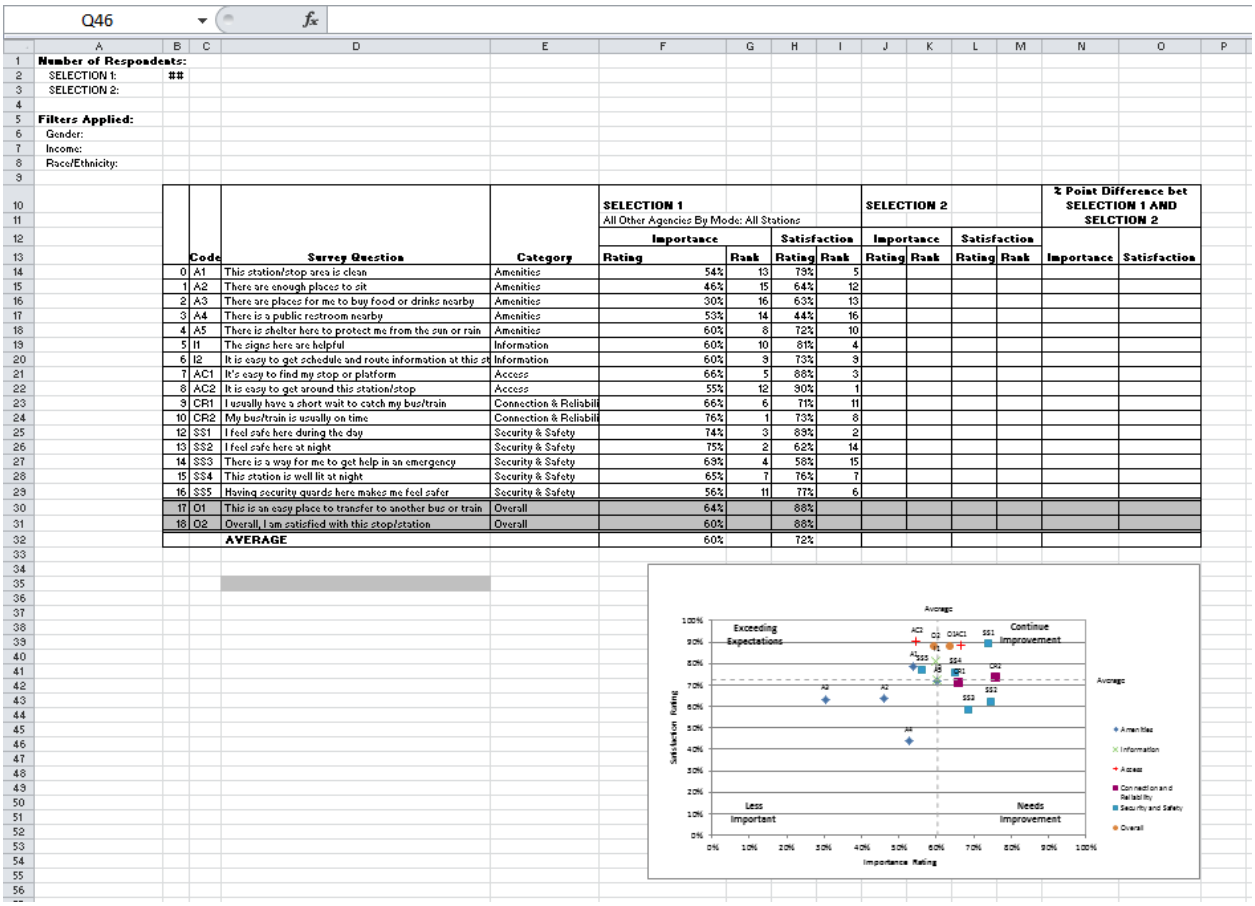
- **Bottom, Left | Less Important**
  The group of attributes located in this quadrant received, on average, relatively lower importance levels and also lower satisfaction levels. Because these attributes are lower in importance to transit riders, transit agencies should consider these attributes as *less critical* when considering potential improvements to make.

- **Top, Right | Continue Improvement**
  These attributes were rated as important and riders reported that they are also relatively satisfied with them. For this reason, transit agencies should *maintain* these attributes so that customers continue to be satisfied with them.

- **Bottom, Right | Needs Improvement**
  Attributes in this quadrant require substantial attention due to the lower satisfaction level and the high importance ratings. Transit agencies should direct their attention and efforts to improving the attributes here.

Downloading the IS analysis output

The TASC website interactively generates and displays the IS graph and also allows an analyst to download the graph and its corresponding data in tabular form (Figure 8) in an Excel spreadsheet. This function allows users to reformat data for other reporting purposes, or to conduct additional analysis outside of the TASC environment.



Q46

Number of Respondents:															
SELECTION 1:	##														
SELECTION 2:															
Filters Applied:															
Gender:															
Income:															
Race/Ethnicity:															

	Code	Survey Question	Category	SELECTION 1 All Other Agencies By Mode: All Stations				SELECTION 2				% Point Difference bet SELECTION 1 AND SELECTION 2	
				Importance		Satisfaction		Importance		Satisfaction			
				Rating	Rank	Rating	Rank	Rating	Rank	Rating	Rank	Importance	Satisfaction
0	A1	This station/stop area is clean	Amenities	54%	13	73%	5						
1	A2	There are enough places to sit	Amenities	46%	15	64%	12						
2	A3	There are places for me to buy food or drinks nearby	Amenities	30%	16	63%	13						
3	A4	There is a public restroom nearby	Amenities	53%	14	44%	16						
4	A5	There is shelter here to protect me from the sun or rain	Amenities	60%	8	72%	10						
5	I1	The signs here are helpful	Information	60%	10	81%	4						
6	I2	It is easy to get schedule and route information at this st	Information	60%	9	73%	9						
7	AC1	It's easy to find my stop or platform	Access	66%	5	88%	3						
8	AC2	It is easy to get around this station/stop	Access	55%	12	90%	1						
9	CR1	I usually have a short wait to catch my bus/train	Connection & Reliabili	66%	6	71%	11						
10	CR2	My bus/train is usually on time	Connection & Reliabili	76%	1	73%	8						
12	SS1	I feel safe here during the day	Security & Safety	74%	3	83%	2						
13	SS2	I feel safe here at night	Security & Safety	75%	2	62%	14						
14	SS3	There is a way for me to get help in an emergency	Security & Safety	69%	4	58%	15						
15	SS4	This station is well lit at night	Security & Safety	65%	7	76%	7						
16	SS5	Having security guards here makes me feel safer	Security & Safety	56%	11	77%	6						
17	O1	This is an easy place to transfer to another bus or train	Overall	64%		88%							
18	O2	Overall, I am satisfied with this stop/station	Overall	60%		88%							
		AVERAGE		60%		72%							

Figure 9: Downloaded Graph and Data in Tabular Form (Excel)

Filtering observations for IS analysis and comparing subpopulations

A user can also run and re-run the analysis based on various options for filtering data (Figure 10). These filters allow a user to run analyses comparing the results of various subpopulations of users (e.g. men's preferences vs. women's preferences, preferences of various income groups, etc.).

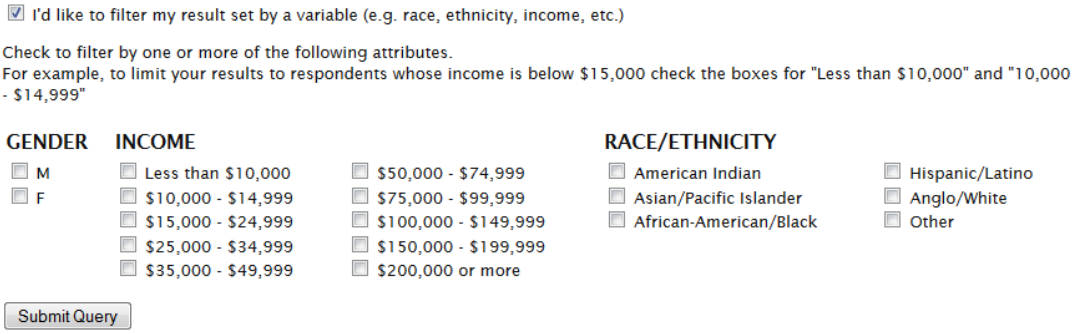


Figure 10: Filtering Results by Subpopulations

Some examples of comparative IS analyses are included below in the following figures:

Comparing a single station to a set of stations:

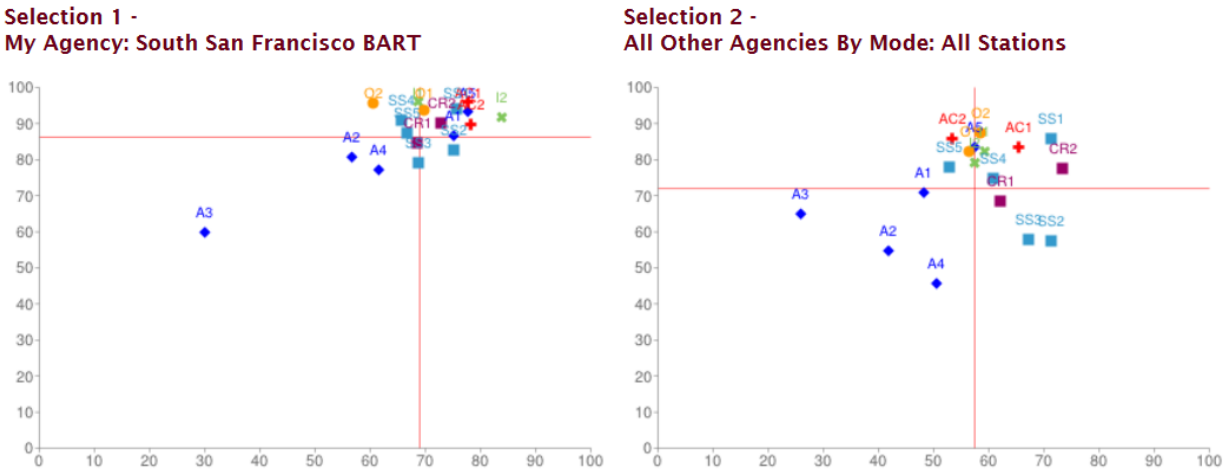


Figure 11: Comparing One Station with Systemwide Responses

Comparing men's and women's responses:

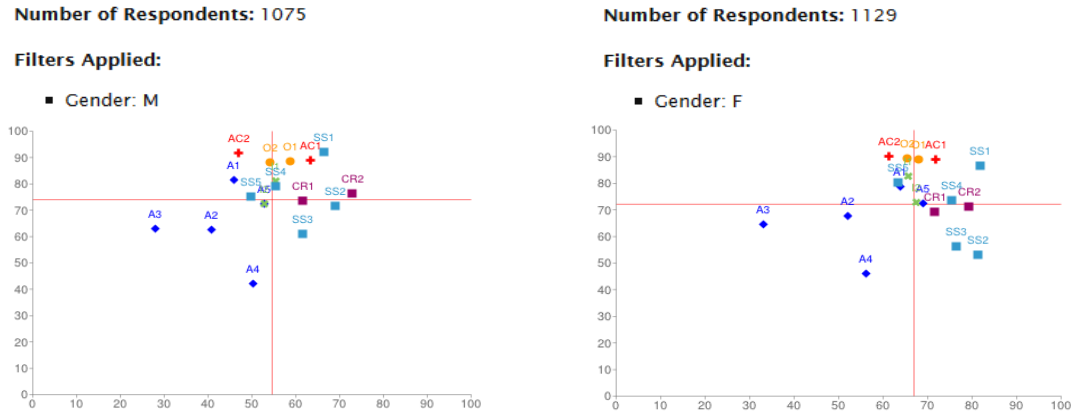


Figure 12: Comparing Responses from Men and Women

Comparing bus and rail riders:

Figure 13: Comparing Bus and Rail Stations

Conclusion and Next Steps

As demonstrated, the TASC website, its analytical capability, and its output far surpass the simple universal list of "good things to do" now commonly used by transportation providers during the planning, design and upgrade of transit stop and transfer facilities. While such best practices lists are useful, they do little to help the practitioner prioritize which of the multiple best practices is indeed *best for the situation at hand*.

This research task, Phase 2B, plays a key role in understanding the quality of transit stops and stations, and enables identification of features and attributes that increase customer satisfaction among current users – thus helping public transportation providers maintain and increase the use of transit compared to current levels. If research-based service improvements that are feasible to implement are significant enough to attract current private vehicle drivers to use transit, these improvements can benefit transit operators through increased revenues and bring other societal benefits such as reduced congestion and improved air quality. The outcome of this research may also prove to be a valuable resource in the planning for and design of new facilities and enhancement modifications to existing intermodal connection nodes. Collectively, the results of this research will translate into direct economic benefits through more efficient and more effective use of the available public funding.

