

Abridgment

Study of Commuter Choice of Information Source to Improve Transit Information Systems

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In order to provide the public with information necessary to use the transit service easily, mass transit agencies are adopting a systems approach to their information programs. The transit information system, which includes the types of transit information provided as well as the available information sources, provides a framework that is particularly useful in the study of commuters' information-retrieval behavior. To date, however, investigation of the relationship between the system of transit information aids and the consumer has been minimal (1). The primary contribution of the research to date (1-5) is in the assessment of the usefulness of information aids rather than in the analysis of information-source choice behavior. The purpose of this study is to gain a better understanding of information-source choice behavior and to suggest a way it can be applied to the improvement of transit information system design. It is based on the results of a demonstration project conducted to develop more informative bus stop signs.

METHOD

The project consisted of three parts: the development, field demonstration, and evaluation of experimental bus stop signs. Three demographically representative bus routes were selected for installation of the bus stop signs. A before-demonstration survey of bus riders on the three routes was designed to determine the commuter information-retrieval pattern for the existing transit information system. The existing point-of-use information was a small sign, which displayed only the words "bus stop". Bus users were asked to indicate their preferences for information that could be displayed on a new bus stop sign. Analysis of the preference data provided a basic hierarchy of desired information (6). Based on the survey results, an experimental bus stop sign was developed. The upper part of the blue and white sign displayed a pictograph of the front view of a bus. Information strips were added below to identify the route number and name and to provide additional information. After the sign was installed, a second survey of bus users was performed to obtain feedback on specific evaluation dimensions.

Both surveys employed preaddressed, postage-paid questionnaires, which were distributed by bus drivers on the three demonstration routes. Bus drivers distributed the color-coded questionnaires to passengers who boarded on their southbound trip during an entire weekday. In the before-demonstration commuter survey, bus drivers handed out 8996 questionnaires, of which 2515 were returned by mail, for an overall response rate of 28 percent. In the after-demonstration survey,

10 207 survey forms were distributed. A total of 2361 were mailed back, for a response rate of 23 percent. Although this was somewhat lower than the response rate for the first survey, it was within the range of expectation for a longer questionnaire, which required more of the commuter's time. Response rates for the three routes were consistent for the two surveys.

RESULTS

Analysis of the survey results focused on two questions: (a) whether differences in the commuter information-retrieval patterns involving the experimental bus stop sign were statistically significant and (b) whether commuters' choice of information source was significantly related to the personal and trip characteristics of the respondents. The before-demonstration survey identified the commuters' information-retrieval patterns; the after-demonstration survey also measured the patterns as the basis for comparison and evaluation. Selected information-source choice patterns delineated by the two commuter surveys are shown in Table 1. Commuters were asked to select one information source from the five listed that they would use to find out about certain information elements when on the street or at the bus stop. The two information elements in Table 1 (bus routes and transfer points and bus stop locations) are basic information needed by the commuter for transit trip making. Responses to the first survey indicate that commuters most frequently selected the bus driver as the source of information on both information elements. In contrast to the heavy reliance on the bus driver, the weakness of the existing bus stop sign is reflected in the small percentages from the first survey.

The chi-square test was used to compare the response frequencies in the second survey with those in the first to determine whether or not any differences could be attributed to sampling variation. The results given in Table 1 indicate significant differences in choice of information source for both types of information. Additional statistical analysis of other survey data revealed that the experimental signs, which included a large bus pictograph and the route number and name, were significantly more visible and useful in the identification of bus stops. This is reflected in Table 1, which shows that the use of the bus stop sign for determining bus stop locations increased in the second survey and the use of the bus driver dropped.

