Relationship Between Surveyed Behavioral Intent and Actual Behavior in Transit Usage

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Just before Miami's Metrorail opened, ridership projections for the system indicated that (depending on pricing assumptions) as many as 202,000 riders might use the system daily. With this in mind, the University of Maryland (UM) planned to undertake expensive improvements next to University Station. In 1983, a pretransit survey was undertaken on the UM main campus to discern the probability that the campus community would use Metrorail. The overall conclusion was that 5,796 persons expressed an intention to access the campus using Metrorail "at least one time per month or less." Applying a rule from the transportation planning literature suggested that 427 persons would take Metrorail to campus on a randomly selected weekday. In 1987, a posttransit survey was conducted at the UM Metrorail station. All persons disembarking Metrorail and entering UM property were counted. Approximately 313 interviews were completed. The results indicate that about 350 persons were riding Metrorail to UM each day in 1987, a number within an acceptable level of error of the 427 persons predicted from the behavioral intent questions on the 1983 survey. An important point is that the student body changed almost completely in the 4-year span. The principal implication is that the rule of dividing by a number between 3 and 5 (4 was used in this study) is an accurate guide even when considering populations that change between the time of a pretransit survey and the institution of the transit service, such as is true with students, the elderly, employees, and other groups.

Most transportation surveys ask a significant battery of questions concerning attitudes toward transportation, attributes of respondents (demographics, automobile ownership, housing type, etc.), and travel behavior. Models are then used to relate attitudes and attributes to travel behavior to predict travel demand. The results of two surveys are reported. The pretransit survey was conducted in 1983, just before the opening of Metrorail in Miami (Dade County). The posttransit survey was conducted in 1987.

Just before Metrorail opened in Miami, ridership projections for the system indicated that (depending on pricing assumptions) as many as 202,000 riders might use the system daily. With this figure in mind, the University of Miami (UM) planned to undertake landscaping and other improvements in the area of the campus next to University Station. Significant discussions also occurred concerning the relocation of certain campus functions to locations closer to Metrorail. Because of the significant expenditures involved in these plans, a pretransit survey was undertaken on the UM main campus in April 1983 of administrators, faculty, staff, and students to discern the probability that each group would take Metrorail to campus. The overall conclusion from this study was that 5,796 persons expressed an intention to access campus using Metrorail "at least one time per month or less." Applying a rule from the transportation planning literature that implies that actual behavior will be one-fourth of expressed behavioral intent, suggested that 427 persons should take Metrorail to campus on a randomly selected weekday.

In 1987, an intercept survey (the posttransit survey) was conducted at the UM Metrorail station. All persons disembarking Metrorail and entering University property were counted as using Metrorail to access the campus. An attempt was made to interview each of these persons. Approximately 313 interviews were completed. Interviewing occurred both on a Tuesday and a Wednesday because class schedules differed between Monday, Wednesday, and Friday, on the one hand, and Tuesday and Thursday, on the other hand. Questions were asked concerning each respondent's status (faculty, student, staff, visitor, etc.), destination on campus, frequency of riding Metrorail, availability of automobile, and possession of a monthly Metrorail pass. Time of the day the trip was made, gender, and race were obtained via observation.

The results of the posttransit survey indicated that about 350 persons were riding Metrorail to UM each day in 1987, a number within an acceptable level of error of the 427 persons predicted from the behavioral intent questions on the 1983 survey. An important point is that the student body changed almost completely in the 4-year span. The principal implication is that the rule of dividing by a number between 3 and 5 (4 was used in this study) is an accurate guide even when considering populations that change between the time of a pretransit survey and the institution of the transit service, such as is true with students, the elderly, employees, and other groups.

BACKGROUND LITERATURE

Much of the previous theoretical basis for this study has been proffered in the work of Ajzen and Fishbein (*1*). Their "Theory of Reasoned Action" assumes that human beings are rational and make systematic use of available information. The ultimate goal of the theory is to predict and understand an individual's behavior. First, the behavior is clearly defined and the determinants of the behavior are examined. Second, the theory assumes that most actions are under volitional control and, that intention to perform a behavior is the im-

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mediate determinant of the action. In order to predict whether an individual will perform a given behavior, they forward the idea that the "simplest and probably most efficient approach is to ask him whether he intends to (perform the behavior)." Although there may not always be perfect correspondence between intention and behavior, they suggest that a person will usually act in accordance with his or her intention.