Preliminary outreach efforts to practitioners indicate that transit agencies and planning organizations have responded positively to this resource. We have, for instance, presented the tool at a technology showcase at the American Planning Association's annual conference. The showcase was a featured session of the conference, and attracted a over 50 participants from universities, transit agencies (both staff and board members), MPOs, and consulting firms. We received significant interest and generally positive feedback about the potential applications of this tool in the planning and design decisions that transit planners and operators encounter in their daily activities. Several people expressed interest especially because resources are limited and decisions about investing in improvements require considerations about cost-effectiveness.

Future work to extend this research and the TASC website could include more strategic and deliberate outreach to improve the general awareness of the availability of TASC and its benefits, to recruit users and provide technical support, and to conduct further troubleshooting of the tool in more extensive field testing.

Acknowledgements

This research was funded by the California Department of Transportation (Caltrans), and the authors are grateful for this support. The accuracy of the data reported and the conclusions drawn are solely those of the authors, and not the funding agency. The authors thank Bruce Chapman and Bradley Mizuno (Division of Research and Innovation) who managed this project for Caltrans; Vanessa Fernandez and Enrique Orozco who translated the survey from English into Spanish; Karen Hsu who translated the survey from English to Chinese; former UCLA student Ting Sit who helped design and administer the survey and collate and analyze the data; and the many UCLA, UC Berkeley, and San Jose State University students who helped administer the survey and input data: Chie Akiba (UCLA), Kevin Balak (SJSU), Stacy Flores (UCLA), Janet Kim (UCLA), John Kim (UCB), Carlos Robles (UCLA), Yaoyun Shen (UCB), Annie Tam (UCB), Jessica Tse (UCB), Rachel Wang (UCB), and Melanie Woods (UCLA). Thanks go to Chandini Singh (UCLA Institute of Transportation Studies) for overseeing many parts of the field research and for conducting analyses, to Alexis Lantz (UCLA Institute of Transportation Studies) for supervising and training undergraduate students on survey trips in Northern California, and to Celestine Do (UCLA Institute of Transportation Studies) for assistance with public outreach.

Two other researchers – Mark Miller (UC Berkeley PATH Program) and Adina Ringler (UCLA Institute of Transportation Studies) – contributed significantly to the previous stage of this research project from which we expanded the data set; this article would not have been possible without their efforts. Finally, thanks also go to the many transit agencies for allowing us to survey their passengers, and to the transit riders who took the time to respond to the survey. We also thank Ms. Michelle Tse and Ms. Rowena Barlow in the Business Office of the UCLA School of Public Affairs and Mr. Ken Castro-Oistad and Ms. Virginia Anders of the UCLA Office of Contracts and Grants Administration for their administrative support of this project.

About the Project Team

Allison Yoh, University of California, Los Angeles

Allison Yoh is Associate Director of the UCLA Institute of Transportation Studies, and Associate Director of the Lewis Center for Regional Policy Studies. Dr. Yoh manages several research programs in transportation, and also develops outreach and communications strategies to translate research findings into policies and action. Her transportation research focuses on inter- and intra-organizational behavior in the public sector, and specifically on public transportation planning. She has published research on cost-effective ways to increase transit ridership, the costs and benefits of implementing bus rapid transit (BRT), the adoption of innovative technologies in public organizations, and strategies for congestion management in Los Angeles. She is a graduate of UCLA, having received her M.A. and Ph.D. degrees from the Department of Urban Planning.

Brian D. Taylor, University of California, Los Angeles

Brian Taylor is a Professor of Urban Planning, Director of the Institute of Transportation Studies at UCLA, and Director of the Lewis Center for Regional Policy Studies. His research centers on both transportation finance and travel demographics. He has examined the politics of transportation finance, including the influence of finance on the development of metropolitan freeway systems and the effect of public transit subsidy programs on both system performance and social equity. His research on the demographics of travel behavior has emphasized access-deprived populations, including women, racial-ethnic minorities, the disabled, and the poor. His work in this area has also explored the relationships between transportation and urban form, with a focus on commuting and employment access for low-wage workers. Professor Taylor teaches courses in transportation policy and planning and research design. Prior to coming to UCLA in 1994, he was an Assistant Professor in the Department of City and Regional Planning at the University of North Carolina at Chapel Hill, and before that a Transportation Analyst with the Metropolitan Transportation Commission in Oakland, California.

Hiroyuki Iseki, University of Maryland

Hiroyuki (Hiro) Iseki is a research faculty with the National Center for Smart Growth and is assistant professor of Urban Studies and Planning. He earned his M.A. and Ph.D. in Urban Planning from UCLA. Iseki's research focuses on balancing efficiency, effectiveness, and equity in public policy and planning with a special attention to transportation, environment, and land use. His research interest includes transportation economics and finance, public transit planning and management, travel behavior analysis and modeling, regional transportation planning, and applications of GISs to research and practice in public policy and planning. Dr. Iseki's work has been published in a range of transportation and planning journals including *Transportation Research A: Policy and Practice, Transport Reviews, Journal of the Transportation Research Board, Journal of Public Transportation* and *Journal of Planning Education and Research*.

Michael Smart, University of California, Los Angeles

Dr. Michael Smart is a post-doctoral scholar and lecturer in the Department of Urban Planning at the University of California, Los Angeles. His research interests include demographic change and travel, transportation equity, and transportation and economic development. His current research assesses how social networks embedded in neighborhoods shape individuals' travel patterns. He has co-authored several papers on the travel behavior of immigrants to the United States, and is currently involved in a project examining how transit agencies involve immigrant communities in public participation processes. He graduated with a Master's degree in City and Regional Planning from the University of Pennsylvania and a Ph.D. from UCLA in Urban Planning.

Norman Wong, University of California, Los Angeles

Norman Wong is the IT/Data Manager and GIS Program Manager at the Lewis Center for Regional Policy Studies and the UCLA Institute of Transportation Studies. He is involved in GIS research and the design and development of internet-based mapping software. Mr. Wong's duties include database management, GIS analysis/training/consultation, networking, application development, and general technical support. Previously, he held various appointments in the Luskin School of Public Affairs, and has been involved in numerous research projects during his 13+ years at the university. His interests include mapping, programming, and transportation-related issues. Norman has a Bachelor's Degree in Mathematics of Computation and a minor in Geography from UCLA.

Appendix A: TASC Users' Manual

T Tool for
A Analyzing
S Station
C Characteristics

USERS' MANUAL

Caltrans

UCLA Institute of Transportation Studies

TASC USERS' MANUAL

TASC (Tool for Assessing Station Characteristics) is an online tool that was funded by Caltrans and designed by researchers at the University of California, Los Angeles's Institute of Transportation Studies. The TASC tool will help your agency assess how your riders experience *waiting* at various stops/stations in your network. Understanding how your users feel about the wait time at different stops/stations is of vital importance, as users typically find a minute spent waiting for a bus or train to be far more onerous than one spent traveling inside the vehicle. Unlike commonly practiced customer survey methods, the TASC online tool will help you assess the *relative* importance of improving some station/stop attributes over others. By understanding the strengths and shortcomings of various stops/stations in your network, your agency will be able to strategize how best to enhance strengths and overcome weaknesses, especially given limited resources —and thus effectively improving the experience and satisfaction of your riders. This users' manual will guide you through the steps necessary to implement the TASC tool at your agency. Using TASC involves several straightforward steps organized into three phases. First, the **field work phase** includes site selection, assembling a team, and collecting user responses and station inventory data at the sites you have selected. The second phase is **data entry**, which includes inputting the data and then uploading it to the TASC website. Finally, in the last phase of **data analysis** you will be able to query different types of analyses on the collected data, receive an interpretation of the findings, and produce downloadable reports and graphs.

We encourage your feedback on the TASC tool. You may contact the TASC team at TASC@publicaffairs.ucla.edu.

1. FIELD WORK

This section will introduce you to the steps necessary to conduct the field work portion of the TASC tool, including site selection, assembling a research team, and detailed instructions for data collection at the site.

1.1. SITE SELECTION

The first step to implementing the TASC tool is site selection: picking the stops/stations where you would like to learn more about your riders' experience. The TASC tool allows your agency to gather data on how your riders experience the time they spend waiting for the vehicle to arrive at your transit stops and stations. Thus, the sites you select should reflect the real data needs for your agency. Are

there stops/stations in your system that have a reputation for underperformance? You may consider using the TASC tool to identify the specific qualities of that stop/station that your users would like to see improved first. Or perhaps your agency has recently developed a new stop/station typology, and you would like to see how the new design compares to other, preexisting designs in your system. In such a case, it would be useful to collect data at the new stop/station, as well as a similar stop/station using the old design typology, and then compare how your users experience their wait time at both stops/stations. Of course, the tool can be applied to evaluating the system-wide performance of all stations/stops in your network.

When selecting a site, it may sometimes be appropriate to pool data from various locations in the stop/station area—for example, by collecting data from users on both the northbound and southbound sides of a bus stop. At other times, this may not be appropriate—for example, when the northbound stop has plenty of seating while the southbound stop area has none. In such a case, pooling the data would make it impossible to determine how much your users value having seating at the stop, because pooling the data masks whether the users filling out your survey have access to seating or not.

EXAMPLE OF APPROPRIATE DATA POOLING

Northbound and bound platforms of a subway/LRT line with no branching and roughly equal patronage in each direction. You should collect data from passengers waiting on both platforms and consider them to be waiting at the *same stop.*

EXAMPLE OF INAPPROPRIATE DATA POOLING

Northbound and southbound bus stops, with a bus shelter on one side but not the other. You may still collect data from passengers waiting at both bus stops, but you should consider them to be waiting at *different stops.*

A rule of thumb for deciding whether you can pool data collected from multiple locations within the same stop/station is: *can you reasonably expect the experience of two people waiting at these two different locations to have the same waiting experience?* If not, then you should not pool your data. Common reasons for *not* pooling data include: differences in amenities in different areas, different effective headways (e.g. when lines branch, inbound passengers may take any of the branching lines, while outbound passengers must wait for their particular branch line), differences in crowding at the time of the survey, differences in the availability of shade and protection from the elements, and any other significant differences that would make waiting in one area more pleasant than in another area.

1.2. ASSEMBLING A TEAM

Assembling an appropriate team will ensure that your agency is able to accurately collect, input, and analyze data for your sites. For the data collection phase, you should plan on having two or three cheerful survey workers per platform or waiting area. For example, if you are collecting data from both the northbound and southbound bus stops on a particular line, you should plan on having four to six individuals working that day. If you expect the stop/station to be particularly busy, or the arrival of passengers to be particularly peaked (e.g. at commuter rail stations), you should plan on having surveyors. If you expect the stop/station to be less busy, fewer workers may be fine. Generally, our experience suggests that each worker can administer about four surveys in a five-to-ten minute period at busy stops/stations.

You should collect between thirty and one hundred responses per stop/station, so it is important to schedule sufficient time at each stop/station. At particularly low-ridership stops/stations, collecting thirty surveys can take two hours or more. At low-headway but high-patronage commuter lines, you can expect bursts of high productivity followed by slow periods—consider planning for that down time. Additionally, at each station you will need to record station inventory data—budget about twenty minutes for this task as well.

Language is a very important consideration when assembling your survey team. If you expect that many passengers at a given stop/station speak a particular language, having a survey team member who speaks that language will make it *much* easier for you to collect data. In our experience, survey teams work best when at least one team member per stop/station area (e.g. on the northbound and southbound side) speak the language(s) spoken by many of the stop's patrons. For example, if one team member speaks Spanish while another doesn't, the non-Spanish-speaking team member can still request assistance from the Spanish-speaking team member when needed.

Continuity is another important consideration when assembling survey teams. Our experience administering surveys taught us that having at least one person assigned to *all* survey efforts (essentially as a data collection leader) helps to ensure that user surveys and station inventories are conducted in the same fashion each time. This consistency helps to increase the validity of comparisons across stops/stations by removing nuanced differences that might arise from slightly different data collection approaches. If having a continuous data collection leader is not possible, we suggest having a primary data collection leader train a secondary data collection leader for those data collection efforts where s/he is unable to attend.

1.3. AT THE SITE: USER SURVEYS

The data collection phase of TASC runs smoothly when all surveyors are "on the same page" about procedures. This section will lay out the steps involved in administering user surveys, as well as provide some pointers gleaned during our initial pilot phase.

1.3.1. PREPARING FOR THE FIELD WORK

How survey workers dress can influence how your riders perceive them. We found that the most favorable results were achieved when survey workers dressed simply and casually (not overly formally) and wore an orange safety vest and a clearly-displayed identification badge. These elements helped riders to identify surveyors as official transit workers, rather than marketers, street vendors, panhandlers, or other people riders may be accustomed to avoiding at transit stops/stations.