To our knowledge, only one study has attempted to relate choice of information source to a set of commuter characteristics. In this laboratory study, reported in the Urban Mass Transportation Administration (UMTA) handbook (4), age, sex, education, and race were found to be significantly related to the ranking of some of the

information aids for overall usefulness. The current study expanded on this research by relating choice of information source to both personal and trip characteristics collected in on-board rider surveys. The personal characteristics included sex, age, education, race, and automobile availability, whereas the trip characteristics were frequency of use, trip purpose, and the need for transfer. The personal and trip characteristics were

related to the information-source choice patterns through chi-square statistics computed from contingency tables. Although space limitations preclude presentation of detailed results, the following variables were found to be significantly related to choice of information source at or below the 0.01 significance level: age, sex, education, race, trip purpose, and the need for bus transfer. These, as well as the previous results, confirm the value of an information-aid demonstration project in better understanding transit consumer behavior and in guiding the improvement of transit information systems.

Table 1. Percentages of information-source choice for commuters in first and second surveys.

Information Source	First Survey (n = 2515)	Second Survey (n = 2361)
Bus Routes and Transfer Points^a		
Phone information	23.6	21.6
Friend or commuter	10.6	8.1
Bus driver	45.3	44.5
Route schedule	8.1	9.1
Bus stop sign	1.2	4.1
Do not need	2.8	2.9
Marked two	8.4	9.7
Bus Stop Locations^b		
Phone information	10.6	12.9
Friend or commuter	14.1	8.9
Bus driver	38.8	36.3
Route schedule	5.3	6.1
Bus stop sign	19.8	23.6
Do not need	6.5	7.3
Marked two	4.9	4.9