A person's intention to perform a given behavior is seen as a function of two basic determinants, the personal factor and the subjective norm. The personal factor is the individual's positive or negative evaluation of performing the behavior vis-à-vis the manner in which performing the behavior will affect him personally. This evaluation is affected by a person's behavioral beliefs, that is, their attitude is affected by what they believe will be the result if they adopt the behavior. With respect to modal choice, clearly some individuals will have a positive attitude toward use of a rail system, whereas others would view its use in a negative fashion. The transportation planning literature includes many factors that help to shape these attitudes: trip time, trip length, gender, race, occupational status, income, education, and a host of other geographic and demographic variables.

The second determinant of behavior (the subjective norm) is based on the individual's perception of the social pressures placed on him or her to perform a given behavior. Generally speaking, people are more likely to perform a behavior (or to indicate on a questionnaire that they will perform a behavior) if they view social pressures to do so as positive. These subjective norms are also a function of beliefs, termed normative beliefs. Normative beliefs refer to the beliefs concerning the social pressures that one might feel either to perform, or not perform, a given behavior. In terms of the use of a rail rapid transit system, the social pressures may be viewed as both positive and negative. On the one hand, persons riding rail transit receive positive social gratification because much of society views this as positive from an energy and environment-saving perspective. On the other hand, many persons attach a social stigma to the use of public transit. In the particular case described, the university population may be imbued with some degree of social conscience that may lead to a positive answer to a question about intent to use transit. On the other hand, among students, peer pressure may be strong. Students are in a stage of their life cycle when they are beginning to "strike out on their own" and the automobile is a strong symbol of this independence.

Despite the promise of this theory of behavior prediction, only a minority of travel surveys have asked "behavioral intent questions," in which respondents are queried directly as to whether they intend to use a particular transit service in the future. The extent to which direct questions about intent to use a transit system can be used to predict actual future behavior is examined. Some questions about behavioral intentions might be included in a survey as a procedure for measuring attitudes, or as a way of assessing the outcome of an individual's attempt to combine underlying attitudes with perceived situational exigencies. However, the main purpose of asking questions about behavioral intentions lies in the hope that intentions will act as valid predictors of future behavior. Just as questions about past behavior (via a travel diary, for example) might be used to recover information that would otherwise be unavailable, questions about behavioral intent offer a means to study behavior that is unavailable because it has not yet occurred (ridership on a system before system implementation).

Such exercises at prophesy are bound to be hazardous, however, for even when present intentions are obtained accurately, circumstances can always change in a way that upsets the best-laid plans (*2*). Kelley and Mirer (*3*) and Schwartz (*4*) provide evidence that the gap between behavioral intent and actual behavior widens as the distance into the future of the projected behavior increases. Predictions are more successful when the respondent has direct experience with the kind of act asked about rather than encountering it only as a survey question (*5*). This suggests two things in the current context. First, purely hypothetical questions about intentions are less likely to be useful for prediction than are questions about intentions concerning recurrent events. Thus, if a person has been using public transit for the work trip, a question about continued use of this mode into the future probably will yield a result with a high degree of predictive value. Second, questions about the demand for a mode of transit with which people have previous experience should provide more reliable information than for a new mode. In the current context, respondents were being asked to assess the likelihood that they would ride a new rail rapid transit system with which no one was yet familiar. This, in and of itself, suggests that the predictive value of the behavioral intent questions may be limited.

This assessment stands in contrast, however, to some voting studies. When asked whether one will vote in a given election, many will overstate their propensity to vote to please the interviewer (*6*). But when likely voters are asked for whom they will vote, close correspondence is found between intention and behavior (*7*).

A significant literature exists in which behavioral intention is surmised from questions about attitudes (*8,9*). The strength of the attitude-behavior relationship is shown to vary greatly depending on the topic covered, the time involved, the nature of the measurement of both the attitudes and behaviors, and a wide variety of other factors (*2*).

Two studies from the transportation literature bear directly on the problem to be described. Hartgen and Kreck (*10*) examined the problem of forecasting the probable usage of innovative transportation services, such as dial-a-bus and park-and-ride, in a variety of urban and rural environments. Instead of asking behavioral intent directly, they study current behavior in the city in question as well as behavior in other locales in which the innovative transportation system is already in operation.

