INTERACTIONS OF TRANSPORTATION AND TELECOMMUNICATIONS BEHAVIORS

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16. Abstract

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In the empirical part of this project, two major field studies were completed. The first of these was a survey of URI students, probing their car travel, carpool, bus use, and Internet use behaviors. The students were surveyed first by telephone, selected randomly from a list obtained from the Registrar's office. A total of 220 students responded to the telephone survey. Characteristics of the telephone survey respondents are shown in Appendix B. This was supplemented by an in-class survey of 107 students conveniently selected from the courses taught by the research faculty. This supplementary questionnaire probed the students more deeply regarding their motivations for transportation and technology use issues.

The second major field study was a mail survey of southern Rhode Island residents. In this survey, we not only investigated actual travel and transport behaviors but also measured attitudes towards the environment and alternative transport and telecommuting solutions. At the time of writing this report, about 850 individuals had responded to our mail questionnaire. Characteristics of the resident sample are described in Appendix B. The results have laid the groundwork for our second year project where we plan to study the impact of specific interventions on transportation and telecommuting attitudes and intentions.

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Interactions of Transportation and Telecommunications Behaviors

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Interactions of Transportation and Telecommunications Behaviors in relation to RIIR: Modeling the User Perspective

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Interactions of Transportation and Telecommunications Behaviors
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Abstract

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TRB Keywords: Transportation Policy, Telecommuting, Telematics, Telecommunications, Telework, Electronic Commerce, E-commerce, Travel Behavior; Mode Choice, Consumer, User, Retailing, Distance Education, Logistics, Land Use Planning, History, Rhode Island, New England.

Project Description

With the population growth in Southern Rhode Island towns, along with attendant growth in retail activities, traffic problems have increased (Davis 1999). The building of an 8000-seat sports arena at the University of Rhode Island (URI) would put additional strain on Routes 138 and 108, the main routes near URI. In the efforts being made by URITC, RIDOT, and town planners to seek solutions to these problems, the understanding of behaviors of users is critical. This project examined the existing literature on transport-telecom interactions and conducted two surveys of transportation users in southern Rhode Island. The results are expected to lead to a better understanding of behaviorally oriented policy options to solve the region's traffic problems.

Four members of the team that proposed this project started working on the problem of linking transportation behavior to telecommunications technology in January 2000. Our work in 2000 focused on surveys of two groups of users of the road infrastructure in South County: URI students and residents of South County.

The first survey of our Year 1 URITC project in Spring 2000 examined the use of South County road systems by URI students, and explored possible ways of encouraging telecommuting and distance education methods. Some preliminary results from this survey are presented in the next section.

The second survey, conducted in Fall 2000, focused on the telecom and transport behavior of area residents. Among other things, this survey examined the use of telecom and transport modes for commuting to work as well as for accessing retail and financial services.

An additional survey of URI students was conducted to clarify some of the findings of the telephone-based student survey. In particular the focus was on individual differences in attitudes towards the environment, life satisfaction, and transportation, personality variables, and the use of information technologies.

Figure 1: Regional Focus of the Study: Southern Rhode Island
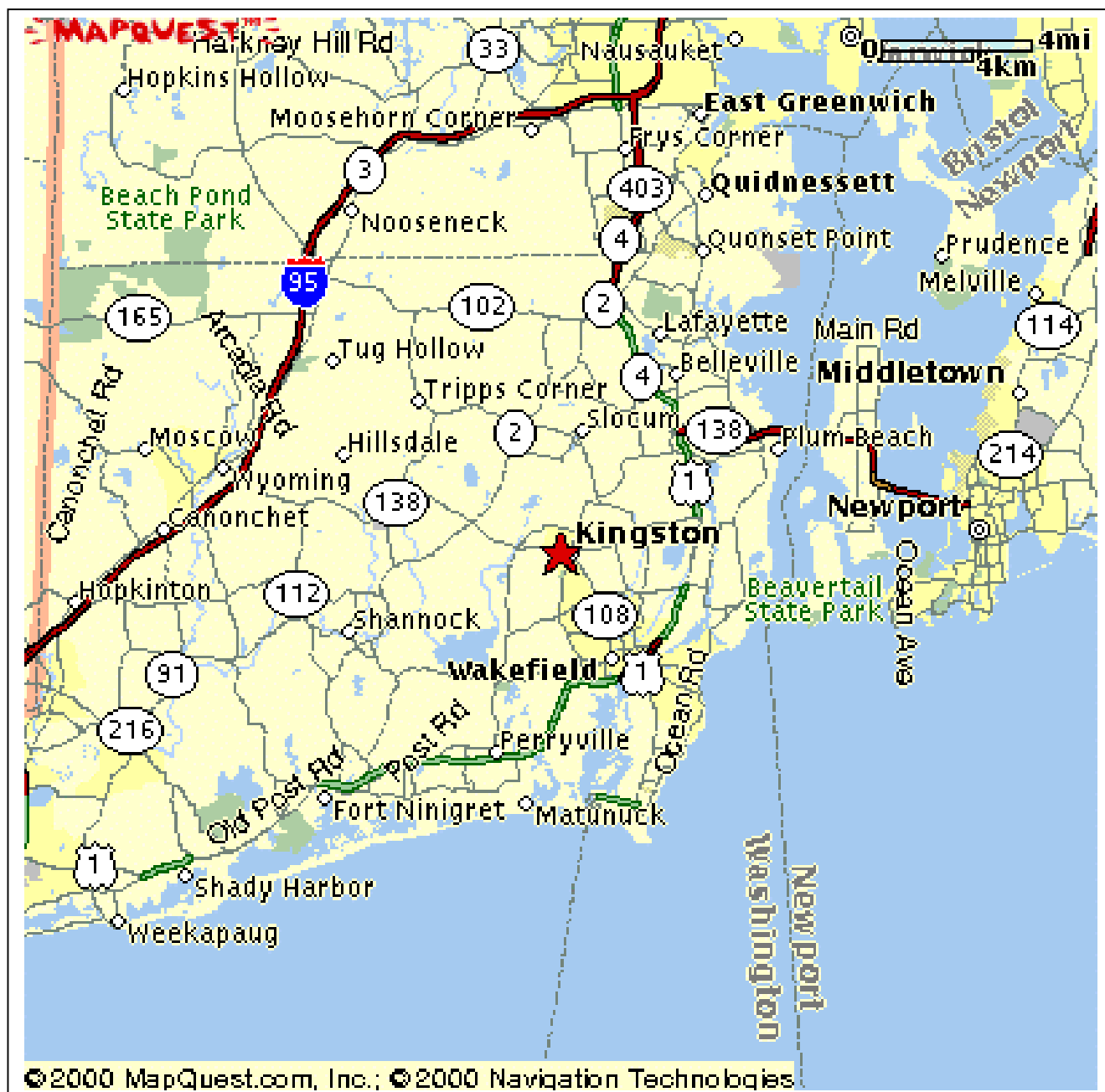
Project Objective

The objective of this project was to build a behavioral knowledge base about the actual and intended transport and telecommunications behaviors of the users.

Modal Orientation of the Project

The project studied multiple transport modes: private automobiles, carpools, buses, vans, and bicycles. A primary thrust of this research was to assess the actual or intended use of "electronic" modes using telecommunications, and to study the substitution and stimulation effects of the electronic modes with respect to the physical modes (Niles 1997, 1998, Niles and Nelson 1999, Pratt 1997).

Task Descriptions

The main tasks for this project are outlined in Figure 2. We followed the task sequence as we had visualized, with some adjustments to the original timeline.