Each survey worker should carry with them three to five legal-size (8½" × 13") clipboards and roughly a dozen pens (some will go missing during the survey day!). Each of the clipboards should be prepared in advance of the field work. Our experience taught us that it's best to prepare each clipboard with thirty to fifty surveys in English, as well as sufficient surveys in other languages as you deem appropriate for the stop/station. We typically placed the English surveys on top, with the non-English-language surveys on the bottom, turned around so they could be quickly located in the field without much trouble.

1.3.2. ARRIVING AT THE STOP

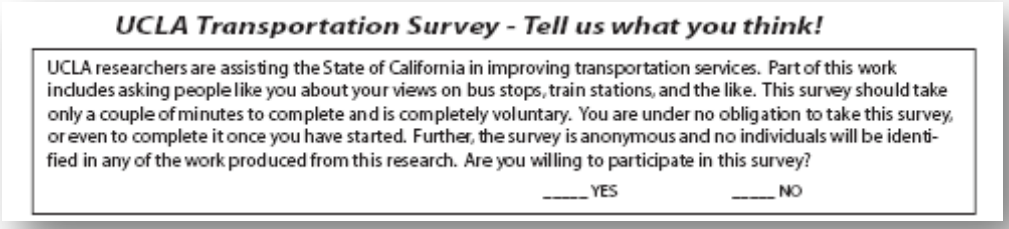
When arriving at the stop/station, the survey team should divide up the territory amongst themselves. Each survey worker should have a "turf" of his or her own; this will help you avoid approaching the same person more than once. Surveyors should wait until passengers have "settled" in place before approaching them—this means that it is off-limits to approach a passenger who is walking or who is clearly occupied with another task.

1.3.3. APPROACHING RIDERS

Once the rider has settled into place, the survey worker should approach the rider with a smile and ask in a friendly tone if he/she would be interested in participating in a survey conducted by your transit agency.

If the rider declines to participate, the surveyor should thank him/her and walk away. Our experience has taught us that some riders will react negatively to being approached. In these cases, it is important to maintain a friendly and professional demeanor and to thank the rider nonetheless.

If the rider agrees to participate in the survey, the survey worker should present the rider with a clipboard and pen and begin explaining the survey:

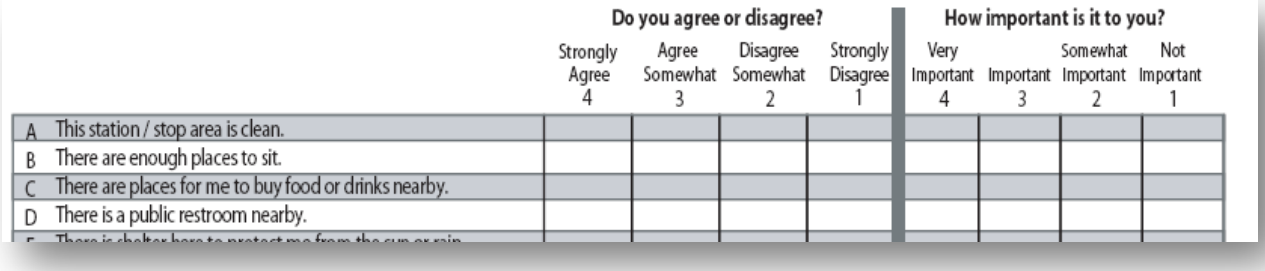


UCLA Transportation Survey - Tell us what you think!

UCLA researchers are assisting the State of California in improving transportation services. Part of this work includes asking people like you about your views on bus stops, train stations, and the like. This survey should take only a couple of minutes to complete and is completely voluntary. You are under no obligation to take this survey, or even to complete it once you have started. Further, the survey is anonymous and no individuals will be identified in any of the work produced from this research. Are you willing to participate in this survey?

_____ YES _____ NO

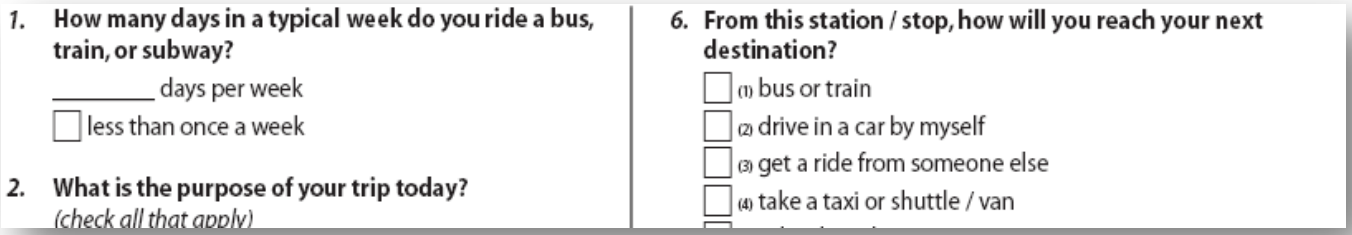
This is the top portion of your user survey. Your agency's survey may look somewhat different, should you replace the UCLA logo with your own agency moniker. This section explains the purpose of the survey and asks the user for his/her consent. Survey workers should make sure that the respondents are familiar with the terms of the agreement—especially the anonymous nature of the survey—before they place a checkmark.



	Do you agree or disagree?				How important is it to you?			
	Strongly Agree 4	Agree Somewhat 3	Disagree Somewhat 2	Strongly Disagree 1	Very Important 4	Important 3	Somewhat Important 2	Not Important 1
A This station / stop area is clean.								
B There are enough places to sit.								
C There are places for me to buy food or drinks nearby.								
D There is a public restroom nearby.								
E There is shelter here to protect me from the sun or rain.								

This is the section of the survey where respondents let you know how important various aspects of the transit stop/station are to them—as well as how satisfied they are with the current conditions at the stop/station. Our experience in the field has taught us that it is essential to spend a moment with the respondent to explain how this section works. In particular, we found that it is important to remind respondents that each sentence requires two separate responses: (1) agree or disagree and (2) how important is it?

It is also important to explain that respondents should evaluate their experience AT THIS STOP or STATION – and not about their experiences at other stops/stations, or about their transit experiences in general.



1. **How many days in a typical week do you ride a bus, train, or subway?**
   _____ days per week
   ☐ less than once a week

2. **What is the purpose of your trip today?**
   (check all that apply)

6. **From this station / stop, how will you reach your next destination?**
   ☐ (1) bus or train
   ☐ (2) drive in a car by myself
   ☐ (3) get a ride from someone else
   ☐ (4) take a taxi or shuttle / van

In the third section of the survey, users provide your agency with background information on their trip, their household, and themselves. Here it may be important to remind some respondents that their information will be kept anonymous and confidential. Additionally, it may sometimes be necessary to remind respondents that they can simply skip questions that they do not feel comfortable answering.

The remaining questions of this third section of the survey should be self-explanatory to the riders you are surveying.

1.3.4. READING SURVEYS ALOUD

In some cases, the rider may tell the survey worker that he/she cannot read the survey on his/her own. In other cases, survey worker may sense that this is the case. In both of these cases, the survey worker should tell the rider that he/she would be happy to read the survey aloud and prompt the rider for answers. Doing this may be time consuming, but it ensures that *all* riders have a fair chance to participate in the TASC survey. The surveyor should maintain a pleasant and professional manner while reading the survey and should not rush. In many cases, we found that it is necessary to prompt the respondent multiple times to provide answers using the scales provided (not important to very important; not satisfied to very satisfied), as we found many respondents replied with non-scale answers such as “yes” or “a lot.”

1.3.5. OTHER TIPS

Our experience administering user surveys has taught us a few valuable lessons:

1. Friendly, cheerful surveyors can overcome many riders' mistrust by immediately explaining that the survey will "help to make the transit experience better" and that they represent the agency itself.
2. Despite your best efforts, sometimes the survey team will approach the same person two or more times. This has, in the past, led to some irritation on the part of the rider. We found that it was sometimes useful to ask waiting passengers if "someone has already approached you about taking a survey for [name of your transit agency]?"—especially at crowded stops where waiting passengers may mill about.
3. It is helpful to explain to riders that the survey should take 5 minutes to complete. Instruct them that if their train or bus arrives while they are completing the survey, they should leave the clipboard and pen on the ground before boarding the vehicle. Your surveyors can then collect the surveys, whether they are fully completed or not.

It is important that all survey workers employ the same methods, so make sure that each of the surveyors is well-trained on the survey methods, the precise language to be used, and any other rules your agency deems appropriate.

If one team approaches passengers in one way and another team in a different way, you may obtain different results that have nothing to do with the qualities of the stations themselves!

1.4. AT THE SITE: STATION INVENTORY

In addition to the user response data that your survey team will collect at each site, you will also complete a station inventory. This inventory provides detailed information on the characteristics of the stop/station, which will help your agency to parse the data you have collected. Additionally, the data from participating agencies are pooled (anonymously) so that you will be able to compare how your users feel about a particular stop/station with how *similar* users feel at *similar* stops/stations in other participating regions.

The station inventory is a separate paper questionnaire that your survey team will complete after finishing the user survey. It is important that this inventory is completed *after* all user surveys have

been completed because it is important that you have a deep knowledge of the station's characteristics and usage—something you will have acquired over the time spent conducting the user surveys.

The station inventory contains many elements that can be considered subjective, but rigorous data analysis demands that each inventory is filled out in the same manner, following the same rules. Thus, we have attempted to create a very clear framework based on our own field work.

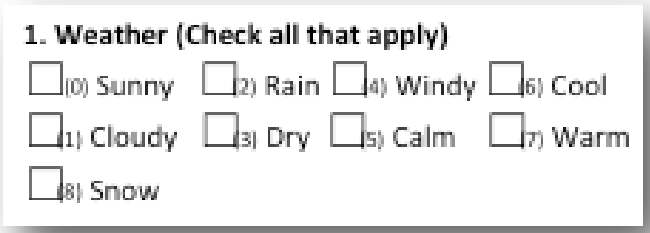
The station inventory is split into two parts: 1) the immediate area and 2) the surrounding area. The immediate area is the location directly at the stop (e.g. the bus stop, bus bay, or train platform) while the surrounding area encompasses the greater area around the stop (e.g. the block on which the bus stop is located, the bus terminal building, or the train station).

Immediate Area

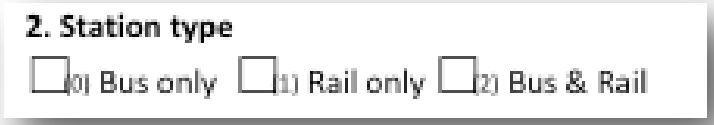
The first section of the station inventory asks you to rate the level of lighting, graffiti, litter etc. at the immediate waiting area of the bus or train stop. When evaluating these amenities, it is important to think about how they compare against the *average* condition of all stops/stations in your experience. For example, when evaluating the lighting at this stop or station, consider the level of lighting *on average* across all stations or stops. Then, consider whether lighting at this particular stop or station is below average, comparable to average lighting conditions, or above average. Of course, if there is no lighting, indicate that on the transit survey.

	Amenities	None 0	Below Average 1	Average 2	Above Average 3
a	Lighting				
b	Presence of graffiti				
c	Presence of litter				
d	General dinginess				
e	Seating				
f	Services (Food, Drink)				
g	Shelter				

In this section, mark your rating of each of the listed amenities. For instance, if you think that the lighting at the surveyed station is somewhat less bright than the typical stop/station, or has missing spots (shadows), you would mark the lighting quality as "below average (1)".



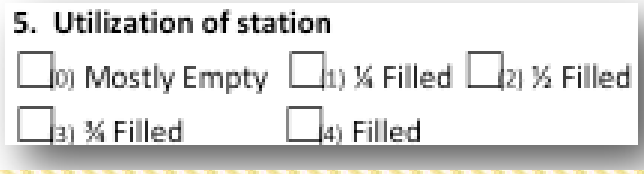
The weather is complex and therefore many conditions may apply to the survey day. You should check every condition that applies to the weather at the stop. You should mark the weather conditions regardless of the stop/station type—even if you are surveying in a fully enclosed subway station, mark the weather.



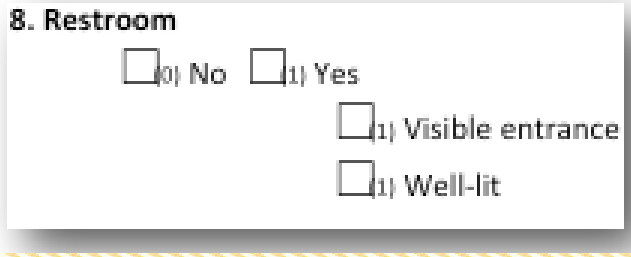
Mark the stop as service only bus, rail or both bus and rail. If you survey at a bus stop adjacent to a rail station, mark "Bus & Rail."

