CHAPTER TWO

LITERATURE REVIEW

The literature review revealed that a considerable number of reports, papers, articles, and press releases have been written about methods of communicating with riders. The literature can be divided into two major categories: (1) research describing the information needs of riders and (2) approaches to customer communication being used by transit agencies, and market research conducted by transit agencies that reflect customer perceptions of communications. All documentation reviewed for the synthesis is cited in the References and Bibliography.

RIDERS' COMMUNICATION NEEDS

There was a wealth of information from the literature describing riders' needs for communication. The following seven key pieces of literature covered this topic extensively and are detailed in this chapter:

- The Ministry of Transport and Communications (Finland), *Guide for Improving the User-Friendliness of Information Services of Public Transport* (*1*).
- *TCRP Report 45: Passenger Information Services: A Guidebook for Transit Systems* (*2*).
- *TCRP Research Results Digest 5: Electronic On-Vehicle Passenger Information Displays* (*Visual and Audible*) (*3*).
- *Customer Preferences for Transit ATIS*, prepared for FTA (*4*).
- *Traveller Information Systems Research: A Review and Recommendations for Transport Direct* (*5*).
- "Public Transport Information Web Sites: How To Get It Right" (*6*).
- Metro (in Leeds, United Kingdom), "Information Strategy 2006" (*7*).

All of this literature describes the customers' needs for communication, including types of information, format and media for dissemination, and frequency. Understanding these needs is critical to identifying the most effective methods of communication.

Finland's Ministry of Transport and Communications documented information that is directly relevant to this synthesis. In its *Guide for Improving the User-Friendliness of Information Services of Public Transport* (*1*), the Ministry recognizes the relationship between providing quality information and the riders' perception of public transportation services. "The use of public transport information increases alongside of the general growth of mobility. Thus, the usability of information will be more and more significant in enhancing the attractiveness of public transport" (*1*, p. 11). The *Guide* covers the nature and distribution of information, effectiveness of communication (called "criteria for information" in this report), and the travel and information chains in a trip (see Figure 1). The criteria for information were identified as clarity, conciseness, reliability, timeliness, repeatability, consistency, and prioritization.

As part of the *Guide*, "Good Practice Cards" were developed that provide the best practices for specific rider communications. Sixteen cards were developed (see Appendix C), corresponding to information that should be provided throughout an entire trip (see the trip chain in Figure 1). For example, there is a card for Electronic Displays on Bus Stops that provides guidance with regard to the technology, location, design, placement, contents of the information, and recommendations regarding the text field.

The other cards were developed for:

- Advance Information—travel information available by telephone, short message service (SMS), or on the Internet.
- Personal Service—service needed to complement other forms of public transport information.
- Info Kiosks—interactive computer terminals for providing information.
- On-Board Displays in Public Transport Vehicles—informing passengers along the various stages of their journey.
- Fixed Information in Public Transport Vehicles—facilitates finding the right vehicles and services during a trip.
- Information Signs—assisting passengers in finding their way in terminals and other areas.
- Hearing Disabilities and Public Transport Information + Acoustics—visual information for those who are hearing impaired.
- Mobility Disabilities and Public Transport Information—information on the accessibility of public transport.
- Park & Ride—information for those who cannot walk to a station or stop.
- Visual Disabilities and Public Transport Information + Tactile Information—audible information for visually impaired individuals.

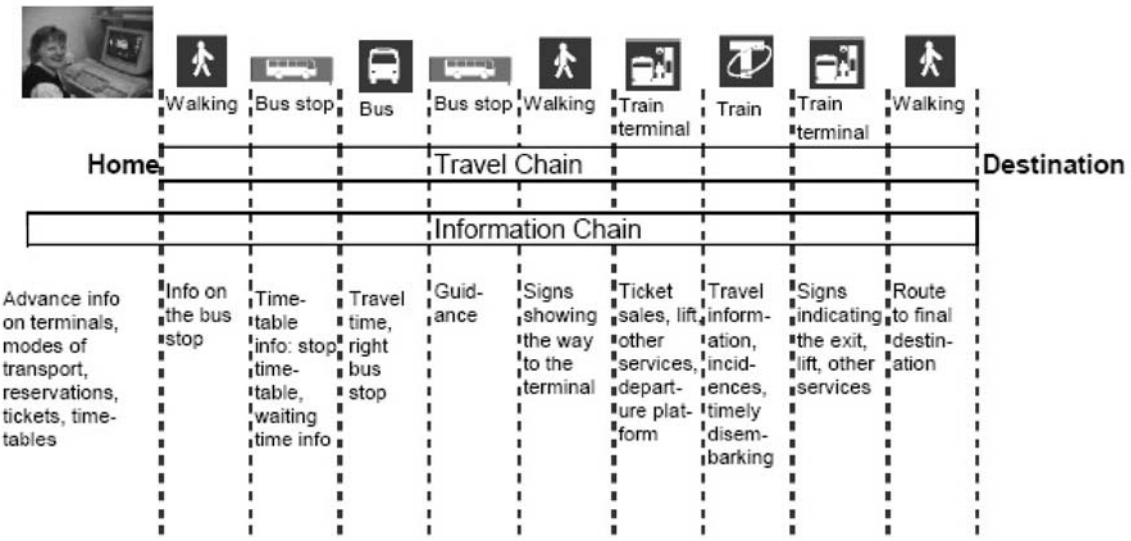

FIGURE 1 Example of information needs during a journey.