Figure 2: Main Sequence of Project Tasks

TASKS IN THIS PROJECT

1. Background research: Interactions of telecommunications and transportation
2. Development of draft survey and sampling plan for URI student commuters
3. Finalizing survey instrument and sampling plan for study of URI student commuters
4. Field survey of URI student commuters
5. Analyzing survey data from URI student commuters
6. Development of supplemental survey of URI students
7. Administration of supplemental URI student survey
8. Draft working paper on interactions of transportation and telecommunications in the Rhode Island economy
9. Development of draft survey and sampling plan for Southern Rhode Island residents
10. Finalizing survey instrument and sampling plan for study of Southern Rhode Island residents
11. Field survey of Southern Rhode Island residents
12. Analyzing survey data from Southern Rhode Island residents
13. Writing and review of the first partial draft of the report, including results of the URI student surveys.
14. Writing of the first Working Papers emerging from this project.
15. Writing and review of the first complete draft of the report, including results of surveys of both user groups
16. Writing of the second round of Working Papers emerging from this project.
17. Development and presentation of conference and publishable papers and book chapters emerging from this project.
18. Finalizing the project report

Relationships to Other Projects

This project has served as a social science complement to the engineering studies supported by URITC. In particularly, our research team is working closely with the research team led by Dr. Joan Peckham of URI Computer Science Department, Dr. Chris Hunter of URI Civil Engineering Department, and Ms. Cynthia Levesque of RIDOT. In this related project, the researchers are developing real-time data representations of the traffic flow on major Rhode Island roadways. In our future year-2 work for URITC, we plan to utilize the real-time data on traffic flows as a way to influence travel behaviors.

Contributions of the Project

Building a Knowledge Base

The most important contribution of this project has been the development of a behavioral knowledge base to support potential policy interventions in areas such as telecommuting, Internet-based travel information systems, Internet-based carpool and flex-bus systems, and ITS messaging via highway signs. The databases resulting from the survey provide a rich source for building projective models for doing "what-if" style analysis of various proposed transportation-related policies. It is hoped that the combined results of this and other URITC projects will help in solving traffic and land use problems of this region.

Technology Transfer

This project team is working with RIDOT, in particular with Ms. Cynthia Levesque, to utilize their real-time traffic flow data to influence the behavior of travelers. In collaboration with RIDOT, we hope to develop effective user-directed communications via traditional media, the Internet, and ITS so as to induce salutary changes in travel behaviors. By salutary changes we mean those behavioral changes that mitigate congestion and/or improve the quality of life and quality of the environment.

Diversity and Student Involvement

The research team for this project was diverse. Students at the graduate and undergraduate levels provided support to various aspects of the project: literature review, software support, website design and maintenance, fieldwork, data entry and analysis, and preparing presentations and outreach materials.

	NAME	UNDERREPRESENTED GROUP
GRADUATE STUDENTS:	Miao Zhao	Woman
	Zhenhong Hu	Woman
	Barbara Braswell	Woman
	Courtenay Dubois	Woman
	Amy Michaels	Woman
UNDERGRADUATE STUDENTS*	Mark Satgunam	Asian American
	Mike Fitzgerald	
	Kristen Chudy	Woman
	Yanik Archer	African American
	Michael Martone	
	Phil Callahan	

*A number of other undergraduates were involved in background research and development of research instruments.

Selected Results from Surveys

URI Student Survey

In April 2000, a telephone survey of URI students regarding travel patterns and alternative transportation modes was conducted on URI Kingston campus. A total of 220 usable questionnaires were completed. Of these, 138 (68%) drove their own car to campus and 58 (29%) walked. There was minimal use of car pools or RIPTA buses to travel to campus.

In terms of current behaviors and future intentions, we found that most URI students are unwilling to use carpool or public transportation to travel to campus. Specifically, 154 (77%) have no intentions; 16 (8%) have intentions; and 29 (15%) currently use carpool or public transportation. In terms of changing behaviors, the primary target would be the large group of students who currently have no intentions to carpool or use public transportation.

The primary reason for current carpool/public transportation use behavior may be explained by the importance assigned to saving money. Students who currently carpool find saving money is important while students who have no intentions to carpool don't find saving money as very important. Chi-square tests indicated that this relationship is very significant ($p<.00$).

To carpool or use public transportation, it is [importance level] that I save money	*Not Important/ Slightly Important*	*Somewhat Important*	*Very / Extremely Important*
Currently Carpool	21%	10%	69%
No Intentions to Carpool	47%	25%	28%

In comparison to carpool/public transportation, more URI students are interested in the use of Internet/World Wide Web in order to avoid traveling to campus. Twenty-eight percent of students said they are currently using Internet / WWW to avoid traveling to campus; another 7 percent are interested in doing so in the near future. The motivation to save money seem to be driving the intentions and behaviors to use the Internet / WWW also.

To use Internet/WWW to avoid traveling to URI, it is [importance level that I save money	*Not Important/ Slightly Important*	*Somewhat Important*	*Very / Extremely Important*
Currently Using Internet/WWW	25%	29%	46%
No intentions to use	49%	22%	29%

Supplementary Student Survey

To understand the motivations underlying student responses, a supplementary questionnaire was developed and administered in class. A total of 107 students participated in this survey. The gender composition of the two student samples is comparable. The in-class survey generated responses

from students who were almost all juniors and seniors at URI, almost exclusively full-time students and proportionately more out-of-state students in comparison to the telephone sample.

Preliminary analysis supports the economic motivations for changing transportation behaviors. Although most of them drove their own cars and show little interest in carpooling or using public transportation, economic incentives are more likely to induce a change in behavior. Discounts on gas and other items are attractive to everybody, including those who show little interest in car pool or public transportation. Convenience-oriented changes such as easy-to-create car pools are less likely to change transportation behaviors. Incentives that are directed to change car use behaviors appear to be more attractive than incentives to promote bus use through lower bus fares or easily available bus schedules.

Likely/very likely to use car pool or public transportation if any of the following changes occurred? ↓	No interest in car pool or public transportation	Future intentions	Currently using
Discounts on gas & other items	47.6%	77.3%	70.0%
Lower bridge & highway tolls	22.2%	45.4%	47.3%
Easy to create car pools	21.0%	40.9%	35.0%
Special car pool lanes	33.9%	31.8%	45.0%
Lower bus fares	8.0%	27.3%	35.0%
Easily available bus schedules	9.5%	22.7%	35.0%

In-state and out-of-state students differ considerably in their perception of local problems. In comparison to out-of-state students, Rhode Island students are concerned with the growth in traffic congestion, the condition of the existing roads and highways and about having a good public transportation system.

Concerned or extremely concerned with ↓	In-state students	Out-of-state students
Growth in traffic congestion	76.0%	54.5%
Conditions of existing roads and highways	74.5%	60.0%
Having good public transportation	52.9%	29.7%

Some of these in-state and out-of-state differences also affect the perception of various incentives that can be offered to change transportation behaviors. In general, in-state students are less likely to respond to the incentives than out-of-state students except in the creation of special car pool lanes on I-95 and I-195. Discounts on gas and other items as well as lower bridge and highway tolls are more attractive to out-of-state students. While bus-related incentives were less attractive to students in general, they are particularly unattractive to in-state students.

Likely/very likely to use car pool or public transportation if any of the following changes occurred? ↓	In-state students	Out-of-state students
Discounts on gas & other items	54.0%	63.6%
Lower Bridge & Highway Tolls	20.0%	42.6%
Easy to create car pools	28.0%	27.8%
Special car pool lanes	38.0%	33.4%
Lower bus fares	12.0%	23.7%
Easily available bus schedules	10.0%	25.4%

Southern Rhode Island Resident Survey

In Fall 2000, a mail questionnaire was developed, pre-tested, and finalized. The questionnaire includes four sections: opinions and beliefs on quality of life and economic development, travel behavior patterns, computer and technology use patterns, and demographic characteristics. At the end of the questionnaire, the respondents were also asked if they want to join a research panel to be formed for year-2 URITC research project of this team. In January 2001, 5000 questionnaires were mailed to the residents of five cities in Southern Rhode Island. As of March 6, 2001, 833 usable questionnaires were returned. As of the writing of this report, more questionnaires were still being returned. Also, the research team has sent the same questionnaire to about 2000 URI faculty and staff to increase the sample size surveyed. The following are some findings based on the preliminary analyses.

Among the 833 respondents, 76% drive their own cars to work, and 97% drive their own car for shopping. Seventy-one percent are currently employed outside of the home. Seventy-six percent currently have access to Internet.