The most important study with respect to the current problem is by Couture and Dooley (*11*). Their major conclusion confirms the findings of earlier studies: that reported prior intentions to use a new service often significantly overstate actual use once the service has been implemented (*12*). This overstatement is seen as deriving from respondents' lack of experience with the new mode and from changing attitudes. More specifically, the study concluded that (a) intentions (to use transit) overstate actual behavior; (b) negative intentions are better indicators of nonuse than positive indicators are of use; and (c) situational factors (e.g., automobile and transit accessibility) are important determinants of modal choice. Couture and Dooley (*11*) suggest that actual behavior can be predicted from behavioral intent by dividing behavioral intent by a number between 3 and 5.

As an example, for a proposed bus system in Danville, Illinois, 85 percent of the women in the sample and 71 percent of the men indicated that they intended to use transit. Actually, only 35 percent of the women and 24 percent of the men used it. These results translate into approximately three intenders for every actual user and confirm the assertion that intention overstates behavior. The results also show that 37 percent of those who said they intended to use transit did use it, whereas 84 percent of those who did not intend to use transit in fact did not. Couture and Dooley (*11*) also found that those indicating intent to use transit more frequently were, in fact, more likely to use transit than those indicating that they would be occasional users. This result would imply, for this study, that greater faith could be put in answers implying that a respondent would use the Metrorail system "everyday" over those answering, say, "about two days a week."

MODELING FRAMEWORK

Figure 1 shows the conceptual framework for this study. The major question being asked is the extent to which expressed behavioral intent can predict actual behavior. Behavioral intent may be viewed as affected by attitudes, perceptions, and beliefs, by demographics, by current behavior, and by the level of knowledge that respondents possess of the future system. Respondents' general attitudes toward public transit, their perceptions of its appeal, and their beliefs as to its cost, comfort, and convenience will clearly influence expressed behavioral intent. Previous literature suggests that demographics, particularly age and gender, should have a significant influence on expressed behavioral intent. As well, it seems logical to assume that respondents who are more familiar with a proposed transit system can better judge their likelihood of using the system. Finally, current behavior should act as a reasonable predictor of future transit use: those currently using buses, for example, to access campus are more likely to use rail transit in the future.

Actual behavior is obviously influenced by the same set of factors identified earlier as affecting behavioral intent. Actual behavior also will be influenced by the actual environment in which the behavioral decision is made. Actual behavior continues to be affected by attitudes, perceptions, beliefs, demographics, and the level of knowledge of the system, although this level is likely to be heightened by the opening of the system. The real question is the extent to which these factors can be used to predict actual behavior on the basis of expressed behavioral intent.

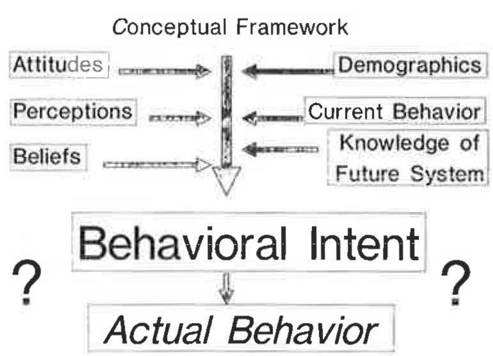

FIGURE 1 Conceptual Framework.

BACKGROUND ON THE METRORAIL SYSTEM

Metropolitan Dade County Florida's Metrorail system is an integrated multimodal public transit system consisting of a 21-mi elevated-rail rapid transit line, a 2.1-mi downtown peoplemover (Metromover), and a bus system originally proposed to expand from 550 to 1,000 vehicles. (This expansion never occurred.) The rail line runs from the expanding Dadeland Shopping Center in the south, past UM to the western fringe of the central business district (CBD), where it connects to Metromover. From the CBD, the line proceeds north to the UM Medical School, through Liberty City, and into Hialeah.

Just before Metrorail opened in Miami in 1984, ridership projections for the system indicated that (depending on pricing assumptions) as many as 202,000 riders might use the system daily. When the system first opened, 6,000 to 8,000 passengers per day were reported; by 1989, the number had increased to about 35,000 per day. Although an analysis of the reasons for the failure to attract the projected number of riders is beyond the scope of the current research, it is important to realize when examining the results reported in the following sections that ridership on the entire system is dismal.

METHODOLOGY

The results of two surveys are reported. The pretransit survey was conducted in 1983, just before the opening of Metrorail in Miami (Dade County). The posttransit survey was conducted in 1987.