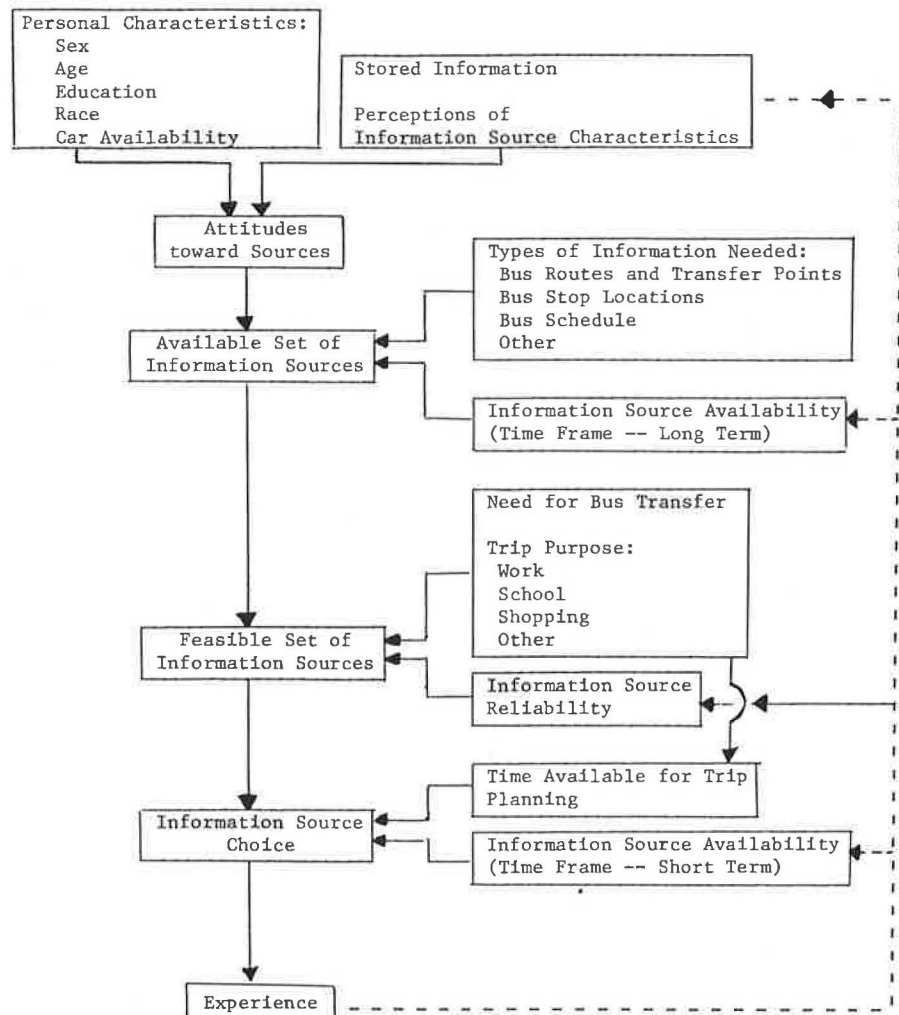
^a $\chi^2 = 50.2; p < 0.001.$

^b $\chi^2 = 40.0; p < 0.001.$

INFORMATION-SOURCE CHOICE MODEL

Based in part on the results of the demonstration project, a model of the process by which the transit consumer chooses an information source is presented in Figure 1. Relationships between the trip and personal characteristics and choice of information source shown in the model have been established. The statistical analysis used to determine the relationships involved tests in a static framework. The model expands on these relationships to develop a dynamic framework, which depicts the normative behavior of a transit consumer as suggested by these relationships as well as by other data.

Figure 1. Model of the information-source choice process.



Attitudes Toward Transit Information Sources

Attitudes toward transit information sources are influenced by a set of personal characteristics and by stored information, which reflects the personal experience of the commuter (7). Also, they are shaped by the commuter's perceptions of information-source characteristics. The perceived complexity of an information source, for example, is an important factor in the process (8). Personal characteristics of significance included sex, age, education, and race. Females, older people, and less educated individuals showed a preference for direct inquiry about information (asking the bus driver or calling for bus information on the phone) but indicated little interest in using a pocket schedule. Choice riders, those who have an automobile available for use, were also more heavily dependent on the telephone for information. Information provision involved in the marketing of public transit to automobile travelers represents a challenge to transit managers. It requires their improved understanding of the transit decision-making process.

Available Set of Information Sources

The set of information sources considered available by the transit consumer is influenced by the consumer's perceptions and attitudes toward information sources. It is also affected by the type of information desired and the availability of this information from various sources. Finally, long-term availability of the information source is dependent on the commuting habits of the individual, which influence the time in which the information is generally conceived to be needed.

Feasible Set of Information Sources

The feasible set of information sources is a subset of the available sources perceived by the commuter. The reliability of available information sources, the nature of the trip as indicated by trip purpose, and the need for bus transfer influence the consumer's perception as to the feasible set of information sources. Information-source reliability is defined as the probability of receiving correct information from a source when the source is queried about an information element. The important role of trip purpose in market-segmentation analysis has been well documented in transit consumer research (6-8). The current study further demonstrates the significance of trip purpose in delineating information-retrieval segments. Evidence of the impact of the improved bus stop sign on choice of information source was observed in the retrieval pattern for bus stop location information. Not only was the choice of the bus stop sign significantly higher in the second survey but, for school passengers in particular, it was the most frequently selected source. Bus transfer was significantly related to choice of information source primarily for bus route information. Such results confirmed the importance of providing adequate route information on the bus stop sign and over the telephone to meet the needs of a predominantly transfer-oriented ridership.

Information-Source Choice

The final source choice, determined before making a trip, depends on

1. The time available for trip planning and

2. The availability of the information source in the short-term time frame in which the decision to undertake the trip is made.

A commuter embarking on a bus trip would choose a timely, available source of information from the feasible set to obtain travel information. Experience in using the information source will augment commuters' stored information as well as update their perceptions of source availability and reliability.

IMPLICATIONS FOR TRANSIT SYSTEM MANAGEMENT

Our research has examined the significant relationships between trip and commuter characteristics and choice of transit information source. A model of the information-source choice process has been proposed based on these relationships and further analysis of the travel information-retrieval patterns. The model brings personal and trip characteristics, together with behavioral variables, into play in a time sequence consistent with the process of seeking travel information with the intention of using the transit system.