Among the respondents who work outside of the home, only 39 people or about 7% carpool or use public transportation to travel to work. Future interest in carpool or public transportation is also minimal: only 27 people responded "yes" to this question. In exploring why most people do not want to carpool or use public transportation, it appears that paying for parking, travel time, and travel distance affect people's use or intention to use carpool and public transportation. For example, 47% of the respondents who have to pay for parking at work said that they use or intend to use carpool and public transportation, while only 10% said so when they park free at work. Respondents whose travel to work time is longer than 30 minutes or travel distance is longer than 25 miles are more likely to report using or intending to use carpool or public transportation than those whose travel time or distance is shorter.

As in the student surveys, the number one incentive liked by the respondents is discounts on gas and other items. The resident population was also interested in easily available bus schedules and easy-to-create car pool arrangements. The following are percentages of various scenarios:

How likely are you to use carpool or public transportation or bike if any of the following changes occurred?	Very likely or likely
Discounts on gas and other items for using carpools/public transportation/bicycles	25%
Easily available bus schedule	21%
Easy-to-create car pools	18%
Safe bike paths	16%
Special carpool lanes on I-95/I-195	12%
Lower bus fares	10%
Higher parking fees	9%
Lower bridge and highway tolls	7%

Grouping the above incentives into two categories - driving-related and alternative transport modes (bus, bike) - provides additional insights. Respondents who are more concerned about quality of life are more likely to respond to both types of incentives. For example, 42% of respondents who expressed concerns about quality of life items were more likely to respond to driving-related incentives, compared to only 33% who were less concerned about the quality of life. A similar pattern is evident for alternative transport modes. Among our respondents, 38% of those concerned about

quality of life were likely to respond to incentives related to alternative transport mode; only 27% were so inclined among those less concerned about the quality of life. In addition, respondents who believe individuals could do something to help protect the environment (Q2) were more likely to respond to the two groups of incentives than those who did not share the same belief.

Use of the Internet to avoid travel to work is negligible; only 34 people, or about 6%, said they engaged in this behavior. Future intentions are also minimal; only 23 people indicated they might use Internet to substitute for traveling to work. Two factors – company encouragement of telecommuting and flexible work schedule – emerge as potential reasons for this lack of interest. For instance, 34% of respondents whose companies encourage telecommuting reported using or intending to use the Internet to substitute for traveling to work, while only 5% of those whose companies did not encourage telecommuting did so. Fourteen percent of the respondents who had more flexible work schedules reported using or intending to use the Internet for travel substitution, compared to 10% of those who had less flexible schedules and 1% of those who had fixed schedules.

Appendix A: Selected Working Papers

Data analyses as well as conceptual work based on this project are ongoing at the time of writing this report. While we expect additional publishable contributions, here we present two papers that have already been written based on this project.

The Impact of Retail E-Commerce on Transportation: A Conceptual Framework

[Because it is being reviewed in Europe, this paper uses UK English as the language.]

Introduction

Economic growth during the past several decades has caused traffic and pollution problems in many parts of the world. For example:

- Many low-population density areas in the New England region of USA have gone through a tremendous period of growth, resulting in problems of traffic congestion and environmental pollution that were unknown previously.
- China's rapidly developing economy is facing major problems of environmental air pollution (World Bank 1997, p.6). As the rising proportion of China's 1.2 billion people take to the road in their private cars, the problems of traffic congestion and pollution.
- Germany is more densely populated than the U.S., and has been confronted with traffic congestion and related pollution issues for decades. Political agencies have been more proactive than in the U.S. in terms of encouraging public transportation, controlling urban sprawl, raising gasoline taxes, creating pedestrian and bicycle zones and paths. Nevertheless, automobile use is at an all-time high, and still increasing. Individuals accept longer commutes, and with the spreading just-in-time supply chain management freight traffic is moving from rail to trucks.

While reengineering of traffic systems may address some the problems of traffic flow and environmental degradation, e-commerce has the potential to enhance quality of life in these regions through trip reduction as well as trip rationalisation behaviors. E-shopping could reduce trips and trip-miles expended in shopping and Internet-delivered information could encourage choice of alternate times, routes, and modes of transportation for shopping activities.

Telecommunications – including established broadcast media and the new Internet media – can substitute for physical transportation as well as stimulate it (Niles 1994, 1997, 1998). "Virtual" communication behaviors, facilitated by information technologies, could replace numerous activities that previously required physical travel. Of special significance are the technologies for teleworking, telecommuting (Garhammer and Mundorf 1997), distance learning, home shopping, information retrieval and home-based electronic entertainment. Travel reduction, however, is not the only possible consequence of telecommunications. Ubiquitous availability of information technology, especially mobile communications, can make people footloose and some travel may increase. Besides trip reduction and trip stimulation, another possible outcome is trip rationalisation. Information delivered in a timely, anticipatory manner using telecommunications may modify short-term transport behaviors such as route choice and timing of trips.

In this paper we focus on the impact of retail e-commerce on transportation. The paper is part of an ongoing, multiyear, multidisciplinary study of the relationships between transportation and telecommunications sponsored by the U. S. Department of Transportation and being conducted at a university in USA. This paper is the first attempt to formulate a conceptual framework that addresses the impact of retail e-commerce on people's transportation patterns.

Conceptual Framework

Forrester Research (1998) classified online shopping into three categories: (1) discretionary purchases of low-cost, convenience items (books, music, apparel and flowers); (2) replenishment goods with moderate cost and high frequency of purchases (groceries and personal care items); and (3) higher cost, information driven and planned purchases (airline tickets, computers, and automobiles). Drawing from and extending the Ghosh's (1990) work on retail store attributes, nine attributes appear relevant for characterizing various online retailers: geography, accessibility, atmosphere, service/experiential convenience, speed of acquisition, price across brands, assortment, security, information availability, customization/ personalization. For the purpose of this paper, based on the established retailing concepts (Ghosh 1990) and the emerging e-tailing classifications (Forrester Research 1998), we deploy four factors to classify product categories: physical good or service, importance of physical contact, price of the offering, and shopping frequency. Table 1 presents detailed definitions and examples.

Table 1. Definitions of Product Categories

No.	Classifying factor:				Examples
	Physical Good or Service	Importance of Physical Contact	Price of the Offering	Shopping Frequency	
1	Good	High	High	Low	Automobile, Jewelery
2	Good	High	Low	High	Everyday clothing
3	Good	High	Low	Low	Contact lenses
4	Good	Low	High	Low	Computer, Printer
5	Good	Low	Low	High	Groceries
6	Good	Low	Low	Low	Hardware, Books
7	Service	High	High	Low	Tattoo, Spa massage
8	Service	High	Low	High	Haircut
9	Service	High	Low	Low	Ear piercing
10	Service	Low	High	High	Air ticket booking
11	Service	Low	High	Low	Cruise booking
12	Service	Low	Low	High	Movie
13	Service	Low	Low	Low	Museum visit

It should be noted that Table 1 is not exhaustive. Three possible categories, for example, are not mentioned: (1) Good, physical contact important, high cost, high frequency, (2) Good, physical contact not important, high cost, high frequency, and (3) service, personal contact important, high cost, high frequency. While these may be relevant to certain very affluent segments, average consumers rarely use these categories.

A core premise of our conceptual framework is that the substitution of physical shopping by electronic shopping will depend on the relative hedonic values of these shopping activities. To compare physical and electronic shopping in terms of their hedonic values for different categories of consumer goods and services, we focused on five effort-intensive characteristics of these shopping trips: price comparison, time needed for shopping (including research), product information other than price, interpersonal interaction, and access to the store. For convenience, we use the term p-shopping for physical shopping and e-shopping for electronic shopping. We rated these five characteristics of shopping for each category of consumer products in the p-shopping as well as e-shopping modes. Since the rating is subjective and heuristic, we employed a simple rating method in which -1 represents a negative hedonic value, 1 represents a positive value, and 0 represents a neutral state.