1983 Pretransit Survey

With the 202,000 riders per day projection in mind, UM planned to undertake improvements in the area of the campus next to University Station. Because of the significant expenditures involved in these plans, a pretransit survey was undertaken on the UM main campus in April 1983, of administrators, faculty, staff, and students, to discern the probability that each group would take Metrorail to campus. A questionnaire was developed, using a feedback process involving two review cycles including various faculty and administrators. It was then pilot tested with three geography classes. It was also reviewed by knowledgeable Dade County personnel, leading to a questionnaire in which five types of questions were asked: travel to and from campus, parking, midday travel, potential Metrorail usage, and questions identifying the respondent as to employment status, gender, and student status.

Five campus user groups were identified: faculty, students, staff, administrators, and visitors, although no attempt was made to obtain information from the final group. It was decided to undertake a blanket sample of all faculty, administration, and staff both for political and logistical reasons. Such was not so for the 13,000 students. Here, a random sample of 70 class sections of the 2,748 offerings was selected and a blanket sample done in each randomly selected class section. Overall, at least a 62 percent response rate was achieved from the nonstudent groups; 100 percent of the students cooperated. Only for part-time faculty was the response rate unsatisfactory. Note, however, that one possible bias introduced by nonresponse is that nonrespondents may be less likely to ride than respondents. For this reason, the pretransit survey may be expected to overestimate ridership.

Because of the differing response rates among user groups and because students were sampled only at a 5.5 percent rate, weighting factors were devised so that the reported university-wide results properly reflect the relative sizes of the different user groups presented in Table 1.

The questions concerning behavioral intent provided a range of options, and some suggested frequencies for what was then considered the most likely scenario. Optimally, more scenarios and more frequency choices might have been presented. Yet, the practical aspects of survey research suggested to the survey designers that only a limited number of questions could be asked without trying the respondents' patience.

1987 Posttransit Survey

In 1987, an intercept survey (the posttransit survey) was conducted at the UM Metrorail station. All persons disembarking Metrorail and entering university property were counted as using Metrorail to access the campus. An attempt was made to interview each of these persons. Approximately 313 intercept interviews were completed. Interviewing occurred on both a Tuesday and a Wednesday, because class schedules differ between Monday, Wednesday, and Friday, on the one hand, and Tuesday and Thursday, on the other. Questions were asked concerning each respondent's status (faculty, student, staff, visitor, etc.), destination on campus, frequency of riding Metrorail, availability of automobile, and possession of a monthly Metrorail pass. Time of the day the trip was made, gender, and race were obtained via observation.

An important issue is related to the fact that 4 years elapsed between the pretransit and posttransit surveys. Clearly, over this 4-year period, almost all the student body changed, as did a good portion of the administration, faculty, and staff of the University. Thus, the sampling universe for the pretransit survey is different from the universe for the posttransit survey. This change in universe may help explain any differences between the expressed behavioral intent of the pretransit survey and the observed behavior of the posttransit survey. Although this argument is reasonable, it is more than balanced by the fact that while the individuals had changed, the students, as a group, did not change significantly during this period.

More important, this situation (of a changing population between the time of a survey and the implementation of a transit program) is not unique to a student population. Certainly, the time delay between surveying employees for a vanpool or carpool program and the implementation of such a program also may be considerable. The actual population whose behavior would be measured by the postvanpool survey will have changed because of employee turnover. A second example of this situation can be illustrated with the planning of Metrorail itself. Between the time data collection first began (1964 Miami Urban Area Transportation Study) and the completion of Metrorail (1984), the Dade County population increased from less than 1 million to over 1,700,000. Also, it is not difficult to believe that (given that about 20 percent of Americans move each year) many of the 1 million persons in residence in 1964 were no longer Dade County residents in 1983. Similar figures probably could be cited for many major transit systems. Thus, the idea of a changing universe between data collection and project implementation is probably the norm rather than the exception.

One potential problem was that different methodologies were used in the pre- and posttransit surveys. Thus, differences in the results of the two surveys could be related to differences in the methodologies. Finances, however, made it impossible to repeat the 1983 effort in 1987. In addition, observing 1987 behavior may lead to a more accurate ridership estimate than sampling respondents. Unfortunately as well,

TABLE 1 CAMPUS POPULATION AND RESPONSE RATES

User Group	Coral Gables Campus Population	% of Campus Population	Number of Surveys Returned	Response Rate
Graduate	3,617	22.7%	153	100%
Undergraduate	9,469	59.5	557	100%
Student Total	13,086	82.2	710	100%[a]
Staff	1,500	9.4	1021	68.1%
Administration	350	2.2	272	77.7%
Full-time Faculty	750	4.7	426	56.8%
Part-time Faculty	238	1.5	42	17.6%
Total	15,924[b]	100.0%	2,471	

[a]All students asked to cooperate did. The 710 responses is a 5.4% random sample of all students.