- Phone Services + Mobile Phone and Wireless Application Protocol (WAP)—a variety of travel information accessible by telephone.
- Fixed Information on Stops—information on routes and schedules, and other fixed information.
- Fixed Information in Terminals—essential travel information, such as way-finding and information on auxiliary services.
- Real-Time Information in Terminals—real-time arrival and departure information to customers.
- Websites—up-to-date information by means of the Internet on a variety of public transport and related services.

In *TCRP Report 45: Passenger Information Services: A Guidebook for Transit Services* (*2*), pre-trip information needs were identified as consisting of the following elements:

- Location of the nearest bus stop,
- Routes that travel to the desired destination and transfer locations,
- Fare, and
- Time of departure and approximate duration of the trip.

Information needs of customers who are en route were identified as consisting of at least the following:

- At the departure point—identification of the correct bus to board.
- On board the vehicle—identification of bus stops for transfers or disembarking.
- At transfer points—how to transfer to another route; cost, time limits, and restrictions; and identification of the correct bus to board.
- At the destination—area geography (i.e., location of the final destination in relation to the bus stop) and return trip information (e.g., departure times and changes in route numbers).

This guidance describes the need for more information at each stage of travel and reports that a combination of information (e.g., maps and use of signage) is needed because each type of communication and media has its own set of strengths and weaknesses.

This report identifies the most critical factors or elements that will increase the effectiveness of the communication. These are, in no particular order:

- Rehearsal—customers' viewing maps and other material to become familiar with the transit system.
- Simplicity—requiring the use of common names and terms, and references to known locations or directions to aid in orientation.
- Consistency—names, codes, and formats being consistent from sign to sign and from one type of information aid to another.
- Continuity—the rider building on initial information with data that confirm decisions and reiterate next steps in the trip. This can be provided by bus stop signs, on-board route maps, and other information aids that help the rider progress from one step of the journey to the next.
- Repetition—redundancy (e.g., repeated formats, coding by shape and/or color, and consistent number and name), which will help to reinforce trip and transit information in the mind of the rider.

In terms of on-board communication with riders, passengers participating in two focus groups "indicated that attention to both transportation messages and entertainment may enhance customer experiences on vehicles (*3*). Focus group participants were especially interested in next-stop, route number and

name, and other transportation information, as well as entertainment, time of day, and traffic updates" (*3*, p. 2). Although this study is more than 10 years old, it reflects the current needs of passengers, as described in *TCRP Report 45* and other key documents summarized in this section.

As described in the FTA report (*4*), workshops were held in four metropolitan areas across the United States (Providence, Rhode Island; Columbus, Ohio; Salt Lake City, Utah; and Seattle, Washington) with transit customers to answer the following questions:

- What kinds of transit information do customers want and expect transit agencies to provide?
- Where should information be made available to transit travelers?
- Which delivery system do users prefer?
- When should the information be made available to be most useful to transit travelers?
- What are the critical human factors issues in presenting and displaying transit information?

Many types of communication were considered essential by the workshop participants, given the demographics of the focus groups, specifically (*4*, p. 3):

- For pre-trip planning purposes, the highest preferences were for timetables.
- Traditional (printed) or static forms of information were preferred over real-time (electronic) information for pre-trip planning, again, given the demographics of the focus groups.
- The two predominant ways transit customers preferred to obtain pre-trip information is in printed form (such as a portable schedule) and by means of a computer (such as Internet or e-mail).
- Trip time forecasts were the most preferred type of real-time pre-trip information.
- Pre-trip information needs were much greater when planning an unfamiliar trip than for a familiar trip.
- The overall level of preference for information while at the wayside was substantially less than for pre-trip planning. Once a transit trip is initiated, the options narrow and the traveler has most of the information he or she wants. The preferences for information at the wayside focus mostly on real-time information to be accessed through electronic message signs or video monitors.
- At the wayside, in addition to real-time information types, static information printed on paper or on signs at the transit stop was also considered essential by many riders, and primarily includes schedules, route maps, and fares.

Extensive research into customer needs for communication was conducted for the development of Transport Direct (*5*), a program that provides the United Kingdom with multimodal traveler information, including the ability to compare travel options across public and private transport modes (see http://www.transportdirect.info/TransportDirect/en/Home.htm?cacheparam=1). Of the 13 factors critical to the design of Transport Direct, at least 6 were devoted to customer communications and, specifically, the aforementioned dimensions of communication. The recommendations regarding these factors were:

- *Consumer demand for information*. "Transport Direct will need to capture the public's attention with unique features that distinguish it from other services and which are valued by consumers" (*5*, p. 4). Furthermore, "poor information accessibility can pose a barrier to public transport use that is as serious as the potential barriers of physical access to public transport services" (*5*, p. 4).
- *Information requirements of the end user*. "Customer understanding of the term *reliability* associated with travel options needs to be defined and understood. Possible representations of reliability as information should be conceived and assessed in terms of their usefulness to customers" (*5*, p. iii).
- *The importance of awareness and marketing*. "There appears a need for the public transport industry in particular to do more to promote to the public the availability of information concerning its transport services" (*5*, p. 13).
- *Effects of information on behavior*. "Potential users of an information service should have the opportunity to physically be exposed to the service or a prototype of the service in order to determine their attitudes towards the service and the behavioural consequences, if any, of using this service" (*5*, p. iv).
- *Media and presentation formats*. "Alternative interface designs and information structures should be identified for [an information] service. Prospective end users of the service should be engaged in the design of the service through an iterative process of consultation and usability testing" (*5*, p. iv).
- *Integration of real-time systems into travel information systems*. "Research to accelerate the understanding and delivery of real-time information to mobile devices is needed concerning user take-up, technical aspects (including development of information sources such as [automated vehicle location (AVL)], costs, and presentation of information" (*5*, p. v).