We made several assumptions to rate these product categories. For example, we assumed that consumers would have a hard time comparing prices in p-shopping. Price paid for a product detracts from its hedonic value. Hence, for high-priced products the score of -1 is assigned and for low-priced products the score of 0 is assigned. Going to p-shopping takes time; thus all categories of products are assigned -1 in terms of "time needed for shopping". For services, consumers must eventually go to the shop or service center to receive services; thus all types of services are assigned 0. In p-shopping, consumers can get detailed information about the brands carried by the store. In addition, we assume consumers have enough about the information regarding frequently purchased products; thus, frequently purchased products are assigned 0 and less frequently purchased products are assigned 1. Some products need interactions with sales people and commodities (e.g., trying on a garment) or services people (receiving a massage). These products that need physical contacts are assigned 1 and other products are assigned 0. We assume consumers have better access to stores that offer frequently purchased products (assigned 0) and less access to stores that offer less frequently purchased products (assigned –1).

Table 2. Hedonic Assessment of Physical Shopping Trips

Type of Shopping Trip[*]	Characteristics of the Trip (Trip Rating: -1=Negative, 0=Neutal, 1=Positive)					Hedonic Index of Trip
	Price Comparison	Time Needed	Information Needed	Interpersonal Interaction	Access to store	
1	-1	-1	1	1	-1	-1
2	0	-1	0	1	0	0
3	0	-1	1	1	-1	0
4	-1	-1	1	0	-1	-2
5	0	-1	0	0	0	-1
6	0	-1	1	0	-1	-1
7	-1	0	1	1	-1	0
8	0	0	0	1	0	1
9	0	0	1	1	-1	1
10	-1	0	0	0	0	-1
11	-1	0	1	0	-1	-1
12	0	0	0	0	0	0
13	0	0	1	0	-1	0

[*]*Note:* Trip type codes refer to the trip profiles in Table 1.

Using these assumptions, the hedonic indices of trips were calculated (Table 2). Table 3 rearranged shopping trips for different categories of products according their hedonic index scores.

Table 3. Hedonic Classification of Physical Shopping Trips

Physical Shopping Activities Classified by Hedonic Scores					
Low Hedonic Score		Medium Hedonic Score		High Hedonic Score	
Trip Type[*]	Score	Trip Type[*]	Score	Trip Type[*]	Score
4	-2	2	0	8	1
1	-1	3	0	9	1
5	-1	7	0		

6	-1	12	0		
10	-1	13	0		
11	-1				

Note: Trip type codes refer to the trip profiles in Table 1.

In the same manner, we assigned ratings for e-shopping activities. The results are shown in Table 4. For price comparison, we assigned 0 to frequently purchased products and 1 to less frequently purchased products. For time used for shopping, we assigned 1 for goods and 0 for all services. For product information, we assigned 0 to frequently purchased products and -1 to less frequently purchased products. For interpersonal interaction, we assigned -1 to products that physical contacts are important and 0 to other products. For accessibility, we assigned 1 to all commodities and -1 to all services. Table 5 rearranges e-shopping activities based on their hedonic index scores.

Table 4. Hedonic Assessment of Electronic Shopping Trips

Type of Shopping Trip*	Characteristics of the Trip (Trip Rating: -1=Negative, 0=Neutal, 1=Positive)					Hedonic Index of Trip
	Price Comparison	Time Needed	Information Needed	Interpersonal Interaction	Access to store	
1	1	1	-1	-1	1	1
2	0	1	0	-1	1	1
3	0	1	-1	-1	1	0
4	1	1	-1	0	1	2
5	0	1	0	0	1	2
6	0	1	-1	0	1	1
7	1	0	-1	-1	-1	-2
8	0	0	0	-1	-1	-2
9	0	0	-1	-1	-1	-3
10	1	0	0	0	-1	0
11	1	0	-1	0	-1	-1
12	0	0	0	0	-1	-1
13	0	0	-1	0	-1	-2

Note: Trip type codes refer to the trip profiles in Table 1.

Table 5. Hedonic Classification of Electronic Shopping Trips

Electronic Shopping Activities Classified by Hedonic Scores					
Low Hedonic Score		Medium Hedonic Score		High Hedonic Score	
Trip Type*	Score	Trip Type*	Score	Trip Type*	Score
9	-3	11	-1	4	2
7	-2	12	-1	5	2
8	-2	3	0	6	2
13	-2	10	0	1	1
				2	1

Note: Trip type codes refer to the trip profiles in Table 1.

E-Commerce and Transport Interactions

Tables 3 and 5 classified p-shopping and e-shopping activities into categories with low, medium, and high hedonic scores. Table 6 combines the results of Table 3 and 5.

Table 6. E-Shopping and P-Shopping Trips[*]: Hypothesized Interactions

		Hedonic score of e-shopping experience is		
		LOW	**MEDIUM**	*HIGH*
Hedonic score of p-shopping experience is	**LOW**		**10, 11**	**1, 4, 5, 6**
	MEDIUM	**7, 13**	**3, 12**	**2**
	HIGH	**8, 9**		

[*]***Note:*** Trip type codes refer to the trip profiles in Table 1.

Substitution Effects

According to Table 6, we believe that products that have high or medium e-shopping and low p-shopping hedonic values could reduce consumer travelling to the store. These are trips to purchase product categories 1, 2, 4, 5, and 6. Examples include automobile, clothing, computer, groceries, and books. If the substitution effect happens, consumers would reduce their travel for shopping substantially. For products that have low e-shopping and high p-shopping hedonic values, however, e-commerce would have little substitution effects for travel. These are product categories 8 and 9 and examples include getting a haircut or getting one's ears pierced.

Rationalization Effects

Rationalization refers to the situation in which consumers modify their shopping trips with assistance of Internet and e-shopping. The modification could be changing the length of a trip, frequency of trips, timing of a trip, route of a trip, and mode of a trip (driving or riding bus) (Niles, 1997). Rationalization could reduce total travel. Consumers could do online research for high cost products for price comparison and other information before the purchase. For products where physical contact is important, consumers could do online information and price research first, then go to desirable shops to test and buy the product. E-shopping has limitations in delivering services to consumers; especially services that occur in different locations and need intensive interpersonal interactions. Consumers could use two-step shopping for services. First they can do online research to compare services and even electronically purchase the package judged the best. Then they can go to the service center or location to receive the service. E-shopping for products with medium e-shopping and medium p-shopping hedonic values (m-m profile) or other similar combinations, such as m-l, and l-m, should have rationalization effects. According to Table 6, these products include categories 3, 7, 10, 11, 12, 13. Examples could be contact lens, tattoo, air ticket, cruise, movies, and museum. Thus, the rationalization effect may reduce the total trips for shopping because it could reduce the trips for information search and ticket purchase.

Stimulation Effects

In most instances, transportation planners are not interested in stimulating user behavior that leads to additional trips and could cause traffic problems. Usage of the new Internet and wireless media (and e-commerce activities using such media), however, could *sometimes* have the intended or unintended consequence of stimulating greater numbers of trips. If products have high hedonic values in both p-shopping and e-shopping, e-shopping may stimulate p-shopping and result in travel. While no product in Table 6 fell in this category, it is only a matter of time before multimedia e-commerce technologies would evolve in ways that could induce more travel.

Macro-systemic Effects

So far, we have only looked at the potential impact of retail e-commerce on physical travel by the shoppers. E-commerce, however, also affects the logistics of the retail supply chain. Instead of big shopping centers, e-commerce encourages the location of supply centers in low-rent areas with good shipping access. Also, instead of individual consumers making trips to the stores, there are trips made by delivery vans to the neighborhood. Thus, the total trip reduction would be the difference between the reduced consumer trips and increased delivery trips caused by e-commerce in a certain area. E-shopping has advantages in busy holiday seasons in terms of time saving and accessibility. Thus, the availability of e-commerce in holiday seasons might mitigate traffic jams caused by holiday shoppers in commercial zones.