If a transit system expects to maintain or increase its ridership, it is important that it determine shortcomings in its public information system. However, the goal of providing the commuter with the information necessary to use a transit system has to be viewed within the constraints of a limited budget. In order to evaluate the effectiveness of one information source over another, in addition to ascertaining the commuter information-retrieval patterns, the cost of providing the information must be determined. The transit management can use cost information and a general knowledge of the social impacts of each information source to develop programs that will improve the transit information system and possibly enhance transit ridership.

In order to improve its information system while working within a set budget, transit management can use the proposed model to consider alternative strategies for modifying information aids. To demonstrate the use of the model, consider the following example. The management of a transit system wants to increase the bus usage of the choice-rider segment. It is considering two information-aid options:

1. Improve a currently inefficient telephone information service, or
2. Increase the availability of pocket schedules to choice riders.

Use of the proposed model helps management identify the feasible set of information sources from the viewpoint of the choice rider. Without the use of the model, the management might have been inclined to increase the availability of pocket schedules rather than to improve the telephone information service. This would have been a wasteful move—the model indicates that choice riders are less likely to use the pocket schedule and actually prefer the telephone as a source of their schedule information. Thus, management can focus on the optimal plan of increasing choice ridership either by adding additional operators or installing an electronic data retrieval system.

This example indicates the benefits to be derived from a systematic analysis and interpretation of transit consumers' information-source choice. The proposed model provides a method by which significant relationships between consumers' information-source choice and their trip and personal characteristics can be used to identify deficiencies in transit information aids. The applica-

tion of this approach places transit management in a better position to evaluate alternative strategies for improving information aids and to allocate their resources more effectively in support of the various information aids.

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Communication Considerations for Transit Route and Schedule Brochures

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Route and schedule brochures provide information on the specific service features of fixed-route transit. Clear, concise, and easy to understand information on these pamphlets is important to both users and prospective users of transit services. To date, insufficient attention has been directed toward development of effective communication techniques on these pamphlets. Many are difficult to interpret, incomplete, or poorly formatted, which makes them of marginal value to prospective users. The assumption that the reader is familiar with transit service characteristics, and thus able to translate any printed information, can make the brochures difficult to comprehend for automobile-oriented individuals. Nonusers cannot be expected to use the transit mode if they are uncertain about the characteristics of a specific service. The paper outlines methods by which communication techniques can be improved for route and schedule brochures. The design process should be governed by rational and systematic design principles, which are proposed and explained. The principles have been applied to the redesign of Knoxville Transit's route and schedule brochures. Each element on the brochure cover, timetable, and route map is briefly discussed in terms of desirable design practices and the rationale for each.

Route and schedule brochures provide information basic to the use of fixed-route transit services. The pamphlets show the path of a particular route, the activity centers it serves, and the arrival times of a vehicle at specific locations. A prospective or regular user can then determine whether a transit route is suited to the time and spatial characteristics of a particular trip. The type of information provided on these pamphlets is usually more detailed than such instruments as bus stop signs, systemwide maps, and other supporting information devices. Therefore, route and schedule brochures

aid the user in gaining access to transit services and have an important influence on the user's understanding of those services.

ROLE OF ROUTE AND SCHEDULE BROCHURES

Although a printed information aid should not be considered a promotional device (1, pp. 52-60), the route and schedule brochure may have an important function when new users are attempting to understand transit services. A study by Liff (1, pp. 52-60) of 103 individuals who have varying amounts of transit experience indicated that 70 percent use passive information sources (the telephone or route map) or an acquaintance as their source of information to determine the correct route to take. In addition, no one would seek information from a stranger. This may reflect a desire to use passive information sources rather than to seek information from sources that one might find embarrassing or threatening. If so, it would be consistent with other consumer experiences, exemplified by self-service supermarkets and department stores.

Since route and schedule brochures provide the most basic and detailed information on fixed-route transit services, effective communication on these pamphlets is vital to user comprehension of the service and to successful promotional campaigns. Inquiries generated by promotional programs must be reinforced by readily available and easy to understand descriptions of the ser-