In 2001, the United Kingdom organization, Institute of Logistics and Transport (ILT), developed guidance for creating effective public transport information websites. In their guide (*6*), ILT states that "for Internet-based public transport information to be useful, it must fulfill the user's needs and it must be easy to use. If this new medium for public transport information provision is used to best effect, public confidence in the quality of Internet-based public transport information can be fostered and greater use of public transport, by existing users and non-users, can be encouraged" (*6*, p. v). Although this appears obvious, after examining a variety of websites during the research phase of this synthesis, it was clear that not all public transport information websites are

easy to use. Furthermore, ILT stated that "fundamental to the success of public transport information web sites is a focus on the user. Unless the user's information needs have been understood, the information content is unlikely to be relevant to the user's needs" (*6*, p. v).

In addition, the ILT study emphasized that public transport information websites should focus the users of the website and the information content should be made easily accessible. The website user should be able to navigate to the desired information within "three clicks." The information provided on websites should not be overly technical and should be easily comprehended. Website content should be rich in information and concise. The internal and external links should be designed properly to prevent users from being confused. For example, the users should be alerted when being automatically navigated to an external website. To attract users, the websites should also organize the content by effective use of text and visuals (e.g., graphics and maps).

A review of more than 600 transit websites was done to analyze public transport information website content. It was concluded that site content should be revised to make it more appropriate by defining the audience and purposes of the site, including information that is necessary for the purposes, and excluding information that is not necessary. It was also suggested that user interfaces should be revised to improve sites to make them easier to use and more accessible.

Another important aspect of this guidance is the implication of providing web-based public transport information by means of recent technologies and services, such as WAP-enabled portable devices, the ability to locate the wireless device user, and new communications technologies, such as Bluetooth and general packet radio service. Although at the time this guidance was written (in 2001) several of these technologies were brand new, they are fairly commonplace now. The key implication of these new technologies on public transport information website design is to keep the interfaces and information simple.

Metro in Leeds, United Kingdom, developed a detailed information strategy based on customer needs. This information strategy is updated annually and identifies priorities for improvements based on these customer needs. Table 1 shows Metro's information requirements for 2006.

In September 2005, Metro launched a campaign called "yournextbus" in West Yorkshire, which was expanded to South Yorkshire in 2006. In preparation for the launches, the Metro hired a marketing and media firm and proceeded to develop the system using the four P's of marketing: product, price, place, and promotion. The yournextbus product consists of information accessible by means of SMS, WAP, and the Internet. A price was determined for the text messaging, and the promotion was developed. The promotion identified who was being targeted by the new system, defined the communication, and identified where and what promotional material would be provided to those being targeted. A detailed Communications Plan was developed that covered all of the necessary activities within and external to Metro as the new system was being launched.

As mentioned in Metro's Information Strategy, the success of the yournextbus was measured by examining the use of the system and customer feedback. In the West Yorkshire system, detailed statistics regarding the number of SMS messages and WAP/Internet visits were compiled and analyzed over a five-month period starting just before the launch of yournextbus. Furthermore, the number of text messages sent and received on an hourly basis was examined for a one-week period to determine usage profiles. Finally, Metro studied what affected usage of the new system, in addition to customer feedback.

Other documentation that reflected riders' communication needs focused on specific aspects of transit travel, such as transferring. For example, in a recent study conducted for the Metropolitan Transportation Commission (MTC) in the San Francisco Bay Area (*8*), the communication issues associated with "transit connectivity" were identified. Transit connectivity refers to a customer's ease of transferring from one transit system to another. In the Bay Area, this is a significant part of the transit travel experience, with more than 20 public transportation agencies providing services. Given that several of the key aspects of connectivity are customer information, sources of that information, and dissemination media, this study examined the current barriers to connectivity related to these elements.

Taking into account these barriers, the following recommendations were made (*8*, pp. 3–8):

- Provide transit information by means of a variety of dissemination mechanisms to support pre-trip and en-route planning.
- Continue to support, enhance, and promote the 511 phone service as the number for transit information, and encourage transition from individual operator phone services to 511.
- Continue to support, enhance, and promote 511.org as a one-stop location for transit information.
- Improve printed information in transit stations.

Recommendations for real-time information and technology were also made (*8*, pp. 3-13–3-14):

- Provide real-time information for segments of "routes that improve regional or intra-agency connectivity, or routes that serve main arterials, express, or limited-stop routes" (*8*, p. 3-14).
- Develop real-time performance accuracy standards.
- Provide required real-time information to a regional database for dissemination on 511 phone, 511.org, and to other transit operators, if applicable, in a standard format.
- Make real-time information displays consistent among hubs.