Individual Differences

Individual consumer characteristics could also affect the choice of p-shopping and e-shopping. Early profiles indicate that men are more likely to go e-shopping and women to go p-shopping. Computer literate people might like e-shopping. Outgoing people might like p-shopping and introverts may like e-shopping. Consumers who lack computer and Internet access are unlikely to do e-shopping unless kiosks are provided. Consumers who perceive using credit card online is insecure are less likely to use e-shopping. Thus, demographics of a population might affect the extent of the impact of e-commerce on people's travel patterns.

Summary and Conclusions

In those regions of the world where there is old, established and often congested road infrastructure, any e-commerce-based methods that could lead to trip reduction and/or trip rationalization can contribute to an improvement in the quality of life. In those regions of the world where new road infrastructure is being built, or could potentially be built, it is important for transportation planners and new media and e-commerce planners to develop mutually supportive systems that avoid the problems of congestion and pollution. While preliminary, this conceptual framework helps in understanding the relationships between e-commerce activities and physical travel.

The Impact of Internet on Travel Decisions: Results from a Student Commuter Survey at a U.S. University

Introduction

Previous travel surveys have focused on characteristics of traveler behaviors, such as travel mode, travel time, and departure time; and on environmental and institutional factors that affect travel behaviors, such as weather and work schedule (see Spyridakis, Barfield, Conquest, Haselforn & Isakson 1991 for a survey of earlier studies and see De Palma & Rochat 1999 for a survey of recent studies; also see Chin 1990). Previous theoretical work on transportation behavior has focused on creating models for congestion, scheduling, and travel time savings (Arnott, De Palma & Lindsey 1993; Jara-Diaz 1990; Small 1982; Vickrey 1969). Some transportation researchers have drawn attention to telecommunications, an emerging institutional factor that may affect travel behavior. Mokhtarian (1990) developed a typology of relationship between telecommunications and transportation. She also used two telecommuting programs in San Diego, USA, to illustrate a variety of transportation-related impacts of telecommuting (Mokhtarian 1997). Interesting issues associated with understanding how travelers perceive and respond to the attributes of the technology including telecommunications should be researched (Lee-Gosselin & Pas 1997).

This paper focuses on the impact of telecommunications on travel behavior. Specifically, we first discuss theoretically the impact of IT-based distant education on travel behavior based on the theory proposed by Mokhtarian (1990). Then we report perceptions of a sample of student commuters at a U.S. university regarding the impact of distance education on their travel patterns. Using student commuters for this research has several advantages. College students can be considered lead users of Internet applications, with close to 100% Internet access. Also, many college students tend to have greater lifestyle flexibility compared to other populations, which might encourage experimentation with alternative work styles. Finally, IT adoption and use are traditionally related negatively to age and positively to education, making college students a prime group of adopters of distance learning methods.

The paper is organized in the following way. Section two theoretically discusses the relationship between IT-based distant education and transportation. Section three reports the survey method and section four discusses findings from a survey among student commuters at a U.S. university regarding their perceptions of the impacts of telecommunications on their travel patterns. Section five concludes the paper.

Distant Education and Transportation

The concept of distance education has been in existence for more than a century in terms of correspondence courses, and later through the use of radio, television, and the videotape players. The widespread availability of computers in schools and homes and of satellite and videoconferencing technology offer prospects for extending interactive distance learning to large parts of the population. Interactive evening or weekend courses can make it easier for employees to improve their skills without the inconvenience of additional travel (Patterson 1999).

The majority of four-year colleges and universities now offer distance education. Several institutions currently offer degree programs entirely at a distance (Goldberg, 1998). Interactive technologies are popular in that they offer students far greater control over the learning process than is possible in traditional learning environments. Most previous studies focused on the effectiveness of distance education compared to traditional classroom education. The conclusion of most studies was

that distance learning should enhance, complement and expand education options as it can lead to achievement levels that are at least comparable to traditional instruction in most academic circumstances. Face-to-face complements however, add to the quality of the classroom experience, at least for younger students(Cavanaugh 1999; Decker, Vega, Shallit & Wills 2000; Hecht & Klass 1999; Hodge-Hardin 1997). While there is considerable research on distance learning, the issue of reducing travel through distance learning has not been addressed in a satisfactory way. As part of a general program of research on telecommunications and travel behavior, our study focused strongly on this issue.

Mokhtarian (1990) conceptually discussed the variety of demand and supply relationships between telecommunications and transportation. She used tele-education as one of the examples to demonstrate the substitution impact of telecommunications on the demand for transportation, but also argues that telecommunications can stimulate travel. She considered that all communications require some form of transportation. Such transportation may take one or more of three forms: (i) transportation of people to meet fact-to-face; (ii) transportation of objects, such as letters, books, newspapers, etc.; and or (iii) transportation of electronic impulses. She used historical, anecdotal, abstract, and hypothetical examples to support her hypothesized theory: the actual amount of personal travel increases as part of a general expansion in communications, even though transportation's share *as a mode of communications* declines.

For student populations, traditional education modes need to transport students from home to classroom while distant education could eliminate most such trips to university classrooms. In this case, distance education reduces this type of travel. Distant education, however, could also stimulate travels in several ways. As suggested by Mokhtarian (1990), telecommunications could have short-term direct, short-term indirect, and long-term effects. In the case of distance education, time saved traveling to school could be used for traveling to other places (short-term indirect). Telecommunications, for example, may make students better informed about on-campus events and activities and may encourage them to travel to campus to attend such events. Mokhtarian labeled this as short-term direct effect but it may be better labeled as spillover effect. In the long term, universities that offer distant education may reach students they never possibly reached in the traditional education modes. That, in turn, may stimulate travels since even perfect distant education requires occasional travel to campus. For example, students enrolled in online courses usually have to meet the instructors face-to-face to get specific instructions and to become familiar with the procedures in the first few weeks of the school year.

Farrell (1999) discusses factors facilitating and inhibiting the development of virtual classrooms. These factors indicate particular demographics of people who have higher demand for distant education: those who are isolated due to physical location or reduced mobility, have expectations of cost reductions, and have access to networks. Factors that are related to demand for distance education could also be monetary costs, time costs, and other psychological costs. Investigating perceptions and willingness to use telecommunications technologies to substitute for education-related travel would help better understand travel behaviors and facilitate transportation planning. In the following, we will report findings from a sample of American college students regarding these issues.

The Survey Method

<u>The Context of Survey Location</u>
Many students live and work off-campus and thus travel frequently. For many colleges in rural areas, travel to and from the campus can exacerbate traffic problems on roadways designed for light rural traffic. Such is the case at the University of Rhode Island where commuter students have a major

impact on traffic in rural southern Rhode Island, especially in the town of South Kingstown. Findings from this study are expected to contribute to the state and university traffic plans and help in the reconstruction of routes and parking arrangements at the university and surrounding area.

While some institutions are offering full-fledged distance learning programs, including online degrees, the majority of postsecondary institutions have adopted the concept only gradually. Initially, online courses were mainly targeted to part-time students with full-time jobs. The reach has expanded to the student body at large. At the University of Rhode Island, for instance, Web-based courses during the summer attract considerable numbers of out-of-state full-time students. Many students submit their assignments and comments from home.

Another format has been courses that rely on videoconferencing. At the University of Rhode Island, such courses are usually taught at the rural main campus and transmitted to the urban satellite campus. Highly specialized courses (e.g., nursing) are even transmitted to a network of regional universities. These courses currently use compressed video; however, desktop video is a feasible alternative given adequate transmission speeds.

Aside from specifically designed distance learning classes, students use the Internet during the academic year in ways that may reduce their need to travel to campus. These include online registration, online library access, online contact with instructors, submission of assignments, class websites, and online course-related chat.

Data Collection

A team of four experienced researchers developed the questionnaire. It included questions regarding transportation and telecommunications behaviors, as well as demographics. The questionnaire was pre-tested and revised based on the pre-test. The registrar's office provided randomly generated 1,278 student telephone numbers. The phone numbers were sorted into five groups: graduate, senior/junior/on campus, senior/junior/off campus, freshman/sophomore/on campus, and freshman/sophomore/off campus. The groups were created based on housing patterns and level of education since these two variables were most likely to impact travel behavior. The telephone survey was conducted in April 2000, and took about 10 minutes to complete. Respondents were contacted by phone and quotas were established for each group. A total of 572 telephone connections were successfully established to complete 220 surveys. The overall response rate was 38.5%. Because the purpose of this study was to identify student intentions to use Internet-based education to substitute for travel to campus, we selected only off-campus students in the analyses, which resulted in a sample size of 155.