[b]Accounting for vacation and sick leave and the number of days per week people come to campus imply 14,600 persons coming to campus each day, exclusive of visitors.

the 1987 methodology did not allow for collections of demographics comparable to the 1983 survey.

Note as well that the posttransit survey was only completed for 2 days and that some possibility exists that these 2 days were not representative. Optimally, a larger sample of days might have been included. Two factors seem to obviate the need for a larger sample of days. First, Dade County ridership figures indicated little daily variation in boardings at the UM Metrorail station. Second, the numbers of riders observed on each of the two sampled days were almost exactly equal.

RESULTS OF THE PRETRANSIT SURVEY

Because the pretransit survey was to be administered to faculty (who constantly complain about demands on their time) as well as to students at the beginning of classes, it became imperative to minimize the length of the questionnaire. Thus, questions designed to predict behavior on the basis of attitudes, perceptions, beliefs, and level of knowledge of the proposed system were not included. Rather, questions were limited to an examination of current behavior, to questions of behavioral intent, and to just two demographic-type queries.

Current Travel Behavior

This section summarizes some major findings of the study, with respect to current travel behavior, which convinced the author (*13*) to treat the behavioral intent results with some degree of conservatism. Table 2 indicates that 91.5 percent of the UM community arrived on campus by car, with the majority (88 percent) parking on campus. Only 1.5 percent used the bus to get to campus on the day on which they completed the form. Table 3 indicates that only about 4 percent used a bus even as few as 20 times in a year; 83 percent had never used a bus to access campus in the past year. Table 4 indicates that even half those persons who did not use a car to access campus did, in fact, have a car available; Table 5 indicates that 90 percent of the UM community possess a driver's license. None of this portends well for rapid transit: most transportation surveys indicate that a good portion of transit riders are "captives," i.e., they have no other options except transit (*14*). This is not so for the UM community. In addition, the 11 percent of the UM community who carpool to campus (Table 6) are less likely to switch to transit because they already enjoy a somewhat inexpensive group journey to school.

Table 7 indicates that, unlike most large employment centers, only 45 percent arrived during the morning peak period (7:00 to 9:00 a.m.); only 28 percent left in the evening peak (4:00 to 6:00 p.m.) (Table 8). The implication of this information is that much of the UM population traveled during the off-peak period, when rapid transit headways are greatest and road traffic is lightest.

Table 9 indicates that 71 percent of the campus community spent 6 min or less finding parking. 80 percent were within a 6-min walk of their first building destination on campus (Table 10). Thus, a serious parking problem that would certainly encourage transit usage (as it does in many CBDs) did not exist on the UM campus.

One aspect of current behavior that did portend well for Metrorail usage is the percentage of persons (49 percent)

TABLE 2 HOW DID YOU GET TO THIS CAMPUS TODAY?

Mode	Faculty	Student	Staff	Administration	Total
Car—parked	88.1%	89.4%	77.4%	88.6%	87.8%
Car—dropped off	3.7	2.2	12.8	4.7	3.7
Walk	2.5	3.9	2.1	1.6	3.5
Bus	1.6	1.1	4.2	2.7	1.5
Other	4.1	3.4	3.5	2.4	3.4
Total	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE 3 HAVE YOU TAKEN METROBUS TO OR FROM THIS CAMPUS IN THE PAST YEAR?

Frequency	Faculty	Student	Staff	Administration	Total
Never	87.0%	83.1%	79.0%	85.1%	83.0%
1 - 2 times	7.4	5.0	6.9	5.2	5.3
3 - 10	3.6	6.7	4.6	3.3	6.2
11 - 20	.2	1.5	1.1	.0	1.4
More than 20	1.8	3.7	8.5	6.3	4.1
Total	100.0%	100.0%	100.0%	100.0%	100.0 %
Summary: 1+ times	**13.0%**	**16.9%**	**21.0%**	**14.9%**	**17.0%**

TABLE 4 DID YOU HAVE A CAR AVAILABLE TO COME TO THIS CAMPUS TODAY?

Of Those Not Using a Car Today:					
	Faculty	**Student**	**Staff**	**Administration**	**Total**
No	22.1%	45.5%	79.5%	52.9%	48.9%
Yes	77.9	54.5	20.5	47.1	51.1
Of All Persons, Whether They Used a Car Today or Not:					
No	1.8	3.8	7.8	3.5	4.1
Yes	98.2	96.2	92.2	96.5	95.9

TABLE 5 DO YOU HAVE A DRIVER'S LICENSE VALID FOR USE IN FLORIDA?