TABLE 1
METRO (WEST YORKSHIRE) INFORMATION REQUIREMENTS

Stage of Journey and Information Requirements	Current Provision (January 2006)	Priorities for Improvement
Pre-journey, where requirements are principally journey planning and fares information	• Timetable leaflets • Maps • Metroline/Traveline • Journey planner and website (wymetro.com) • Public Internet access points • Travel center service • Printed information, including timetable booklets, bus stop displays, bus and train station displays, area maps and local guides • Range of information outlets stocking timetables, maps, and leaflets • Bus stop and station information	• Increase self-service through promotion of Metro's website (wymetro.com) for journey planning information and timetable downloads • Provide fare information through Metroline and journey planner • Achieve consistent standard across all travel centers • Tailored, personalized information delivery • Info kiosk/Internet access points at more locations
Beginning the journey	• Location of bus stop/shelter and how to find which is your stop • Real-time information by text, WAP, and Internet • Bus stop information, confirming time, and departure location	• Real-time displays at shelters, voice real-time service accessed via Metroline number • Bus stop information to be expanded to all stops
Bus stop/shelter/ station	• Real-time information • Travel centers at bus stations • Electronic information displays at bus stations • Printed information • Location information	• Real-time information at all bus stations
Bus journey	• Service change dates information • Promotional information	• Next stop information • Route information • Destination information

Note: WAP = wireless application protocol.

Transit agencies are providing more communication regarding security awareness and procedures than ever before. One key document regarding this type of communication was prepared by the Permanent Advisory Committee to the New York Metropolitan Transportation Authority (MTA) (*9*). This organization conducted a study regarding communications policies at several MTA agencies.

> It is especially important that communication with customers involve not only the agencies transmitting information to customers, but also the agencies listening to customers, who constitute a vital first source of information about potential threats in the public transportation system. This is a new paradigm . . . (*9*, p. i).

Customers have found the quality of response during emergencies to be inconsistent, particularly related to communication. In our research we found that MTA operating agencies' emergency response plans differ significantly in how they incorporate communication as an integral component.

Recommendations resulting from this study included those for communicating with riders covering all of MTA and individual operating agencies. In summary, these covered improving and expanding customer information regarding emergencies; supplying personnel with appropriate information to provide customers with during emergencies [e.g., alternative service, providing information in common formats, and preparing a detailed communication section to be included in the emergency response plan (*9*, pp. 28–32)].

After this report was published, one specific aspect of communication with riders, the audibility of announcements in New York City subways, was the subject of a newspaper article that described the current status of public address systems in the system's 468 stations (*10*). In a subsequent article (*11*), statistics were cited indicating that an upgrade to the public address system would be necessary for announcements to be understandable by customers. The MTA does have a plan to upgrade the public address systems by installing "public address/customer information screens with audible speakers and digital text display panels" in 201 stations by 2009 and the other 267 stations by 2015.

It has been reported that different types of media can be used to communicate with riders, particularly to disseminate pre-trip and real-time information. However, the selection of the media is dependent on several factors, including the location of the riders. For example, pre-trip information can be accessed through the Internet, wireless personal digital assistants (PDAs), and mobile phones. For customers at bus stops, information can be provided in the form of light-emitting diode (LED) dynamic message signs (DMSs), liquid crystal display (LCD) panels, video monitors, kiosks, and/or mobile phones. Mobile information media such as mobile phones and PDAs can be used at any stage of the trip. On-board information can be provided visually through DMSs and audibly through voice announcements. Recently, agencies have also started deploying wireless Internet [wireless fidelity (Wi-Fi)] on board, providing customers with access to static or real-time information over the Internet while they are on board.

In terms of disseminating real-time information, *TCRP Synthesis 48: Real-Time Bus Arrival Information Systems* (*12*) identified several media that are being used to disseminate real-time information (see Figure 2). Although these information dissemination media have proven to be effective, transit agencies are improving the content of the communication as well as the media based on customer feedback and their own experiences in deploying the media. For example, the MyBus system, which provides pre-trip and real-time information for King County Metro in Seattle, was updated over time based on user feedback (*13*). In addition, a study on MyBus revealed that the key elements in providing effective communication to transit riders included developing partnerships among all transportation agencies in a region, recognizing the utility of dissemination media and systems to end users, and keeping up with advanced technologies. The feedback that caused the system developers to update the system over time included the notion that users wanted to be aware of the real-time progress of their bus on the Internet and to be alerted just before the arrival of the next bus at their bus stop(s).