Findings
Descriptive Statistics
    Table 1 presents transportation behavior among off-campus students. 92.9% drive their own car most of the time to travel to class; 3.2% walk, while 3.9% use other means of transportation (bus, bicycle, carpool). Off-campus students seem to attend fewer days of classes a week and only 41.9% of off-campus students have five days of classes per week. Travel to class is high during the morning commute (7 to 9 a.m.), and peaks between 9 and 11 a.m., while return times peak between 2 and 4 p.m. Most off-campus students need 11-20 minutes to reach campus from their home, followed by "21-30 minutes" and "over 30 minutes" categories.

TABLE 1 *Frequencies of Student Transportation Behavior (N=155)*

Variable	Percentage
Transportation method	
Drive own car	92.9%
Walk	3.2
Other	3.9
Number of days going to class	
1 day/week	14.2%
2 days/week	13.5
3 days/week	15.5
4 days/week	12.9
5 days/week	41.9
Don't take class	1.9
Time gong to class	
7-9AM	31.1%
9-11AM	45.0
11AM-12noon	19.2
12-2PM	13.9
2-4PM	13.9
4-6PM	11.9
6-8PM	14.6
8-10PM	7.9
Time returning home	
9-11AM	0.0%
11AM-12PM	4.0
12-2PM	21.2
2-4PM	35.8
4-6PM	19.2
6-8PM	15.9
8-10PM	17.2
Number of minutes going to class from home	
<10 min	13.5%
10-20 min	37.4
21-30 min	25.8
>30 min	23.2

Table 2 presents student computer access and use behavior. Almost all (97.4%) of off-campus students have Internet access, and 85.2% of students have access to Internet from home. Computer accesses from home is mainly through dial-up modem (79.5%), followed by cable modem and Ethernet. Most students access Internet from only their residences (44.7%) or from both residences and labs (34.7%), while a significant minority use university computer labs (10%) exclusively.

We asked, "What are your primary uses of the Internet?" and provided twenty options. We regrouped the twenty options into six broader categories: communications (e-mail, Internet telephony), course-related (course-related assignments, exchange of files, research related to courses, course registration), information (news/discussion groups, read papers/ magazines, information search), e-commerce (banking/stock trading, shopping/ auction sites), entertainment (web surfing, chat rooms, online games, MP3/music, online travel), and other. The leading purposes of Internet use were

communications (72.9%) and course related (71.6%). Entertainment (32.3%), information (29.0%), and e-commerce (12.3%) were other prevalent usage purposes.

TABLE 2 *Frequencies of Student Computer Use Behavior (N=155)*

Variable	Percentage
Currently access internet	
Yes	97.4%
No	2.6
PC available at home	
`Yes, access to Internet	85.2%
˛Yes, but no access to Internet	2.5
No	12.3
Connection method	
Dial up modem	79.5%
Cable modem	11.4
ISDN	0.8
Ethernet	3.0
Don't know	5.3
Internet place	
University lab/library	10.0%
Work site	1.3
Home/dorm/fraternity/sorority	44.7
Lab and work	0.7
Lab and home	34.7
Work and home	2.0
Lab, work, and home	6.0
Internet purpose	
Communication	72.9%
Course-related	71.6
Information	29.0
E-commerce	12.3
Entertainment	32.3
Other	6.5
Currently take distance course	
No	95.5%
Yes	4.5
Number of days per week use PC at home	
Mean	6.17
S.D.	2.01
# of minutes per day access internet at home	
0	16.8%
1-30 min	40.0
31-60 min	25.8
61-90 min	9.7
91-120 min	3.2
121-180 min	1.9
>180 min	2.6

Only few sampled students (4.5%) took distance courses. Students used computers at home 6.17 days per week on average. Most students (40.0%) accessed Internet for 1 to 30 minutes a day, followed by 31-60 minutes per day (25.8%). Only 2.6% students accessed the Internet for more than 180 minutes a day.

Factors Associated with Using Internet to Substitute for Travel to Campus

To assess the potential of information technology to influence or substitute travel we asked the following question: "Do you use the Internet/World Wide Web so that you avoid traveling to campus now?" To identify factors that affect student use of the Internet for educational purposes, we conducted both bivariate and multivariate analyses. The key variable in this study was whether or not students use or intend to use the Internet or WWW to avoid traveling to campus. Five options were given to the student respondents:

0 - I DO NOT intend to use Internet/WWW to avoid travel to URI in the next academic year / Don't know

1 - I DO intend to use Internet/WWW to avoid travel in the next semester

2 - I DO intend to use Internet/WWW to avoid travel before the current Spring semester is over

3 - I have been using Internet/WWW to avoid travel since this semester started

4 - I have been using Internet/WWW to avoid travel since at least last semester

Because less than half of students selected options 1 to 4, we collapsed these categories into one, resulting in two groups: those with no intention to use the Internet/WWW and those who intend to use or actually use it. For convenience, we labeled the two groups as users (including respondents who currently use or intend to use Internet in the future) and nonusers.

TABLE 3 One Way ANOVA Results: Whether Or Not Use Internet/WWW To Avoid Traveling To Campus

Variable	Mean	Std. Dev.	F	p
# of days/week going to class			8.327	.004
nonusers	3.8876	1.5184		
users	3.1429	1.6349		
# of days/week using computer			7.546	.007
nonusers	4.7528	2.9166		
users	6.0000	2.5145		
Using internet can save money			13.659	.000
nonusers	2.27	1.36		
users	3.06	1.22		
Using internet can add flexibility			7.659	.006
nonusers	2.99	1.26		
users	3.51	.95		
Using internet can add choice			10.349	.002
nonusers	2.52	1.22		
users	3.17	1.28		

Note: this table reads, for example, students who have fewer days of classes weekly would be more likely than those who have more days of classes (3.14 vs. 3.89 days) to use or intend to use internet to avoid travel.

Using variables pertaining to student characteristics, travel patterns, computer use, and perceived importance of using Internet, we conducted bivariate analyses. One-way ANOVA was used if the behavioral variables were continuous and Chi-square tests were employed if they were categorical. Table 3 presents the ANOVA results and Table 4 presents the Chi-square test results. Only

statistically significant results (p<.05) are presented in the two tables. Among the key results were the following:

- The number of days per week going to class was negatively related to users of Internet substitution. Users went to class an average 3.1 days a week compared to nonusers at 3.9 days a week.

- The number of days of using the computer at home also seemed to have a positive effect. For example, among those interested in Internet substitution, computer use at home is 6.0 days a week, compared to the non-substitution group at 4.75 days a week.

- Perceived importance of using the Internet has a positive effect on Internet use. If students perceived that using the Internet to avoid traveling to campus could save money, add flexibility, and increase choices, they were more likely to use Internet to substitute for travel.

TABLE 4 Chi-Square Test Results: Whether Or Not Use Internet/WWW To Avoid Traveling To Campus

	Nonuser	User	χ^2	p
Student type			4.337	.029
Full time	63.8%	36.2%		
Part time	45.7	54.3		
Use internet for information			4.760	.023
No	63.7	36.3		
Yes	44.4	55.6		
Current take distance course			5.925	.020
No	60.7	39.3		
Yes	14.3	85.7		

Note: this table reads, for example, part time students are more likely than full time students (54.3% vs. 36.2%) to use or intend to use internet to avoid travel.

Table 4 presents the findings from the Chi-square tests:

- Part-time students were more likely to use the Internet for travel substitution than full time students. 54% of part-time students reported using or intending to use the Internet to avoid traveling to campus versus 36% of full-time students.

- Students who reported using the Internet to obtain information were more likely than others to use or intend to use the Internet to avoid traveling to campus (56% versus 36%).