If passengers are loading while the vehicle is partially or fully within a traffic lane, the boarding area is on-street. If the passengers load the vehicle while it is entirely out of the traffic lane, it is off-street.

This question aims to understand how safe the station is and whether there are "eyes" on the riders who waiting for transit.



To what extent is the station being utilized? Are there enough people to fill only one quarter of the station? Is it mostly empty or filled to capacity? Measure this as the ratio of the number of people present to the number of people who could reasonably use the facility safely. If the station is overcrowded, mark it as filled.



If the site has a restroom, does it have a visible entrance from the stop? Is the restroom well-lit?

9. Seating capacity (Check all that apply)

Full-seat (number of standard seats): ____

Half-seat (number of non-standard seats): ____

e.g. flip down, perch lean bar

How are the seats available at the stop or station? Are they full seats where one could comfortably sit down? Or are half-seats available where one cannot fully sit down but lean or rest on a non-traditional seat. Count each of these seating types separately.

10. Services (Check all that apply)

☐ 1) Vending machines ☐ 1) Kiosk (Newspaper, drinks)

☐ 1) Fast food/restaurant with seating

At the stop, are there vending machines or places to purchase newspapers, drinks, and snacks? You should count anything that a waiting passenger could easily access while waiting for the transit vehicle—for instance, a hot dog vendor ten paces from the stop/station should be included in your tally. As long as a passenger could reasonably access the vendor or machine without missing his/her vehicle, you should count it.

11. Shelter (Check all that apply)

☐ 1) From Wind ☐ 1) From Sun ☐ 1) From Rain

At the stop, is there a bus stop or train platform shelter? Does the shelter provide protection from wind, sun, and/or rain?

12. Hidden areas
(Count the number of hiding areas): ____

This question tries to gauge how the perception of safety by measuring the number of hidden areas that might obscure danger from a waiting passenger. Try to approximate the number of areas where someone could hide from the general waiting area.

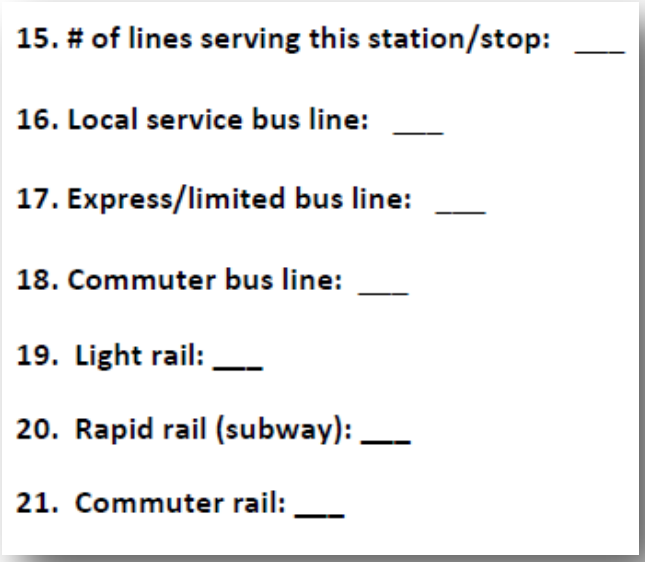
13. Updated Real Time Information (Check one only)

- ☐ [0] None
- ☐ [1] Yes, Arrival Announcement
- ☐ [2] Yes, Digital Display
- ☐ [3] Yes, Arrival Announce. & Digital Display

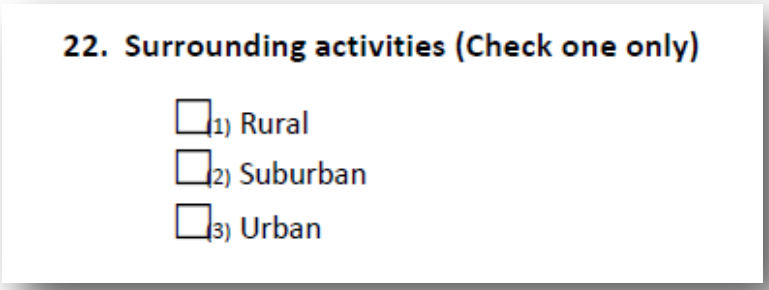
Here, mark the availability of real-time information. An arrival announcement is any real-time message played over a public address system. A digital display is a screen that shows the real-time expected arrival time of the next vehicle. Digital displays that show the scheduled arrival time (i.e. which are not continuously updated to reflect on-time performance) should not be marked here.

Surrounding Area

The following excerpts from the station inventory form include questions about the area(s) surrounding the transit stop or platform where the user survey was conducted. Below we discuss each question and provide detailed instructions on how to complete the inventory.



This question asks how many lines in total serve this one station or stop. #16 asks for the regular, local bus lines. #17 asks you to count the express buses, ones that have limited stops or hours or have signal priority. #18 asks for the number of commuter bus lines or ones that come far distances and have few or no stops in between the origin and destination.



To your best knowledge of the surrounding area land use types and density, choose either rural, suburban or urban as the location type.

23. Transfer facility type

- ☐ (1) Level 1 – Local stop
- ☐ (2) Level 2 – Stop separated from traffic serving multiple routes
- ☐ (3) Level 3 – Off-street stop with multiple loading or raised platforms
- ☐ (4) Level 4 – Grade separated multi-modal station with parking facilities
- ☐ (5) Level 5 – Multi-modal hub with capital intensive passenger amenities

The two sides of the spectrum: Level 1 would be a bus sign post on the sidewalk of a street whereas Level 5 would be a major transportation hub with multiple modes like Union Station in Los Angeles. Determine where this station or stop is in relation to the two most extreme levels.

24. Pedestrian accessibility

- ☐ (1) Below Average
- ☐ (2) Average
- ☐ (3) Above Average

This question asks you to rate the Pedestrian Accessibility of the area surrounding the station. Are there small blocks? Shaded walkways? Is it under a freeway?

25. Pedestrian linkage to street

- ☐ (1) Below Average
- ☐ (2) Average
- ☐ (3) Above Average

How does the surrounding area connect pedestrians to the street? Are there clean, well-lit walkways or stairs to the street? Or is it difficult to find your way to the street?

26. Linkage to Connecting Bus/Train (Check all that apply)

- ☐ (1) Stairway
- ☐ (2) Underpass
- ☐ (3) Overpass
- ☐ (4) Access to Sidewalk
- ☐ (5) Elevator/Escalator
- ☐ (6) Other

Choose each possible path to get from the street to the transit vehicle.

27. Utilization of parking lot

- ☐ (0) Mostly Empty
- ☐ (1) ¼ Filled
- ☐ (2) ½ Filled
- ☐ (3) ¾ Filled
- ☐ (4) Filled

This question asks you to approximate the occupancy of the parking lot. Choose the closest filled capacity from Mostly Empty to Filled.

28. Park & Ride

- ☐ (0) No
- ☐ (1) Yes, # of spaces ___

If there is a Park & Ride available, list the number of parking spaces available in the lot. Stations are considered to have Park and Ride facilities whenever parking is available that is specifically intended for transit riders at that station. The parking may be provided by the public sector or by private entrepreneurs or other entities.

29. Approximate distance of Park & Ride from platform (in walking minutes): _____

Choose a central location in the Park & Ride and calculate its walking distance in minutes from the stop or station.

2. DATA ENTRY AND UPLOAD

Once you have successfully completed the fieldwork with at least 30-100 user surveys and one station/stop inventory form completed for each stop/station, you are ready to enter and upload your survey data.

2.1. ENTERING THE DATA

To begin entering the data you've collected, open the file, "Transit Survey Database,' which you downloaded at the start of this project. If you did not download the file previously, you may download it by clicking on the website tab, "DOWNLOAD TOOLKIT." This file is an Access database with forms for inputting data, and will serve as the "vehicle" in which you will place your data and later upload to the TASC website.

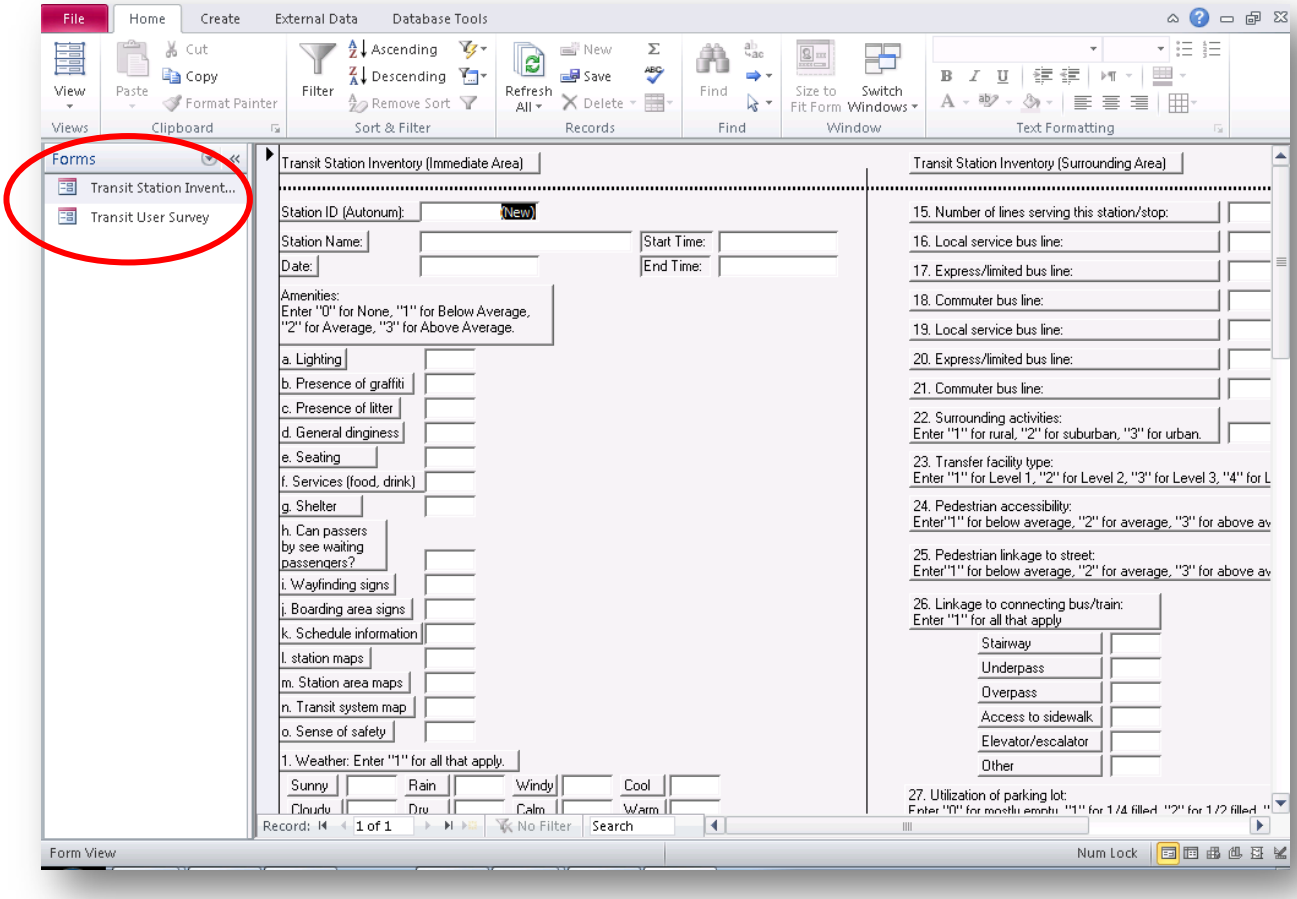
The Access database is stored on your local hard drive, and you will enter your survey and inventory data using the two forms available (see the screenshot below). The red circles show where you should look to identify the forms you'll be using to enter your data. Double click on the form names to access the forms (shown in the screenshot below is the form for the station inventory data entry – where you will start first).

REMEMBER! For every set of user surveys (i.e. a stack of user surveys collected for each station) that you enter, you will also enter the data from one transit inventory form for that same station. It's very important that you enter the inventory and all surveys one station before beginning another station.

ALWAYS enter the station inventory BEFORE the user surveys.

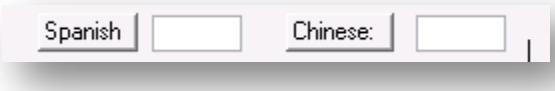
Notice that the the form is designed to closely approximate the order and position of each survey question as they are configured on the paper survey. This should help with data entry, by providing some visual cues as the data entry personnel refers to the paper survey and inputs the survey responses.

ALWAYS start first with each station inventory form followed by all user surveys for each station before proceeding to the next station.