In terms of providing rider communication by electronic media, Europe and Asia have embraced supplying public transport information on mobile devices perhaps more than anywhere else in the world. For example, information is available from both small and large agencies by means of

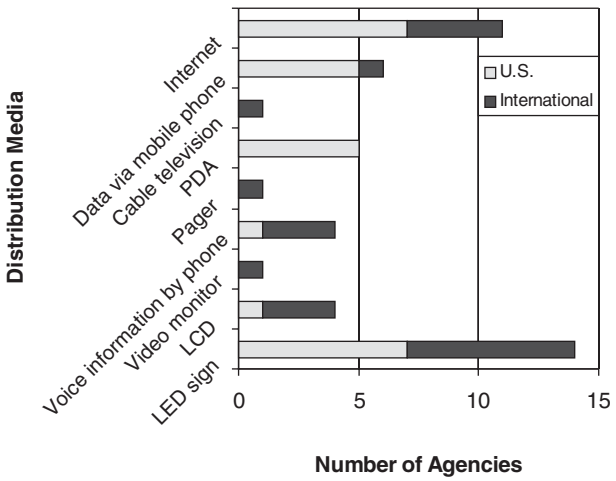

FIGURE 2 Distribution media for real-time bus arrival information (*12*, p. 13).

mobile telephones (from several mobile phone service providers) throughout the United Kingdom and Western Europe. For example, in the United Kingdom, WAP and SMS services are available in Nottingham County as well as in London (see chapter six for a more in-depth discussion of Transport for London). The technologies that drive these mobile services are shown in Figure 3.

One unique application of mobile device use for public transport communication was developed in Magdeburg, Germany. Personalized public transport information, focusing on disruptions, is presented by means of a variety of media as part of a demonstration project (*15*). Magdeburg has a population of 230,000, with 157 trams and 61 buses that operate on 20 lines. The PIEPSER project (personalized information for commuters of public transport) provided notifications of disruptions, as well as information on alternate routes through multiple modes (not just public transit) by means of SMS to subscribers of the information service affected by the disruption.

Hoyer et al. noted that "the acceptance of a personalized information service strongly depends on its quality" (*15*, p. 5). Furthermore, providing accurate disruption notifications was a challenge, given that several manual processes were required and, once the incident occurred, information regarding the disruption has to be continually updated. This project resulted in a strong case for using this type of rider communication to at least maintain public transit ridership.

Another European example of rider communication using the latest technology is provided through Portsmouth's Real-time Integrated Traveler Information System (PORTAL) (*16*). "PORTAL combines the provision of a Real-Time [Bus] Passenger Information system (RTPI) delivered by wireless broadband (Wi-Fi), with touch screen information and Internet services integrated within bus shelters, providing a range of great travel services for the 41,000 or so daily

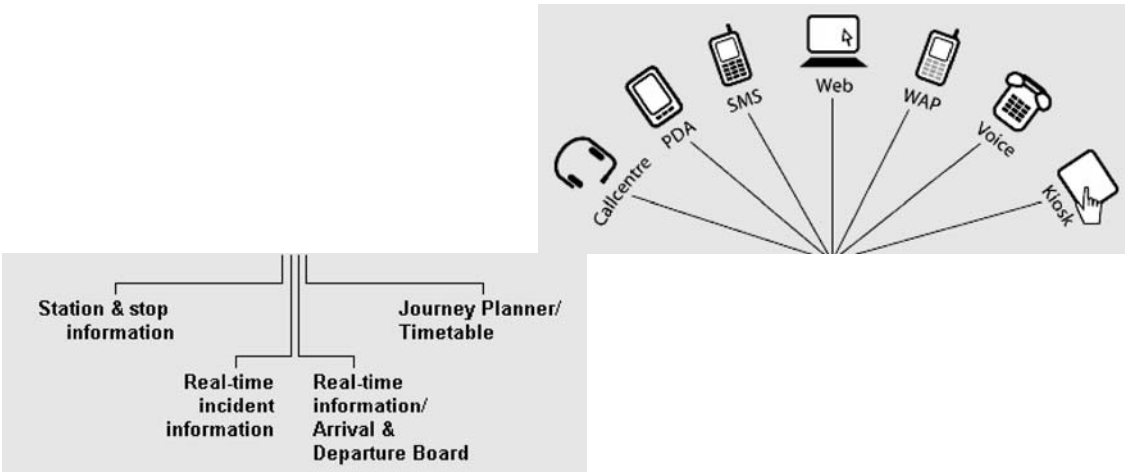

FIGURE 3 Dissemination media for public transport information (*14*).

passengers across the city" (*17*). (See Figures 4 and 5 for photos of PORTAL shelters and real-time information.)

From a rider perspective, essential transit information, including information on real-time arrivals and disruptions, and itinerary planning, is provided in the bus shelters through display screens and fully integrated touch screens. In addition, maps and other service information can be printed out.

FIGURE 4 PORTAL at bus shelter.

As mentioned earlier, rider communications by means of mobile devices is common in Europe and Asia. Specifically, the use of SMS or text messaging is much more common than it is in the United States, as shown in the literature and on agency websites. For example, Auckland, New Zealand's, public transit system has embraced WAP and SMS as a way to increase ridership and provide better customer service (*18*). Text messaging is the hallmark of the "Virtually Thr" system that was introduced in Auckland in 2002. This system was developed to "present bus information in the way customers wanted it. It was also about tapping into people's

FIGURE 5 PORTAL display in shelter.

preferred media." Text messaging is the preferred way for young people in the Auckland area to communicate, and the chief information officer (in 2002) at the Auckland Regional Council recognized this as a significant market for public transit.

In addition to WAP and SMS services, the website was improved and web discussion groups were added. These discussion groups are rare in public transit settings, as noted by the chief information officer at the Council in 2002. "We are one organization that is not hiding behind a website. Our discussion area is a place where people can have a go about the transport services, even the drivers" (*18*).