- Those taking distance courses were more likely than others to use Internet to avoid traveling to campus (86% versus 39%).

The above bivariate analyses identified possible associations between substitution behavior or intentions and separate variables. We also conducted multivariate logistic analysis to examine whether these variables have effects on actual or intended substitution behaviors when they are regressed together. Table 5 presents the logistic analysis results.

When all these variables are considered together, two variables are still strongly statistically significant. These are: "perceived importance of saving money" and "use of Internet to obtain information."

- Students who feel that using Internet to avoid traveling to campus can save money were more likely than others to actually use or intend to use Internet to substitute for travel to campus.

TABLE 5 Logistic Regression Results: Whether Or Not Use Internet/WWW To Avoid Traveling To Campus

Variable	B	S.E.	p	Exp(B)
Number of days/week going to class	-.262	.153	.087	.770
Using Internet can save money	.367	.158	.020	1.443
Using Internet can add flexibility	.032	.228	.889	1.032
Using Internet can add choices	.226	.197	.252	1.253
Number of days/week using computer	.137	.072	.057	1.146
Full time student	-.009	.517	.986	.991
Use Internet to obtain information	.974	.414	.019	.378
Take distance course	1.466	1.140	.199	.231
N = 151				
-2 Log likelihood = 169				
Nagelkerke R Square = .29				

- Students who reported using the Internet to obtain information were more likely to be actual or potential Internet users to substitute for travel to campus.

- In addition, two variables – number of days per week using computer at home and number of days per week going to class – had weaker statistically significant effects (the significance levels are 5.7% and 8.7%, respectively).

Factors Associated with Perceived Impact of Using Internet on Higher Education

We asked a question regarding potential impact of Internet based courses on student transportation behavior. The question – "If Internet/web courses such as WebCT courses were to be offered more fully by URI, would your enrollment in these courses affect any of the following" – had a number of options including the following two:

- Affect number of days you travel to campus (55.5% said "yes")

- Affect types of transportation you use for traveling to campus (11.0%)

We also conducted bivariate analyses to explore what factors affect student perceptions of the potential impact of distance education on their transportation behavior. Table 6 presents ANOVA findings and Table 7 presents the Chi-square results at significance level of 10%. Among the main findings in Table 6:

- Saving money as a benefit of using Internet differentiated the two impact variables. If students felt saving money was important, they were more likely to report changes in the number of days of travel (mean importance index or MII = 2.80 for students who reported possible change vs. 2.29 for those who did not) and transportation type to school (3.65 vs. 2.45).

- Perceived benefits of using the Internet as adding flexibility and choices increased the probability of students reporting changes in number of days for travel to school (for flexibility, the pairs of MII are 3.55 vs. 2.79; for choice, the pairs of MII are 3.10 vs. 2.43).

- Number of days per week going to class was negatively associated with changes in the number of days traveling to campus (3.35 vs. 3.90 days among students who reported change or not).

- Number of days per week work while attending school and number of days using computer at home were related positively to changes in number of days travel to campus, 3.02 vs. 2.42 days and 5.73 vs. 4.75 days, respectively.

TABLE 6 One way ANOVA results: If Internet Courses Were To Be Offered More Fully, Would Your Enrollment In These Courses Affect Any Of The Following:

	Mean	Std. Dev.	F	p
I. Number of days travel to campus				
Number of days/week going to class			4.636	.033
no change	3.90	1.63		
will change	3.35	1.54		
Number of days/week work while attending classes			3.092	.081
no change	2.42	2.09	3.092	.081
will change	3.02	2.15		
Use internet can save money			5.446	.021
no change	2.29	1.33		
will change	2.80	1.35		
Use internet can add flexibility			17.717	.000
no change	2.79	1.28		
will change	3.55	.94		
Use internet can add choices			11.409	.001
no change	2.43	1.26		
will change	3.10	1.22		
Number of days/week using computer			4.791	.030
no change	4.75	3.00		
will change	5.73	2.56		
II. Types of transportation used to travel to campus				
Time from home to campus			3.194	.076
no change	24.93	13.10		
will change	31.06	15.30		
Use internet can save money			12.686	<.0001
no change	2.45	1.33		
will change	3.65	1.11		

Note: this table reads, for example, students who have fewer days of classes weekly would be more likely than those who have more days of classes (3.35 vs. 3.90 days) to change the number of days travel to campus if internet based courses were to be offered more fully.

- Driving time from home to campus was associated positively with change in types of transportation used traveling to campus (31.06 vs. 24.93 minutes).

As indicated in Table 7, students who intended to use carpool or public transportation were more likely than the other two groups to change in the type of transportation to campus (30.0% vs. 18.2% and 8.1%). Students who currently access the Internet or take distance learning courses are more likely than others to change the number of days traveling to campus, 57.0% vs. 0% and 100% vs.

53.4%, respectively. Students using Internet for information purposes were more likely than those who do not report so to change the type of transportation used for traveling to campus (13.6% vs. 4.4%).

TABLE 7 Chi-square Test Results: If Internet Courses Were To Be Offered More Fully, Would Your Enrollment In These Courses Affect Any Of The Following:

Variable	No change	Will change	χ^2	p
I. Number of days travel to campus				
Current access to internet			5.118	.037
Yes	43.0%	57.0%		
No	100	0		
Current take distance course			5.882	.014
Yes	0	100		
No	46.6	53.4		
II. Types of transportation used to travel to campus				
Use internet for information			2.763	.078
Yes	86.4	13.6		
No	95.6	4.4		
Carpool intention			5.896	.052
No intention	91.9	8.1		
Intention in the near future	70.0	30.0		
Current use	81.8	18.2		

Note: this table reads, for example, students who have access to internet are more likely than those who do not (0 vs. 57%) to change the number of days traveling to campus if internet based courses were to be offered more fully.

We also conducted multiple logistic analyses, the results are presented in Table 8. After including variables that showed associations in the bivariate analyses as the independent variables in the logistic regression, one variable, the perception of using Internet will increase flexibility is still positively related to the change of number of days traveling to campus if Internet-based courses were to be offered more fully (p=.011). When the dependent variable in the logistic analyses was the possible change in types of transportation used to travel to campus if Internet-based courses were offered more fully, one variable, the perception of using Internet to substitute for travel can save money still showed a strong positive effect (p=.004), and two other variables, using Internet for information purposes and number of minutes driving from home to campus, showed weak positive effects (p=.085 and p=.093, respectively).

Summary and Conclusions

This paper has discussed the potential impact of Internet-based distant education on travel behavior. It also reports findings from a sample of college students at a U. S. university in terms of their perceptions and willingness to use Internet to substitute for traveling to campus. The results indicate that if the students perceive using Internet can save money or if they use Internet for informational purposes, they are more likely to use or intend to use Internet to substitute for travel. If they consider using Internet can increase flexibility, they would change their number of days traveling to campus in online courses are offered more fully. Students who perceive using Internet to substitute for travel can save money are more likely to report possible change in types of transportation used to travel to campus if they enroll in online courses. These findings imply that the increased acceptance of Internet-based courses by students may reduce their travels for educational purposes.

TABLE 8 Logistic Regression Results: If Internet Courses Were To Be Offered More Fully, Would Your Enrollment In These Courses Affect Any Of The Following:

Variable	B	S.E.	p	Exp(B)
I. Number of days travel to campus				
Number of days going to classes	-.211	.140	.132	.810
Number of days work while attending classes	.130	.100	.196	1.138
Use internet can save money	.081	.158	.607	1.085
Use internet can add flexibility	.648	.255	.011	1.911
Use internet can add choices	.071	.207	.732	1.073
Number of days using computer at home	.014	.094	.883	1.014
Have access to internet at home	1.304	1.305	.318	3.683
Take distance courses	-7.443	21.367	.728	.001
N = 134				
-2 Log likelihood = 149				
Nagelkerke R Square = .285				
II. Types of transportation used to travel to campus				
Number of minutes from home to campus	.031	.019	.093	1.032
Use internet can save money	.778	.270	.004	2.177
Use internet for information	1.467	.851	.085	4.335
Intend to use carpool	-.433	.720	.548	.649
Use carpool	.861	.995	.387	2.366
N = 154				
-2 Log likelihood = 85				
Nagelkerke R Square = .262				

To encourage substitution behaviors, instructors and university administrators need to foster perceptions that using the Internet from home for educational purposes can save money and add flexibility. They need to stress the usefulness of the internet to obtain information.