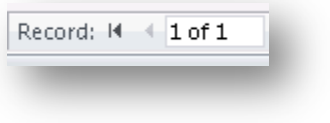


Enter all the data from the transit inventory form, scrolling down and across the Access form as necessary. To enter data quickly, you can use the keyboard "TAB" key to move from one field to the next. Once you are finished with entering the data for the station's inventory, hit "ENTER" and the data will be saved.

Next, double click on the "TRANSIT USER SURVEY" button on the left of the scree (circled above) to access the transit user survey, and begin entering data from the user survey sheets. If the survey was conducted in Spanish or Chinese, type a "1" in the appropriate box (top of the form); if the survey was conducted in English, leave both boxes blank:



Next, continue to enter responses into the form, scrolling down as necessary. Again, to enter data quickly, you can use the keyboard "TAB" button to move from one field to the next. Once you are finished with entering data for one survey, hit "ENTER" and the data will be saved. You can then continue to the next survey. Look at the record indicator in the lower left corner of the screen to see how many records you have entered. You can also move backwards and forwards through your records to check the data and/or make any corrections:



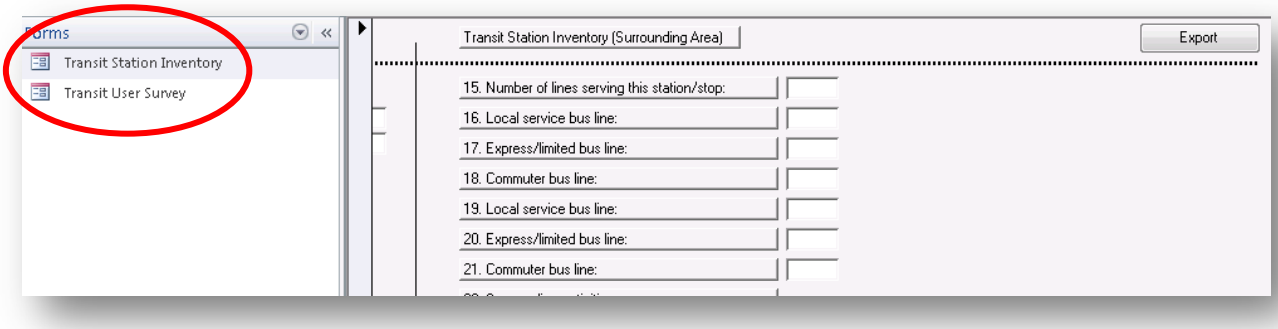
After you have finished entering the inventory data and the surveys for one station, return to the inventory form (red circle above) and enter the inventory data followed by the surveys for the next station. ***It is extremely important that you enter for each station one inventory form followed by multiple user surveys, in that order. You must complete this set for one station before moving to the next.***

2.2. SAVING THE DATA

As you continue to enter data, periodically save your work. Save the Access database to your local computer. Of course, it helps to remember where you save it, and to give the file an appropriate name. Should you need to stop work and return to it later, you may do so by opening the file and resuming data entry.

2.3. EXPORTING AND UPLOADING THE DATA

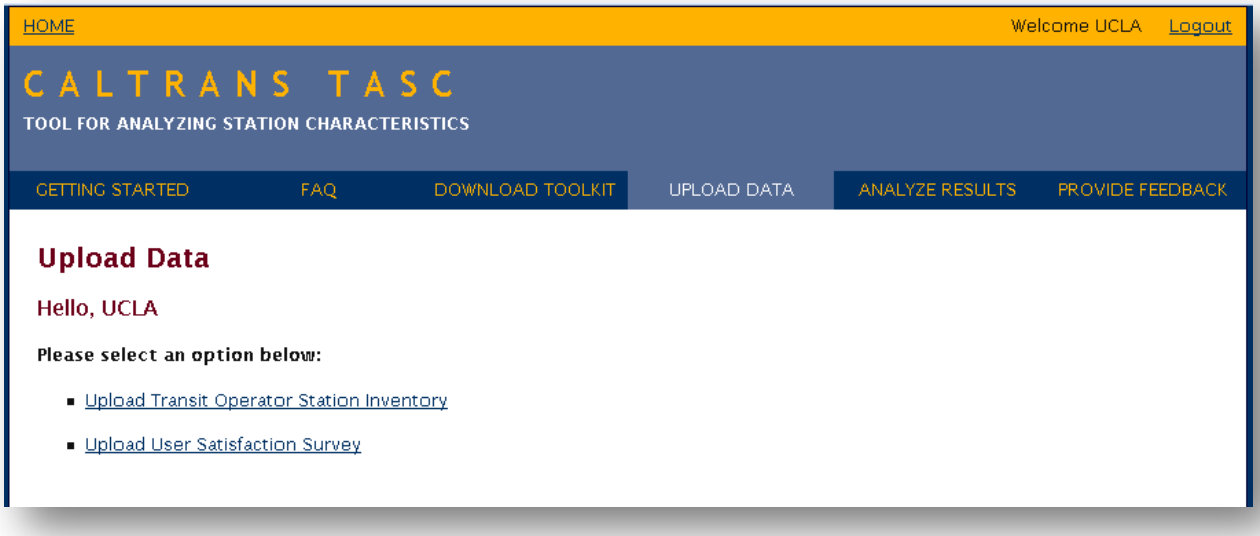
At this point, you have completed all data entry, and have saved the database on your local computer. The next step is to export the data into a format so that it can be uploaded to the TASC website. In the upper right corner of each of the two forms (inventory and user surveys), there is a button, "EXPORT." By clicking this button, you'll be asked to export all of the data in Access to an Excel format.



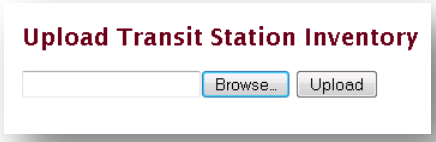
When prompted for where to save the exported data, save the Excel file to your local computer. This will be the file you will upload to the TASC website in the next steps.

To upload your Excel file to the TASC website, log in with your user identification and password. Once logged in, click on the tab, "UPLOAD DATA."

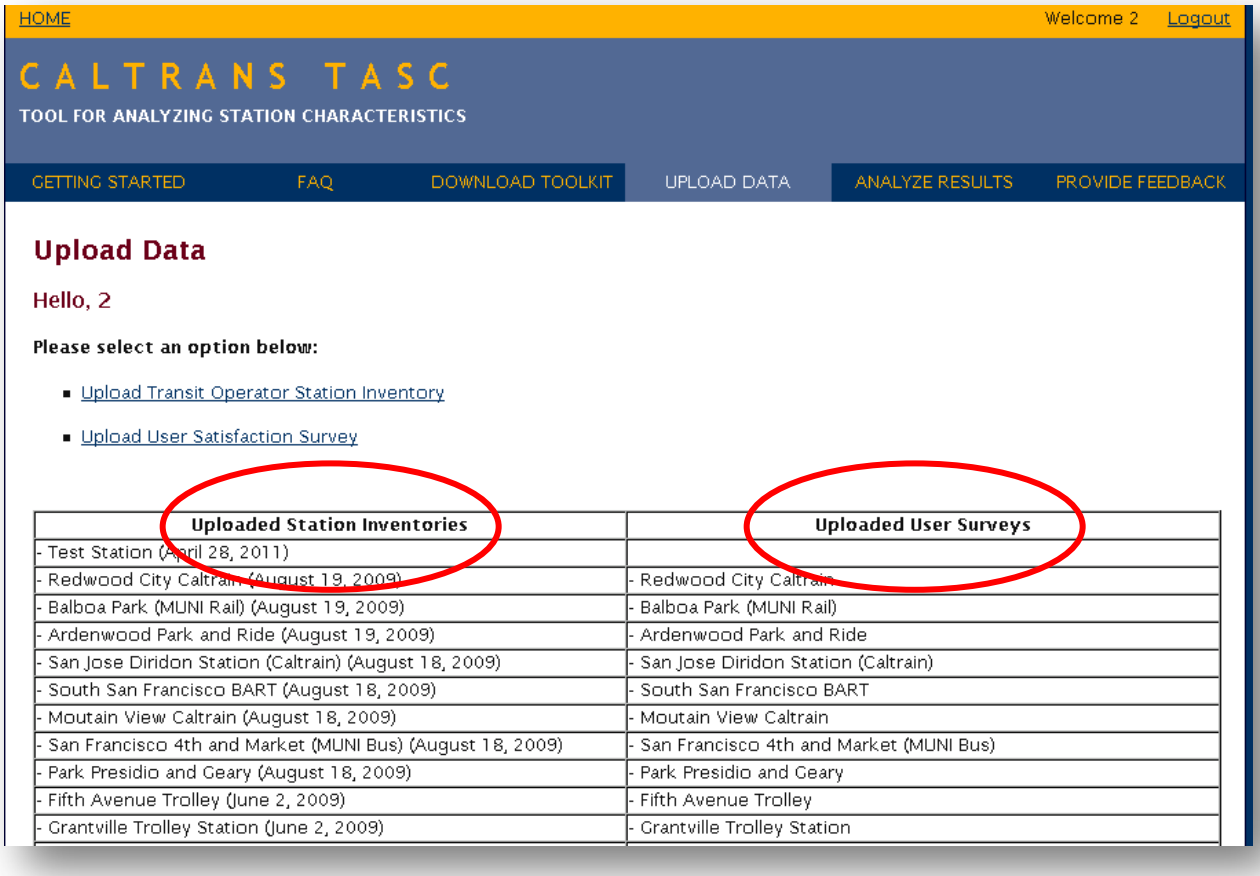
There, you will see the following screen, which provides options to upload your station inventory data, and your user satisfaction survey data.



By clicking on either link you will be taken to a page prompting you to browse your directory for the file to upload. Repeat this process for each of your station inventory and user survey files.



Each time you upload your files, you will receive a confirmation message and will also see the file listed on the UPLOAD DATA screen. Note that for each station, you should have one uploaded station inventory, and one uploaded user survey, as you see below.

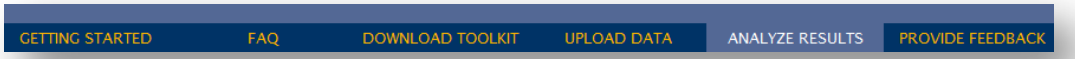


Once you have uploaded all of your files, you are ready to begin analysis!

3. DATA ANALYSIS AND INTERPRETATION

3.1. ANALYZING RESULTS

Now that you have entered the data (user surveys and station inventories), you are ready to analyze your results! To begin, click on ANALYZE RESULTS in the navigation bar at the top of the website. If you are not already logged in to the system, you will be prompted for your username and password.

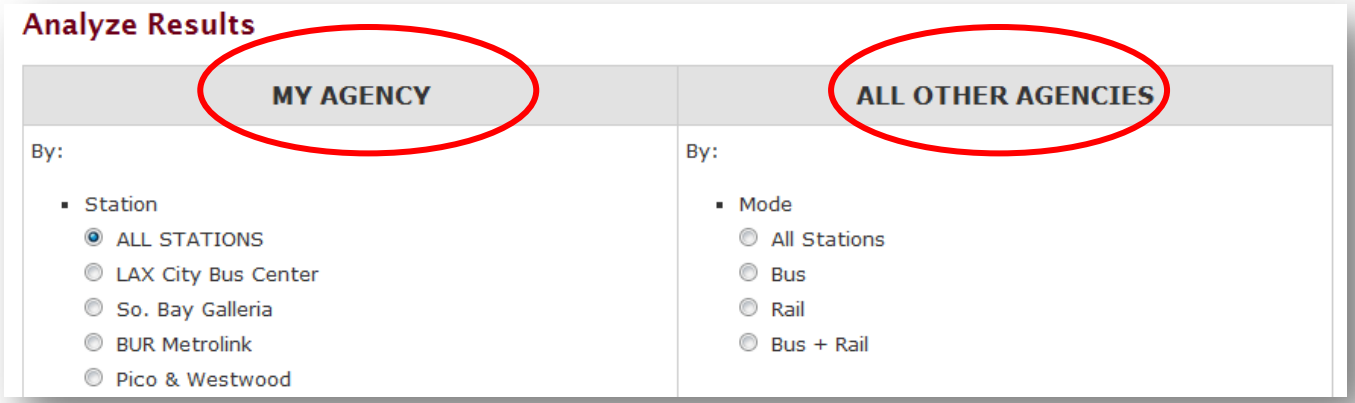


3.1.1. CREATING THE REPORT

Once you have clicked on this tab, you will be presented with a menu of options and filters for creating reports. You can create reports for individual stations, or for all stations served by a specific mode, or for specific user groups at stations.