Another notable aspect of the Virtually Thr system is the cost to both taxpayers and customers. "Our Rideline call centre costs us $1.80 per interaction with the public. Compare that with our new services, the web, WAP, and SMS, which cost us 9 cents per interaction. (The SMS messages cost 30 cents each for users.)" (*18*). Furthermore, "the call centre costs just under $2 million a year to operate and handles 1.4 million calls a year; the ongoing cost of the website, the WAP, and SMS services combined is $60,000 a year and between them they already handle 600,000 calls annually—and the number keeps on rising, about 30% every six months" (*18*).

One final observation of this system is that it uses only one integrated database to store and provide all customer information. Before Virtually Thr, customer information resided in numerous locations in the agency.

Yet another approach to communicating with riders is being demonstrated in Zurich, Switzerland, based on the location of a mobile device owner (*19*). Because several countries have mandated or will be mandating that mobile telephone locations be provided by telecommunication companies, commercial firms are exploring the opportunity to provide public transport information based on the location of the phone user. The potential for providing location-targeted customer information includes the following (*19*, p. 35):

- Personal "last km" navigation—the final stage at the end of a journey that is necessary to reach the entrance of the destination building by walking.
- Tracking people in transit who need to find each other (or who may be vulnerable).
- Managing or redirecting traveling field workers.
- Supporting visitors arriving in unfamiliar cities in finding points of interest (restaurants, hotels, and the like) with electronic tour guides.
- Providing navigation aids for people with disabilities (e.g., in the form of aural locational information for those with visual impairments).

One of the key issues associated with providing location-based rider communication is that riders may be in locations where global positioning system (GPS) signals are very weak or nonexistent. In a demonstration that is being conducted in Zurich, weak GPS signals are being boosted within Zurich's main rail station. This station not only serves local, regional, national, and international rail customers, it is also a major hub for other public transportation services. "The test, covering typical passenger movements across the station concourse between entrances, generated GPS-derived position fixes that clearly depicted the routes walked" (*19*, p. 36).

TRANSIT AGENCY COMMUNICATION APPROACHES AND MARKET RESEARCH

The literature review covered customer preferences for agency-provided traveler information. The FTA report (*4*), mentioned earlier in this chapter, describes several features of traveler information. The report shows that customer preferences vary based on several factors, including gender, age, and education level. For example, in this study female riders preferred real-time information to static information more so than male riders. Travelers in the 25–64 year age group were found to have a stronger preference for video displays or kiosks that show real-time information at the wayside as compared with younger or older riders. Individuals with higher levels of education were more comfortable with advanced technology media such as the Internet and wireless devices.

This 2003 report also shows that, in general, customers have a greater inclination toward pre-trip planning resources, which are preferred primarily in traditional (paper-based) forms. This study also shows that pre-trip information is needed more for an unfamiliar trip. While at the wayside, customers prefer real-time information through video monitors or kiosks. This information mainly includes estimated trip time or real-time bus arrival information. It was also emphasized that transit agencies should ensure that all communication, particularly real-time information, is accurate and timely.

The Tri-County Metropolitan Transportation District of Oregon's (TriMet's) Transit Tracker displays show real-time information at selected bus and light-rail stops in countdown format (*12*) as shown in Figure 6. This information is also available using TriMet's website and through portable wireless devices, such as PDAs and mobile telephones.

An on-line survey (*20,21*) of Transit Tracker Online users revealed the significance of an accurate and timely real-time information system on customer satisfaction. The survey results showed that the system was easy to use and that the information was useful and accurate. It was also reported that the DMS displays helped save time. Furthermore, the survey reported that more than 50% of the users (of a total of 368 survey respondents) were satisfied with the bus service in the presence of such information (see Figure 7). The riders also perceived increased safety and comfort in the presence of the real-time arrival information, because they were aware of the wait at the stop.

FIGURE 6 TriMet Transit Tracker dynamic message sign (*Courtesy:* Orbital Sciences Corporation).

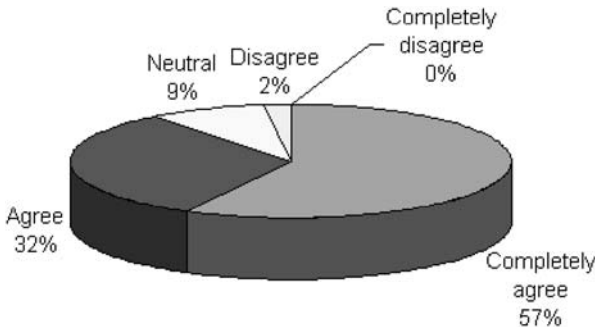

FIGURE 7 Customer satisfaction with bus service owing to Transit Tracker (percentage) (number of respondents, 368).

Another example of effective communication was discussed in the Island Explorer Field Operational Test (Acadia National Park, Maine) evaluation. This evaluation (*22*) was conducted, in part, to determine the customer satisfaction with the Island Explorer system, including the information communication to riders. (The evaluation activities began in the spring of 2000 and were completed in the winter of 2002–2003.) A survey with 928 respondents concluded that visitors believed that the availability of real-time departure information (on DMSs) and on-board next-stop announcements (provided by means of an automated annunciation system) made it easier to get around the area (90% and 89%, respectively) and saved them time (80% and 69%, respectively). In the final analysis, the technologies appear to have been an important factor in the decision of many visitors to use the Island Explorer. Fifty-four percent of the survey respondents strongly agreed that the real-time departure signs helped them decide to use transit, and 43% strongly agreed that the on-board automated annunciation system helped as well. The perceived benefits of using real-time information by means of the Island Explorer DMSs are shown in Table 2.