	Faculty	Student	Staff	Administration	Total
No	9.3%	9.6%	15.7%	4.8%	10.1%
Yes	90.7	90.4	84.3	95.2	89.9

TABLE 6 DID YOU (WILL YOU) CARPOOL WITH SOMEONE TODAY?

	Faculty	Student	Staff	Administration	Total
No	94.3%	89.7%	83.3%	90.9%	89.3%
To & From Campus	5.0	7.0	11.8	7.1	7.4
To Campus	.4	1.9	2.9	.8	1.9
To Leave Campus	.4	1.4	2.0	1.2	1.4
Total	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE 7 APPROXIMATELY WHEN DID YOU ARRIVE ON CAMPUS TODAY?

Time	Faculty	Student	Staff	Administration	Total
Before 9 AM	58.9%	35.9%	79.8%	81.1%	44.6%
9 AM - Noon	32.9	44.5	6.7	12.5	38.0
Noon - 4 PM	6.6	6.8	4.5	5.6	6.3
4 PM - 6 PM	.6	10.0	3.2	.8	8.1
After 6 PM	1.1	2.8	5.8	.0	2.9
Total	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE 8 APPROXIMATELY WHEN DID YOU EXPECT TO LEAVE THIS CAMPUS AT THE END OF YOUR UNIVERSITY DAY?

Time	Faculty	Student	Staff	Administration	Total
Before 9 AM	2.8%	1.8%	6.6%	1.6%	2.4%
9 AM - Noon	2.7	5.8	.3	.0	4.7
Noon - 4 PM	19.3	32.6	16.0	3.5	28.6
4 PM - 6 PM	49.7	18.8	63.8	70.2	28.3
After 6 PM	25.5	41.0	13.3	24.7	35.9
Total	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE 9 HOW MANY MINUTES DID IT TAKE YOU TO FIND A PARKING SPACE TODAY?

Time	Faculty	Student	Staff	Administration	Total
0 - 3	83.0%	45.0%	81.0%	81.4%	53.0%
4 - 6	8.1	20.5	11.5	9.1	18.0
7 - 10	4.2	13.2	5.8	3.5	11.3
11 - 20	3.2	12.7	1.3	3.5	10.5
Over 20	1.5	8.7	.4	2.3	7.2
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Summary: < 6 min	**91.1%**	**65.5%**	**92.5%**	**90.5%**	**71.0%**

TABLE 10 HOW MANY MINUTES DID IT TAKE YOU TO WALK FROM THE CAR TO THE FIRST BUILDING YOU WENT TO ON CAMPUS?

Time	Faculty	Student	Staff	Administration	Total
0 - 3	69.7%	31.7%	71.5%	70.2%	40.8%
4 - 6	22.9	44.0	21.5	24.8	39.0
7 - 10	5.8	18.5	4.7	4.6	15.4
11 - 20	1.5	4.7	1.9	.4	4.0
Over 20	.0	1.0	.4	.0	.8
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Summary: < 6 min	**92.6%**	**75.7%**	**93.0%**	**95.0%**	**79.8%**

indicating that they leave the campus and return at least one time at some point during the day (termed a "midday trip") (Table 11). Questions about the destinations of these trips led to the conclusion that at least 38 percent of such trips could be made by Metrorail (in that they are to destinations that are accessible by Metrorail). Table 12 indicates that 25 percent of the midday tripmakers would have used Metrorail for their midday travel had it been available on the survey day. On the other hand, Table 13 indicates that 89 percent of midday trips are made currently by car, implying that about 44 percent of campus personnel leave campus by car during the midday—many to locations that are not accessible to Metrorail. Certainly, persons who need their car for travel during the day are less likely to leave their car behind in the morning and use Metrorail.

Overall, the questions concerning current travel behavior suggested that ridership of Metrorail by the UM community could not be expected to be significant.

Behavioral Intent to Use Metrorail

Table 14 presents the results of a question with a series of conditions that were, at the time the questionnaire went to print, the Dade County staff recommendations for Metrorail pricing. (The adopted fare was, in fact, $1.00 each way and parking was free during the 1987 posttransit survey.) Table 14 indicates that approximately 31 percent of the UM community expected to use Metrorail; 11 percent would use it "once a month or less"; 10 percent, "1–7 times per month"; 5.4 percent, about twice per week; and 4.4 percent, "everyday." Behavioral intent is certainly much higher among student groups (34 percent planning to use it at least "once a month or less") than nonstudent groups (18 to 20 percent). Note as well that, of those persons expressing an interest in riding 36 percent would use it "once a month or less"; 32 percent, "1–7 times per month"; 17 percent, about twice per week; and 14 percent, "everyday."