Remember that you can analyze data for individual stations—or for specific user groups (e.g. all women surveyed) or station types (e.g. all rail stations surveyed).

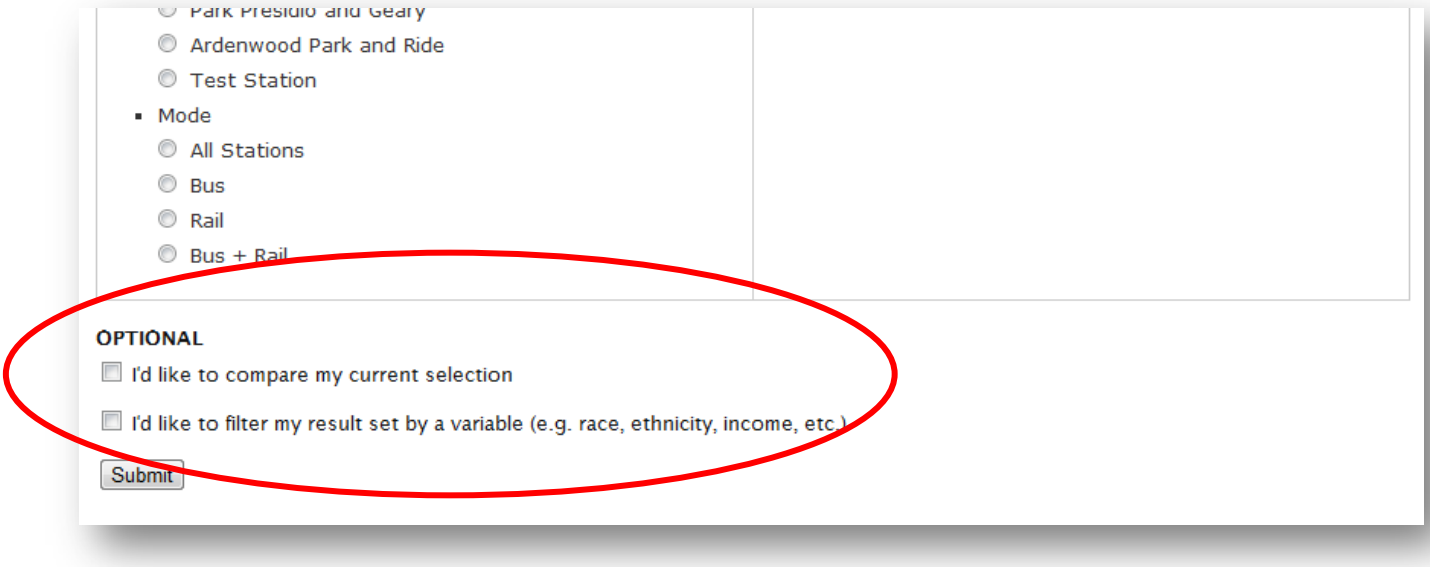
In the left-hand column, you are presented with a list of stops/stations for which you have collected and entered data previously. In the example below, you see some example stops/stations from the Los Angeles metro area. You could simply select one of these stations (say, the LAX City Bus Center) and view a report for that bus facility. As you will see below, however, the TASC website gives you considerable flexibility in creating reports for specific user groups.



Notice, too that the right-hand column allows you to produce reports for all other agencies' data. (Don't worry—all data are kept confidential, and these reports are presented only in aggregate form with no geographic identifiers). These reports can be very helpful when you want to compare how your stops/stations measure up against other agencies' stops and stations in terms of overall user satisfaction with specific amenities. Notice, too, that you can create reports for all other agencies' bus-only, rail-only, or bus-and-rail facilities.

Comparing your stations' results to those from other agencies can give you a sense of how your agency's stops/stations differ systematically from typical stops/stations at other agencies.

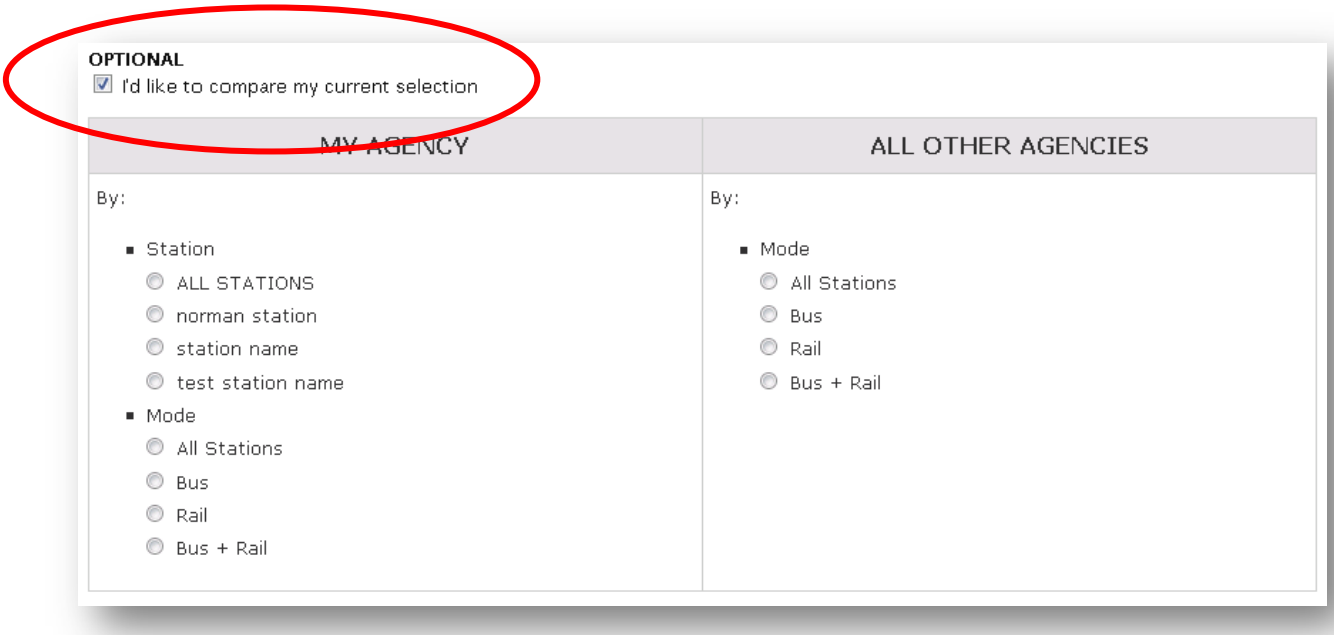
At the bottom of that same page, you will find a few other important options. At the bottom of the left-hand column, you can choose to create reports for all of *your agency's* stations that of a particular station type (bus; rail; or bus and rail). This can be helpful if you want to see how users' experiences at specific types of stops/stations compare with users' experiences at other stops/stations.



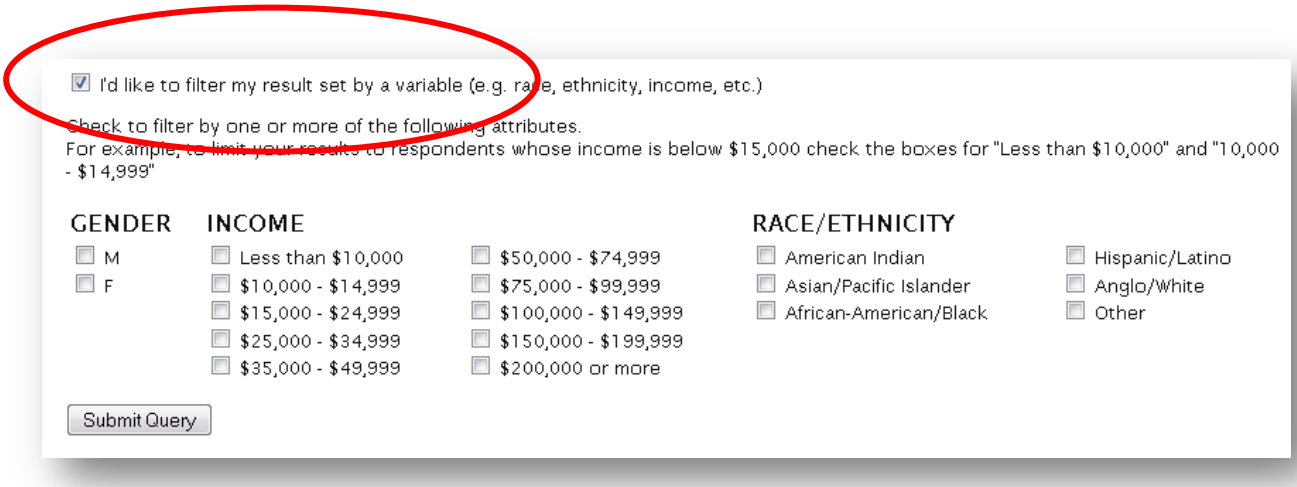
Importantly, the bottom of this webpage also provides you with two "optional" checkboxes that, when checked, allow you to further specify your reports:

- **Compare my current selection:** The first checkbox allows you to compare two sets of results to one another—for example, two of your own stations, or one of your rail stations and all other rail stations in the database, or even the same station at two different points in time (for instance, if you collected data before and after adding amenities to the stop/station.) When

you click this checkbox, a second list of stops/stations will descend below the checkbox, allowing you to select another station (or station type) for which you would to produce results. The specific results of this type of comparison analysis will be discussed below in section 2.2.2. "Interpreting Results."



- **Filter my result set by a variable:** By clicking this checkbox, TASC allows you to conduct analysis on specific populations or subsets of your observations. For example, you can run an analysis that includes only men or women, only specified race/ethnicity groups, or by income level, etc.



3.1.2. INTERPRETING RESULTS

There are a couple of different types of reports that you can generate using the TASC website. The main output of the system is the Importance-Satisfaction Table, or *I-S Table*. This chart provides you with information about how your users rated both the *importance* and their level of *satisfaction* with each of the amenities listed on the user survey.

Number of Respondents: 1965

Filters Applied: NONE

			My Agency By Mode: All Stations			
			IMP.		SAT.	
Code	Question on the Survey	Category	Rating	Rank	Rating	Rank
A1	This station/stop area is clean	Amenities	54%	13	80%	5
A2	There are enough places to sit	Amenities	45%	15	62%	14
A3	There are places for me to buy food or drinks nearby	Amenities	29%	16	65%	12
A4	There is a public restroom nearby	Amenities	51%	14	40%	16
A5	There is shelter here to protect me from the sun or rain	Amenities	58%	10	67%	11
I1	The signs here are helpful	Information	59%	9	81%	4
I2	It is easy to get schedule and route information at this station	Information	60%	8	73%	9
AC1	It's easy to find my stop or platform	Access	65%	6	89%	3
AC2	It is easy to get around this station/stop	Access	54%	12	90%	2
CR1	I usually have a short wait to catch my bus/train	Connection & Reliability	66%	5	73%	10
CR2	My bus/train is usually on time	Connection & Reliability	76%	1	76%	7
SS1	I feel safe here during the day	Security & Safety	74%	3	90%	1
SS2	I feel safe here at night	Security & Safety	75%	2	63%	13
SS3	There is a way for me to get help in an emergency	Security & Safety	68%	4	58%	15
SS4	This station is well lit at night	Security & Safety	65%	7	74%	8
SS5	Having security guards here makes me feel safer	Security & Safety	56%	11	76%	6
O1	This is an easy place to transfer to another bus or train	Overall	63%		89%	
O2	Overall, I am satisfied with this stop/station	Overall	60%		87%	

The percentages listed for each question listed on the survey indicates the percentage of respondents who identified that particular attribute as falling into one of the two highest categories for importance and satisfaction. Those categories are *somewhat important* and *very important* for the importance rating, and *somewhat satisfied* and *very satisfied* for the satisfaction rating.

In the table above, for example, you can observe that 54% of 1,965 respondents rated cleanliness as being either somewhat or very important.

A far greater share of respondents—80%—stated that they were either somewhat or very satisfied with the cleanliness of the stop/station where they were waiting.