TABLE 2
VISITOR PERCEPTIONS OF BENEFITS FROM USING ISLAND EXPLORER REAL-TIME BUS DEPARTURE SIGNS

Benefit of Using Real-Time Bus Departure Signs	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	*N* =
Helped to relieve uncertainty when the bus would arrive	51	34	11	3	1	435
Made it easier to get around the area	58	32	8	2	1	430
Saved time	48	32	16	4	1	434
Helped decide to use Island Explorer	54	26	13	5	2	434

Note: Percentages do not always add up to 100 owing to rounding.

As mentioned earlier in the Riders' Communications Needs section, in addition to communicating regular traveler information to customers, agencies are beginning to integrate passenger information systems with nontransportation-related information, such as news, sports, weather, and video-based entertainment (e.g., short subjects) (*23*). This report on the future of traveler information discusses the need to enrich passenger information services using the latest technology. The purpose of enhancing website and other information contents with advanced multimedia features is to get riders' attention. Consumer research was done as part of this study to obtain transit passengers' perceptions regarding the use of advanced features for passenger information. The results of the consumer research in three international cities yielded the following (*23*):

- High customer acceptance levels,
- High advertising awareness achieved, and
- High general satisfaction levels with passengers.

"More than 77% and in some cases more than 88% of the passengers perceived an improvement in the quality of the journey due to passenger information displays" (*23*, p. 4).

The literature review also revealed that agencies are communicating with riders to provide multimodal information. This trend is being adopted by transit agencies to attract the riders that use multiple modes for the completion of their trips. The 511 program provides multimodal information by offering traffic information (e.g., driving conditions, incidents, and construction) as well as transit information (e.g., fares, schedules, and trip planning) in one place. Figure 8 shows several San Francisco Bay Area 511 website pages that display multimodal traveler information. Extensive market research was done in the Bay Area to find out the most effective ways to disseminate information to transit riders and other travelers.

Market research conducted in the Bay Area (*25*) resulted in several improvements in the 511 system using interactive voice response (IVR) technology. For example, the phone service was improved by including a voice recognition feature that follows a menu item called "short cuts." This feature assists experienced callers by allowing them to bypass the full menu. The research also found a strong need for transit information that would allow users to plan a variety of trips beyond their day-to-day commutes. The updated

FIGURE 8 San Francisco Bay Area's 511 system (*24*).

FIGURE 9 Bay Area Transit information main 511 web page (*26*).

TakeTransit Trip Planner component of the Bay Area 511 system (see Figure 9) fulfills such needs.

A series of three satisfaction surveys were conducted by the San Francisco Bay Area MTC to evaluate the web and phone services of the 511 system. More than 1,000 users participated in two telephone service satisfaction surveys. Later, 415 web users participated in a survey of the web-based 511 services. The results of these two surveys showed that approximately 90% of all respondents were satisfied with the 511 phone and web services. The major reasons for the small amount of dissatisfaction (10%) among the respondents for both phone and web services were associated with the "accuracy/usefulness of information" and "problems with navigation" (*25*, p. 10).

The MTC also collects user feedback throughout the year through the website and by phone. Based on this feedback and results of the aforementioned satisfaction surveys, the MTC has made specific changes to the 511 website and phone service. The 511 website was redesigned to improve the "ease of navigation." Also, MTC plans to improve 511 by making the trip planner more robust and easier to use, improving the size of the map display, adding a search feature for landmarks on maps, and adding specific train station locations as permanent map features.

The 511 website provides real-time information on San Francisco Muni's J, K, L, M, and N lines, and on the historic F-line streetcars (see Figure 10). Eventually, as the full deployment of real-time transit information for all Muni services is completed, real-time information on all Muni bus and rail lines will be available through the 511 system using both the Internet and telephone.

Several agency customer satisfaction surveys were reviewed as part of the literature search, and each of these included survey questions that directly related to the effectiveness of communication. The results of the 2005 survey conducted for San Francisco Muni are discussed in detail in chapter six.