TABLE 11 HAVE YOU LEFT THIS CAMPUS AND RETURNED (OR DO YOU EXPECT TO LEAVE THIS CAMPUS AND RETURN) ANY TIME TODAY?

	Faculty	Student	Staff	Administration	Total
No	61.8%	50.0%	58.6%	28.6%	51.1%
Yes, once	31.8	41.1	36.3	52.8	40.3
Yes, 2+ times	6.5	8.9	5.1	18.6	8.6
Total	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE 12 IF METRORAIL WERE AVAILABLE TODAY, WOULD YOU HAVE USED IT FOR THIS MIDDAY TRIP?

	Faculty	Student	Staff	Administration	Total
No	82.5%	72.4%	83.7%	81.1%	74.1%
Yes	17.5	27.6	16.3	18.9	25.9

TABLE 13 WHAT MEANS OF TRANSPORTATION DID YOU (WILL YOU) USE ON YOUR MIDDAY TRIP?

Mode	Faculty	Student	Staff	Administration	Total
Car	84.0%	76.1%	74.1%	79.2%	76.5%
Car pool	10.8	12.2	15.3	8.3	12.3
Walk	1.9	6.5	2.7	8.9	6.0
Bus	.0	1.6	4.8	1.0	1.8
Other	3.3	3.5	3.1	2.6	3.4
Total	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE 14 SUPPOSE METRORAIL OPENS JANUARY 1, 1984; THE PRICE OF GAS REMAINS AS IT IS NOW; METRORAIL COSTS $2.00 ROUND TRIP, PLUS 25 CENTS FOR TRANSFERS TO AND FROM THE BUS; PARKING AT A METRORAIL STATION IS $1.00/DAY. WOULD YOU USE METRORAIL TO GO TO AND FROM THIS CAMPUS?

Frequency	Faculty	Student	Staff	Administration	Total	Total[a]
Never	80.3%	66.1%	82.7%	82.0%	69.0%	
1/month or less	6.8	12.4	4.5	4.8	11.1	35.8%
1 - 7 times/month	5.3	11.3	3.9	4.4	10.0	32.2
2X/week	3.5	5.9	3.5	1.5	5.4	17.4
Every Day	4.1	4.2	5.4	7.4	4.4	14.2
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

[a]Excluding persons never riding. Thus, the interpretation is that 35.8% of persons who indicated that they will ride indicated that they will ride 1/month or less.

Table 15 presents behavioral intent to use Metrorail under various pricing structures. Note that as the total cost (round trip fare plus parking) increases from $1.00 to $2.00 to $3.00 to $3.50 to $4.00, intended usage decreases from 50 percent to 40 percent to 20 percent to under 5 percent. Thus, the campus community—particularly the students—appears to be price sensitive.

On the basis of the literature review and the generally negative indications about future transit use that arise from the study of current campus travel behavior, projected behavior was put at 25 percent of behavioral intent. Table 16 indicates that at a $2.00 total cost, 5,796 UM persons expressed an intent to use Metrorail "at least one time per month or less." Projected behavior was, then, that 1,449 persons would use Metrorail "at least one time per month or less."

Given that 1,449 were to use Metrorail in a given month, calculations of how many of these persons one should expect to encounter on a random selected day are presented in Table 17 and indicate that we should expect 427 riders per day.

Demographic Variables

Space on the questionnaire precluded the inclusion of many demographic variables. In addition, the variance in age for students is minimal. Only two demographic variables were included. The first was occupation. Table 14 indicates that expressed behavioral intention does vary significantly between students (66 percent never) and the other groups (80 to 82 percent never). Finally, in a result not in a table, 5 times as many males as females expressed intent to use the system, suggesting a concern with safety.

RESULTS OF THE POSTTRANSIT SURVEY

The results of the posttransit survey indicated that only about 350 persons were riding Metrorail to the UM each day in 1987, a number that is within the same ballpark as the 427 figure projected by the Couture and Dooley (*11*) rule. This

TABLE 15 IF INSTEAD, THE ROUND TRIP COST (INCLUDING METRORAIL FARE, BUS TRANSFERS, AND PARKING) WAS $1.00, $2.00, $3.00, $3.50, OR $4.00, WOULD YOU USE METRORAIL?