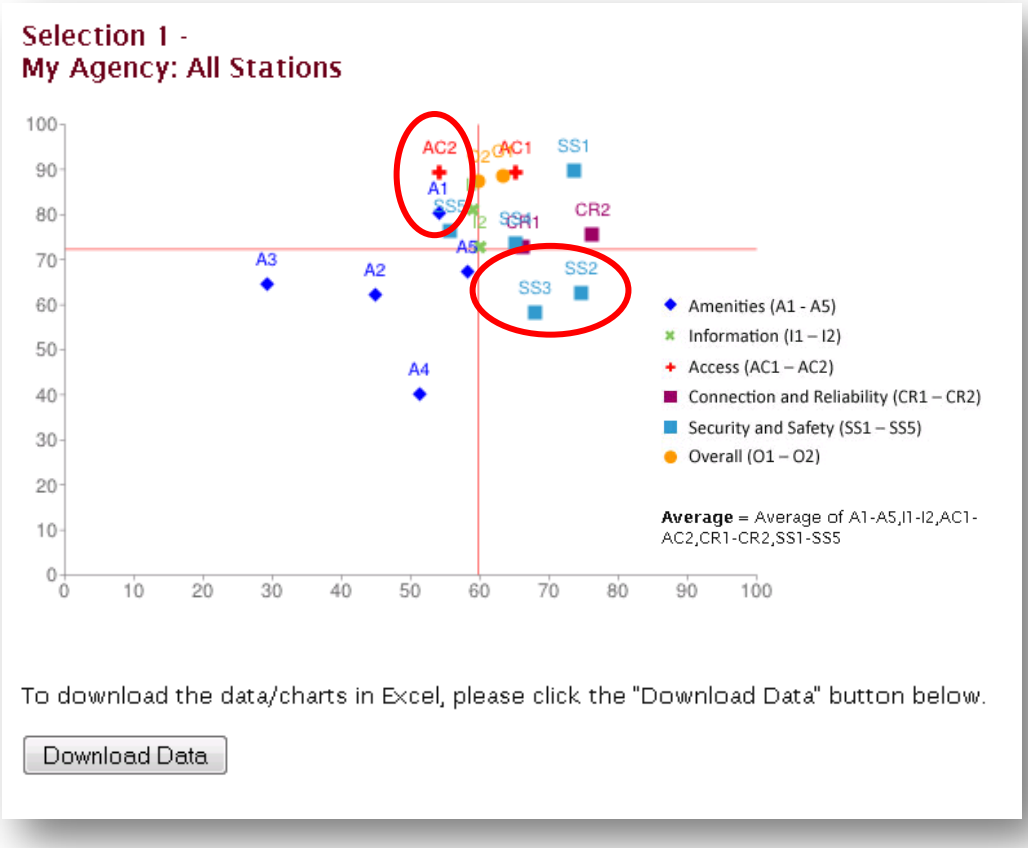
This means that cleanliness is something that our users are generally satisfied with—and something that is generally less imperative to them than other attributes, such as on-time performance.

In addition to the I-S Table, the TASC website produces a graphical representation of the data called the I-S Chart. This chart simply plots the percentage values of the importance and satisfaction ratings for each of the sixteen stop/station attributes (cleanliness, on-time performance, etc).

You'll note that the chart is divided into four quadrants. These quadrants are defined by the average values of importance and satisfaction for all of the attributes. Thus, if an attribute is above the horizontal line, users expressed an above-average level of satisfaction with that attribute. Similarly, if the attribute falls to the right of the vertical line, this means that users attributed an above-average level of importance to that attribute.

Each of these four quadrants, therefore, can be thought of as having a unique meaning:

- **Exceeding Expectations:** Beginning in the top-left quadrant, we find attributes that have above-average levels of satisfaction, but below-average levels of importance—i.e. these are attributes that are not enormously important to the station's users, and where these attributes are quite satisfactory (at least in comparison to the other attributes). Thus, the quadrant bears the label *Exceeding Expectations*.
- **Continue Improvement:** The top-right quadrant contains those attributes that are very important, and where users are generally satisfied with the quality of the attribute.
- **Needs Improvement:** These attributes perhaps require they agency's most immediate attention at the stop/station. Users find the attributes in this quadrant to fall below their expectations, and they also consider the attributes to be very important. This is a strong indication of the need to improve these attributes in order to increase overall user satisfaction with the stop/station.
- **Less Important:** Users have indicated that they find these attributes to have a below-average level of importance, and they also have a below-average level of satisfaction with the performance of these attributes. These attributes should perhaps be addressed following those in the "Needs Improvement" category.

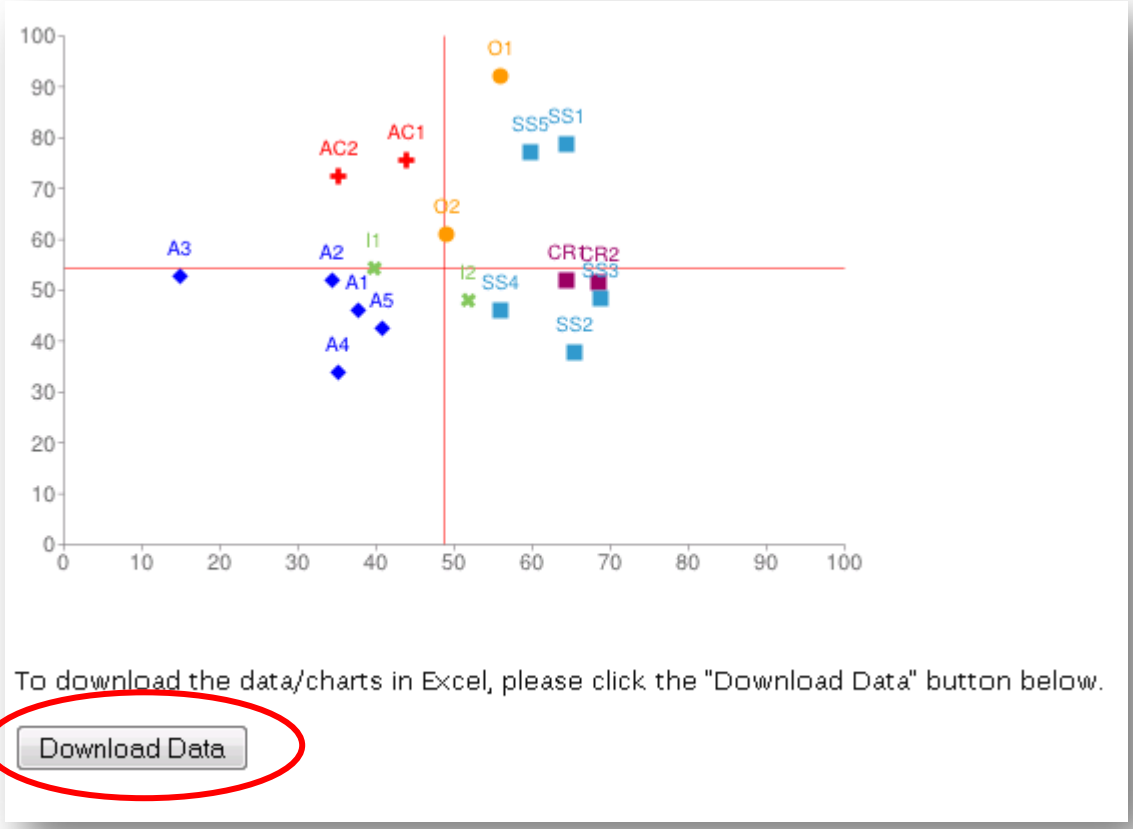


For example, the screenshot above of an IS analysis would be interpreted in the following way: Items SS3 (a way to get help) and SS2 (safety at night) rank very high in terms of importance, and yet riders reported low levels of satisfaction. The agency could dramatically improve rider satisfaction by improving safety at these stations.

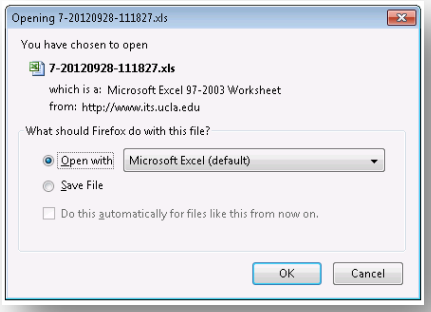
On the other hand, attributes like AC2 (navigability of the station/stop) and A1 (cleanliness of the station/stop) are exceeding riders' expectations, so improving these attributes may not bring much additional satisfaction among riders.

3.1.3. DOWNLOADING RESULTS

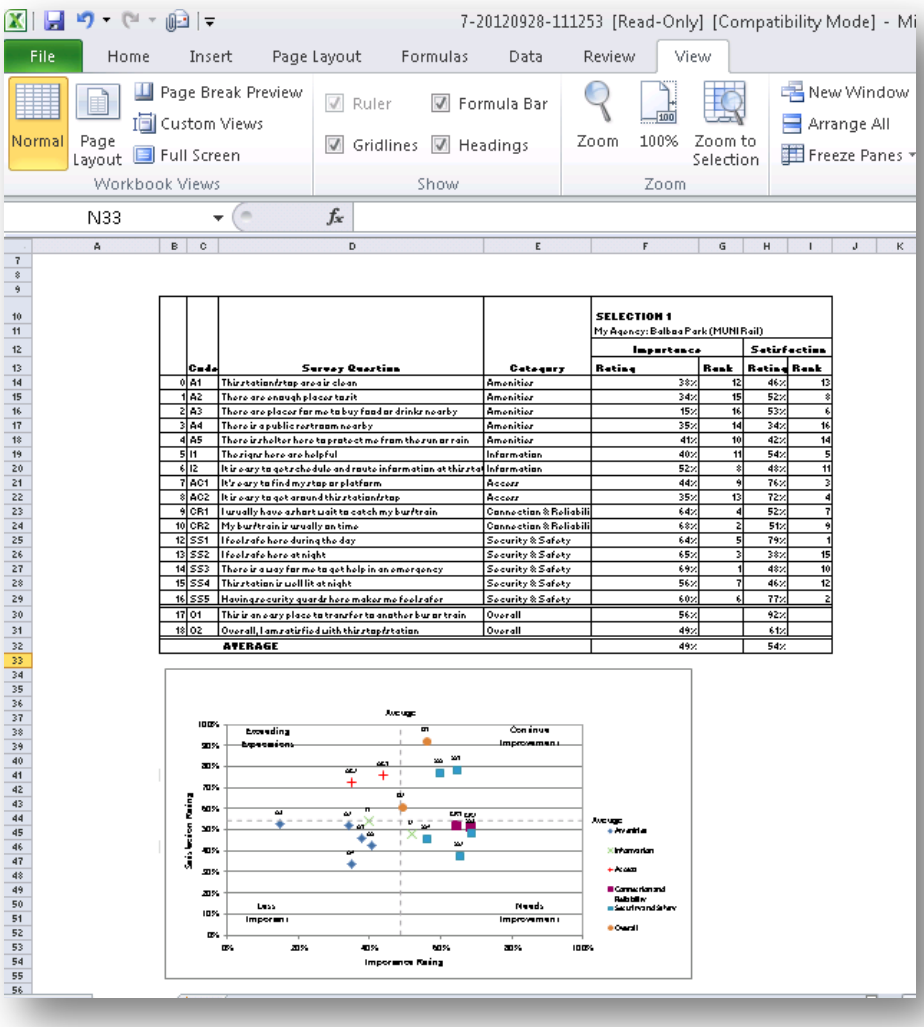
Note also that in addition to receiving these analyses from your online queries, you can also download the IS charts and graphs. This may be useful for inclusion in any agency reports or documents. To download the IS chart and graph, click on the DOWNLOAD DATA button below any IS analysis output:



After clicking DOWNLOAD DATA, you'll be prompted to specify how you would like to open and/or save the file. Select EXCEL:

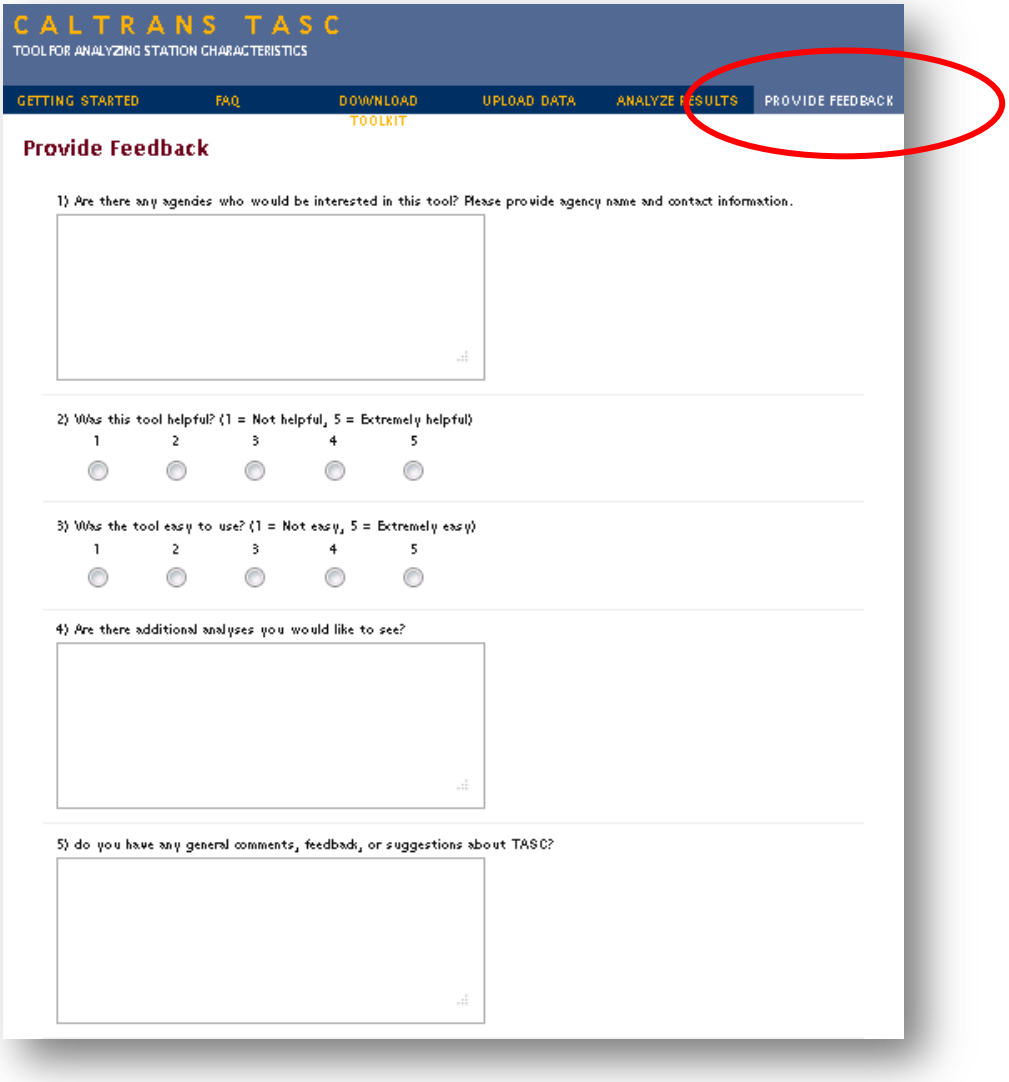


TASC will then produce an Excel spreadsheet that contains both the IS chart and the IS graph, as seen below. The tables and chart can be reformatted as necessary and inserted into other documents, reports, or correspondence.



4. FEEDBACK AND TECHNICAL SUPPORT

We welcome your feedback about the use of this online tool for assessing your station characteristics, and encourage you to click on the website tab, "PROVIDE FEEDBACK." There, you will find a brief survey with five open-ended and multiple choice questions about your satisfaction with this tool.



Should you wish to contact the researchers with questions or need technical support, you may email us at TASC@publicaffairs.ucla.edu, or by calling (424) 442-0046.

Appendix B: Survey Instrument

UCLA Transportation Survey - Tell us what you think!

UCLA researchers are assisting the State of California in improving transportation services. Part of this work includes asking people like you about your views on bus stops, train stations, and the like. This survey should take only a couple of minutes to complete and is completely voluntary. You are under no obligation to take this survey, or even to complete it once you have started. Further, the survey is anonymous and no individuals will be identified in any of the work produced from this research. Are you willing to participate in this survey?

_____ YES _____ NO

		Do you agree or disagree?				How important is it to you?			
		Strongly Agree 4	Agree Somewhat 3	Disagree Somewhat 2	Strongly Disagree 1	Very Important 4	Important 3	Somewhat Important 2	Not Important 1
A	This station / stop area is clean.								
B	There are enough places to sit.								
C	There are places for me to buy food or drinks nearby.								
D	There is a public restroom nearby.								
E	There is shelter here to protect me from the sun or rain.								
F	The signs here are helpful.								
G	It's easy to find my stop or platform								
H	I usually have a short wait to catch my bus / train.								
I	My bus / train is usually on time.								
J	It is easy to get schedule and route information at this station.								
K	It is easy to get around this station / stop.								
L	I feel safe here during the day.								
M	I feel safe here at night.								
N	There is a way for me to get help in an emergency.								
O	This station is well lit at night.								
P	Having security guards here makes me feel safer.								
Q	This is an easy place to transfer to another bus or train.								
Q	Overall, I am satisfied with this stop / station.								

1. **How many days in a typical week do you ride a bus, train, or subway?**
   _____ days per week
   ☐ less than once a week

2. **What is the purpose of your trip today?**
   (check all that apply)
   ☐ (1) work or job
   ☐ (2) shopping or errands
   ☐ (3) college or school
   ☐ (4) visiting family or friends
   ☐ (5) other: _____

3. **How often do you make *this* trip?**
   ☐ (1) regularly
   ☐ (2) sometimes
   ☐ (3) not often
   ☐ (4) never before

4. **Could you have made this trip today by car / truck / motorcycle instead of by bus / train?**
   ☐ (1) yes, easily
   ☐ (2) yes, with a little effort
   ☐ (3) no, probably not
   ☐ (4) no, definitely not

5. **How did you get to this station / stop today?**
   ☐ (1) bus or train
   ☐ (2) drove in a car by myself
   ☐ (3) got a ride from someone else
   ☐ (4) took a taxi or shuttle / van
   ☐ (5) rode a bicycle
   ☐ (6) walked _____ minutes
   ☐ (7) other: _____

6. **From this station / stop, how will you reach your next destination?**
   ☐ (1) bus or train
   ☐ (2) drive in a car by myself
   ☐ (3) get a ride from someone else
   ☐ (4) take a taxi or shuttle / van
   ☐ (5) ride a bicycle
   ☐ (6) walk _____ minutes
   ☐ (7) other: _____

7. **How long have you been waiting at this stop / station?**
   _____ minutes ☐ don't need to wait ☐ unsure

   And how much *longer* do you expect to wait before leaving?
   _____ minutes ☐ don't need to wait ☐ unsure

8. **Would you have preferred to make this trip by car / truck / motorcycle rather than by bus / train?**
   ☐ (1) I strongly prefer car / truck / motorcycle
   ☐ (2) I usually prefer car / truck / motorcycle
   ☐ (3) I usually prefer bus / train
   ☐ (4) I strongly prefer bus / train

9. **Are you:** ☐ (1) male ☐ (2) female

10. **What is your background?** *(check all that apply)*
    ☐ (1) American Indian ☐ (4) Hispanic / Latino
    ☐ (2) Asian / Pacific Islander ☐ (5) Anglo / White
    ☐ (3) African-American / Black ☐ (6) other: _____

11. **In what year were you born?** 1 9 ___ ___

12. **About how much is your yearly household income?**
    ☐ (1) Less than $10,000 ☐ (6) $50,000 - $74,999
    ☐ (2) $10,000 - $14,999 ☐ (7) $75,000 - $99,999
    ☐ (3) $15,000 - $24,999 ☐ (8) $100,000 - $149,999
    ☐ (4) $25,000 - $34,999 ☐ (9) $150,000 - $199,999
    ☐ (5) $35,000 - $49,999 ☐ (10) $200,000 or more
    ☐ (11) unsure / don't know

Thanks for helping us improve public transit!

Appendix C: Presentation to the American Planning Association 2012 Annual Meeting, Long Beach, CA

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TOOL FOR ANALYZING STATION CHARACTERISTICS

UCLA

American Planning Association Annual Conference
Los Angeles, CA
April 14, 2012

Norman Wong
Manager, Spatial Analysis Group
UCLA Institute of Transportation Studies
UCLA Lewis Center

Allison Yoh, Ph.D.
Associate Director
UCLA Institute of Transportation Studies
UCLA Lewis Center

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About the project

- Transit agencies can do a lot toward improving rider experiences by focusing on the wait environments
- What service quality changes or station/stop features are most important to rider satisfaction?
- How do you prioritize these needs?

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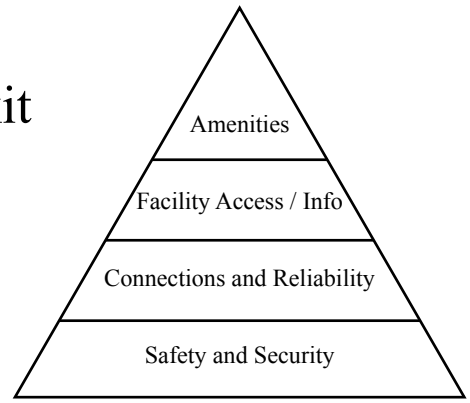
About the project (cont.)

- Determine *relative* importance of various features
- Created an on-line toolkit



Nice to Have
(less important)

Fundamental Needs
(more important)

Objectives of this workshop

- What is TASC?
- What can it do for your agency?
- How do you access and use TASC?
- What are TASC applications and functions?
  - Questions that TASC can help you answer

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What is TASC?

- Tool for Assessing Station Characteristics
- Online web-based tool
- Designed by UCLA researchers; funded by Caltrans
- Assess performance of transit stops and stations based on satisfaction *and* importance
- Not just a checklist of improvements needed
- Uses community-based data
- Scalable

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The basics of fieldwork

- Selecting your site(s)


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The basics of fieldwork

- Assembling a team
  - 2-3 surveyors per platform or waiting area (adjustable)
  - 1 worker ~ 4 surveys in a 5-10 minute period
  - Language considerations
  - Consistency/training




The basics of fieldwork (cont.)

- Administering the user surveys
  - Business casual / orange safety vests / clearly visible ID
  - Divide and assign areas for surveyors
  - Wait for passengers to "settle" before approaching
  - Responses for **this station**, **at this time**
  - Thank them if they decline, walk away
  - CONSISTENCY-CONSISTENCY-CONSISTENCY
  - Collect 30-100 surveys per station/stop

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The basics of fieldwork (cont.)

- Taking inventory of the station/stop
  - Given your knowledge of all stations/stops in your system, consider what is "average" condition
  - Rate attributes for the survey site based on this

- Tips and what worked / what didn't
  - "…help improve transit"
  - "…has someone approached you about taking a survey?"
  - "…5 minutes to complete. If your vehicle arrives, just leave the clipboard/pen on the floor."

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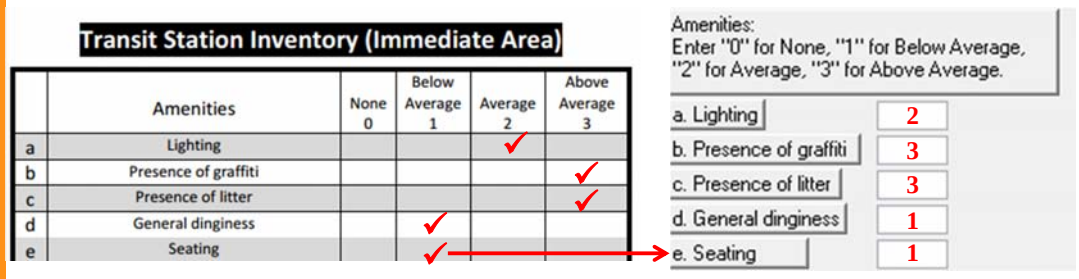
Data Entry

Paper Form

MS Access Form



Transit Station Inventory (Immediate Area)

	Amenities	None 0	Below Average 1	Average 2	Above Average 3
a	Lighting			✓	
b	Presence of graffiti				✓
c	Presence of litter				✓
d	General dinginess		✓		
e	Seating		✓		

Amenities:
Enter "0" for None, "1" for Below Average, "2" for Average, "3" for Above Average.

a. Lighting	2
b. Presence of graffiti	3
c. Presence of litter	3
d. General dinginess	1
e. Seating	1

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Scenario 1

- "What should I do to improve the waiting experience at 4th and Market Street?"
  - Analyzing a single station

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Scenario 2

- "What should I do to improve the waiting experience at 4th and Market Street…
- …for women users?"
  - Analyzing a single station with filter

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Scenario 3

- How does the 4th & Market stop compare to…
  - Another stop/station in my system?
  - A subset of stations in my system?
    - e.g. All other bus stops, other rail stations
  - The stops/stations of other agencies? (demo)
  - Itself, before and after improvements?

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Acknowledgements

- This research was funded by the California Department of Transportation (Caltrans)
- Other researchers
  - Brian D. Taylor, Professor of Urban Planning, UCLA
  - Michael Smart, Postdoctoral Scholar, UCLA
  - Hiroyuki Iseki, Associate Professor, University of Maryland, College Park
  - Mark Miller, Partners for Advanced Transit and Highways, UC Berkeley

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Acknowledgements cont.

- Former UCLA Graduate Student Researchers
  - Celestine Do
  - Alexis Lantz
  - Adina Ringler
  - Chandini Singh
  - Ting Sit

Thanks to the many transit agencies who allowed us to survey their riders…and of course, the survey respondents

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Questions?

Feedback?

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To access TASC:

www.its.ucla.edu/TASC

For more information:

Norman Wong	Allison Yoh, Ph.D.
310.825.8886	310.487.6598
wongn@publicaffairs.ucla.edu	ayoh@publicaffairs.ucla.edu

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