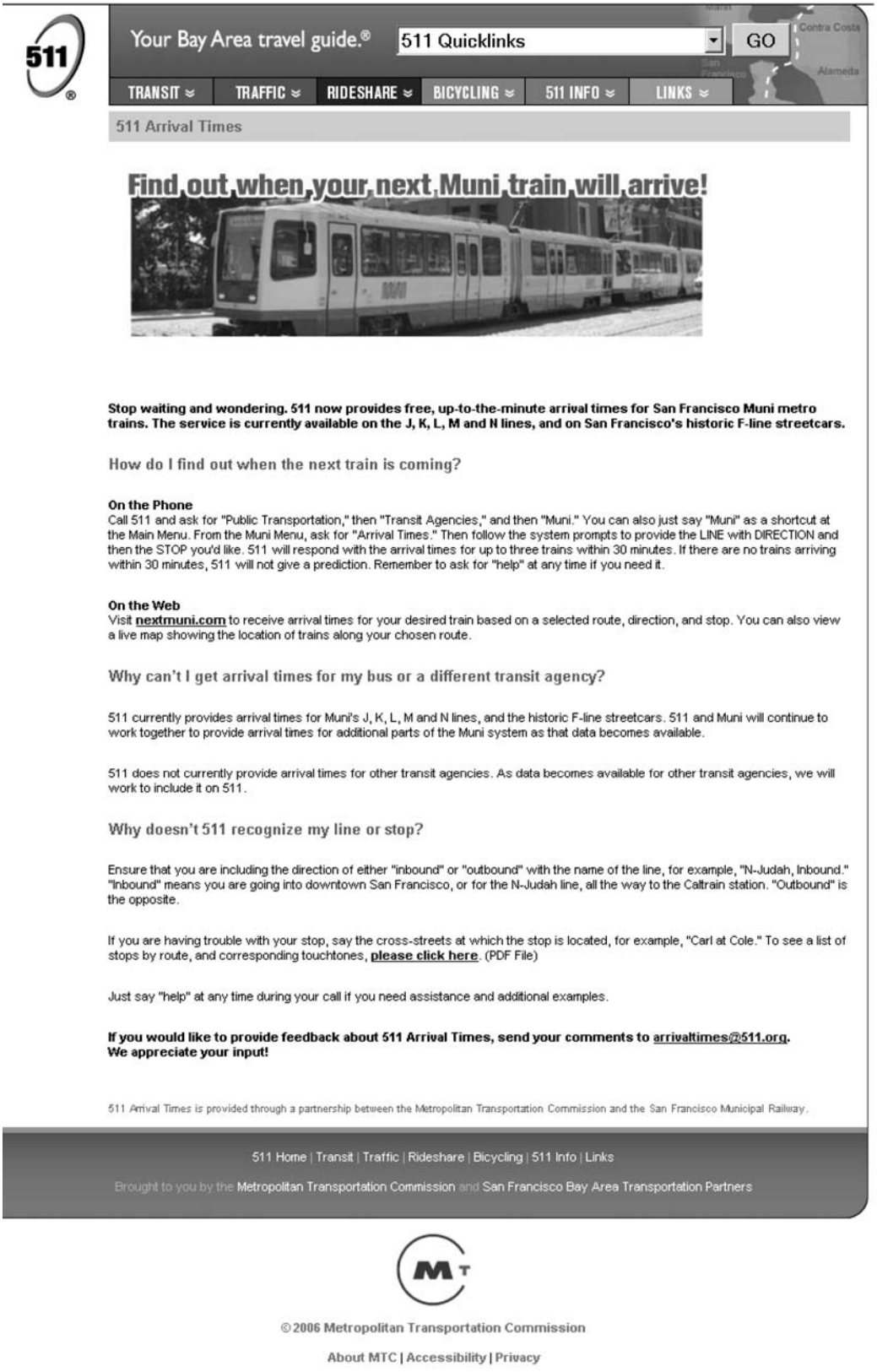

FIGURE 10 Real-time information available on Bay Area 511 (*27*).

Although transit agencies across the world are focusing on providing transit-specific pre-trip and en-route traveler information, many agencies have started to attract riders by providing multimodal information, as discussed previously. The literature review identified several other deployed multimodal traveler information services, including:

- Transport Direct in the United Kingdom (discussed in a 2003 presentation "Transport Direct: Where Have We Got to, Where Are We Going?") (*28*).
- HEILI in Finland (discussed in a 2003 paper "Finnish Multimodal Passenger Transport Information R&D Programme—HEILI") (*29*).
- Northern Europe Mobility Information Service (NEMIS) in Northern Europe (discussed in a 2003 paper "Development of Multi-National and Multi-Modal Traveller Information Services in Northern Europe") (*30*).
- PEdestrian and Public TRAnsport Navigation (PEPTRAN) in Winchester, United Kingdom (discussed in a 2003 paper "Peptran—Mobile Pedestrian and Public Transport Navigation in Your Pocket, Is This the Future?") (*31*).
- Portsmouth's Real-Time Integrated Traveler Information System (PORTAL) in Portsmouth, United Kingdom (*32*) [mentioned earlier in this section and discussed in a 2003 paper "Portsmouth's Real-Time Integrated Traveller Information System (PORTAL)"].

A review of these systems, which serve multimodal riders, has revealed important factors about rider communication. For example, there is a greater need for information during an unfamiliar trip and an inclination toward the use of mobile information media, such as mobile telephones. The market research conducted by the Transport Direct project team shows the following significant items related to customer preferences (*28*). The results of their study, which was conducted in 2003, showed user preferences for multimodal information, especially in the case of unfamiliar trips.

- People (generally) give little consideration to end legs of journeys when planning their travel.
- Mobile phones and SMS are considered by the public as prime candidates for the provision of in-trip and real-time information.
- Seventy-two percent of information users seek information for leisure travel compared with 21% and 29% for commuting and business travel, respectively.
- Users of telephone and Internet information services who determine the mode after consulting information source(s):
  – Short, unfamiliar journey—13%; and
  – Long, unfamiliar journey—27%.
- Sixty-nine percent of information users would prefer to consult a multimodal rather than uni-modal information service when preparing for an unfamiliar journey.