Round Trip Cost	Faculty	Student	Staff	Administration	Total
$1.00	32.4%	54.5%	32.5%	29.7%	50.4%
$2.00	26.3%	43.0%	24.4%	21.6%	39.7%
$3.00	12.9%	21.4%	12.8%	13.3%	19.8%
$3.50	11.1%	8.9%	6.6%	10.5%	8.9%
$4.00	6.5%	4.8%	3.4%	2.7%	4.7%

TABLE 16 BEHAVIORAL INTENT AND PROJECTED BEHAVIOR—NUMBER OF USERS

	Behavioral Intent		Projected Behavior	
Round Trip Cost	% Yes	# Users	% Yes	# Users
$1.00	50.4%	7,358	12.6%	1,840
$2.00	39.7%	5,796	9.9%	1,449
$3.00	19.8%	2,891	5.0%	722
$3.50	8.9%	1,299	2.2%	325
$4.00	4.7%	686	1.2%	172

TABLE 17 PROJECTION OF DAILY RIDERSHIP

Frequency	Percentage	# of Users	Project Daily Riders
1/month or less	35.8%	524	24[a]
1 - 7 times/month	32.2	467	96[b]
2X/week	17.4	252	101[c]
Every Day	14.2	206	206[d]
Total	100.0%	1,449	427

[a]Assumes that about 22 weekdays exist per month. 524 divided by 22 = 24.
[b]Assumes that each person average 4.5 times per month. 4.5/22 of 467 = 64.
[c]Assumes that each person rides 40% of the time (2 of 5 weekdays). .4 times 252 = 101.
[d]Assumes that each person rides each day.

is certainly an encouraging result and suggests that survey research can be used as an effective tool for making ridership projections, even in instances when the population of interest changes significantly between the time of the survey and the implementation of the transit system.

Several additional findings are of interest:

1. Of the 350 riders, 70 percent were students, 13 percent were staff, 12 percent were administrators or faculty, and 6 percent were visitors to campus. This finding is consistent with the pretransit survey, which indicated that a greater percentage of students were likely to use the system.
2. 60 percent rode Metrorail daily and 87 percent rode Metrorail both to and from campus. This is consistent with the idea that behavioral intent is more reliable for respondents who indicated that they would ride everyday.
3. 42 percent had a car available.
4. 54 percent were males. This is interesting because males outnumbered females by 5 to 1 in the group expressing an intent to ride transit in the pretransit survey.
5. 29 percent were black, 58 percent were white, and 14 percent were others.
6. Most of the ridership was during the morning peak.

SUMMARY AND CONCLUSIONS

Previous research examining some methods for predicting behavior with questionnaires has been reviewed and a conceptual framework (Figure 1) outlining the various types of factors that have been used to assess behavioral intent has been described. Such research indicates that the percentage expressing positive intentions to use transit must be divided by a number between 3 and 5 to mirror actual behavior. The results of two surveys have also been reported. The pretransit survey was conducted in 1983, just before the opening of Metrorail in Miami (Dade County). The posttransit survey was conducted in 1987.

Just before Metrorail opened in Miami, ridership projections for the system indicated that (depending on pricing assumptions) as many as 202,000 riders might use the system daily. A pretransit survey was undertaken on the UM main campus in April 1983 of administrators, faculty, staff, and students to discern the probability that each group would take Metrorail to campus. The overall conclusion from this study was that 5,800 persons expressed an intention to access campus using Metrorail at least "once a month or less." Applying a rule from the literature and survey information concerning projected frequency of use led to a prediction of 427 riders expected on a randomly selected weekday.

In 1987, an intercept survey (the posttransit survey) was conducted at the UM Metrorail station. All persons disembarking Metrorail and entering university property were counted as using Metrorail to access the campus. An attempt was made to interview each of these persons. Approximately 313 interviews were completed.

The results of the posttransit survey indicate that only about 350 persons were riding Metrorail to UM each day in 1987, quite close to the 427 passengers predicted by the model, particularly because respondents in 1983 were asked to assess the likelihood that they would ride a system with which no one was yet familiar. These results are encouraging for the continued use of behavioral intent questions in predicting transit ridership.

Clearly, in spite of advances in transportation modeling, transportation planners still do not have a series of models that make accurate predictions of travel demand and modal split. The results clearly argue for further research into the use of behavioral intention questions in modal choice modeling.

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