This study is the first attempt to assess the potential impact of Internet on student commuter's travel decisions. Several factors are identified that affect student intentions to change their travel behavior because of the advance of information technology. However, the data used in this study is limited in the scope and timeframe and many important questions are unanswered and need further research. These questions include: what are actual behavioral changes of student commuters because of the popularity of IT-based distance courses over time, do students cut total travels because of the travels going to campus saved, do the travel pattern changes due to the use of IT affect their academic performances, and do the travel saved because of the use of information technology improve their quality of life? Future research needs to collect panel data from students who do or do not take Internet-based courses and from students before and after they take Internet-based courses.

Appendix B: Questionnaires Employed in the Surveys

Telephone Survey of URI Students

Interviewer Name: _____

Transportation Project: Student Survey Questionnaire

Interviewer Number: _____   Date: Month _____ Day _____
Questionnaire Number: _____   Circle Day: M T W Th F
Telephone Number: ____ - _____   Time: ____ : ____

**Gender of Respondent: 1___Male   2___Female

Hello, this is _____ calling from the University of Rhode Island Research Center. We are surveying URI students for opinions on transportation issues and computer use. May I have a few minutes of your time to answer some questions?

A. Student Status: Screening Questions

1. Are you currently a student at URI?   1__yes   2__no/no response → **TERMINATE**
   If '**Yes**', Are you?   1__full-time   2__part-time

2. What Year in school are you at URI? **(Check ONE only, read out list.)**

   1__Freshman   2__Sophomore   3__Junior   4__Senior
   5__Graduate   6__Other

3. Do you currently live on campus or off campus?

   1__On-campus (dorm/sorority/fraternity)
   2__Off-campus (apartment/house/family home, etc.)

B. Daily Routines
1. Going to Classes

4. Are you currently taking classes at the following URI campuses? **(Multiple responses OK.)**

   1__Kingston   2__Providence   3__GSO (Bay Campus)
   4__Alton Jones   5__Middletown

5. What do you do during the summer months? **(Check ONE only, read out list.)**

1__Take classes at URI   2__Work in Rhode Island
3__Take classes at URI **and** work   4__Take classes at other RI schools
5__Take classes at other RI schools **and** work   6__Move out of Rhode Island
9__No response

6a. How many days a week do you go to classes at URI? **(Check <u>ONE</u> only, read out list.)**

1__1 day/week   2__2 days/week   3__3 days/week   4__4 days/week
5__5 days/week   6__6 days/week   8__Do not take any classes
9__No response

6b. At what time of day do you typically GO to classes at URI? **(Multiple responses OK and Probe for time frames)**

9__No response	Mornings	Afternoons	Evenings
	1__7-9AM	4__12-2 PM	7__6-8PM
	2__9-11AM	5__2-4PM	8__8-10PM
	3__11AM-12NOON	6__4-6PM	

6c. At what time of day do you typically finish at URI and return for home or work? **(Multiple responses OK and Probe for time frames.)**

9__No response	Mornings	Afternoons	Evenings
	1__9-11AM	3__12-2 PM	6__6-8 PM
	2__11AM-12NOON	4__2-4 PM	7__8-10 PM
		5__4-6 PM	

7. *On a typical class day,* how long does it take to reach your first class of the day from your home?

_____ (in minutes)

8. What is your *primary* method of transportation when you go to your classes? **(Check <u>ONE</u> only, read out list.)**

1__drive own car   2__car pool   3__RIPTA bus   4__bicycle   5__motorcycle
6__walk → **GO TO Q.10**   7__on-campus shuttle → **GO TO Q.10**
9__no response → **GO TO Q.10**

9a. What are the MAIN roads you use regularly to travel to your classes at URI? (Multiple responses OK.)
1__Rt. 138   2__Rt. 108   3__Rt. 1   4__Rt. 1A
5__Rt. 4   6__Rt. 2   7__Rt. 110   8__Rt.112
9__Rt. 95   10__South Road   11__Slocum/Flagg   12__Old North Road
13__Other (specify)_____   0__No response

9b. What is the approximate distance (in miles) from where you live now to URI?

_____ number of miles   9__Don't know

2. Working while attending URI

10. Are you currently employed while attending URI? **(Check <u>ONE</u> only, read out list.)**

    1__Yes   2__No → **GO TO Q19**

11. Is your place of employment on campus or off campus? **(Check <u>ONE</u> only, read out list.)**

    1__On campus only   2__Off campus only
    3__Both on and off campus   9__No response

12. How many days a week do you work while attending classes at URI? **(Check <u>ONE</u> only, read out list.)**

    1__1 day/week   2__2 days/week   3__3 days/week   4__4 days/week
    5__5 days/week   6__6 days/week   7__7 days/week   0__Do not work
    9__No response

13. What are your hours at your main job? **(Check <u>ONE</u> only, read out list.)**

    1__Fixed starting and ending time   2__Variable, depending on the work
    3__Variable, at my choice   4__Fixed starting time, variable ending time
    5__Allowed to vary within fixed limits   6__Depending on the work
    9__No response

14. What is your *primary* method of transportation to your place of work? **(Check <u>ONE</u> only, read out list.)**

    1__drive own car   2__car pool   3__RIPTA bus   4__bicycle
    5__motorcycle   6__walk   7__on-campus shuttle
    9__no response

15. How many <u>minutes </u>does it take to reach your *main* place of work?

        a. From URI: _____ (in minutes)
        b. From your home: _____ (in minutes)

16. Do you generally travel to your place of work directly from where you live now or from school? **(Check one only, read out list.)**

    1__directly from home   2__directly from school
    3__depends on time and day   9__no response

17. What is the approximate distance (in miles) from where you live now to your primary place of work?
      _____ number of miles   9__Don't know

18. What are the MAIN roads you use regularly to travel to your place of work? **(Multiple responses OK.)**

    1__Rt. 138   2__Rt. 108   3__Rt. 1   4__Rt. 1A
    5__Rt. 4   6__Rt. 2   7__Rt. 110   8__Rt.112
    9__Rt. 95   10__South Road   11__Slocum/Flagg   12__Old North Road
    13___Other (specify)_____   14__No response

19. Do you carpool or use public transportation to travel to campus now?   1__No   2__Yes

    If **NO**, what are your intentions for the future? (**Read out list**):

    0__I DO NOT intend to carpool or use public transportation in the next academic year/
        don't know
    1__I DO intend to carpool or use public transportation in the next semester
    2__I DO intend to carpool or use public transportation before the current Spring semester is over

    If **YES**, how long have you been doing it? (**Read out list**):

    3__I have been carpooling or using public transportation since this semester started.
    4__I have been carpooling or using public transportation since at least last semester.

20. For you to use carpool or public transportation, how important are the following statements even if you do not use it now? Are they not important, slightly important, somewhat important, very important or extremely important?

To car pool/or use public transportation, it is ….. that	(Check one only, read out list.)				
	Not Important	Slightly Important	Somewhat Important	Very Important	Extremely Important
I save money	1	2	3	4	5
It take more time to travel	1	2	3	4	5
It give me more flexibility	1	2	3	4	5
It increase my choices of things to do	1	2	3	4	5
I reduce control over my life	1	2	3	4	5

C. Computer Use

21. Do you currently access the Internet or World Wide Web?

    1__Yes   (continue)   2__No **→ GO TO Q25**   9__No response **→ GO TO Q25**

22. Where do you currently access the Internet/World Wide Web from? **(Multiple responses OK.)**

    1__University lab/library   2__Work site   3__At home/dorm/fraternity/sorority
    4__Mobile   5__Internet Café/public location

6__Other 9__No response

23. What are your primary uses of the Internet? **(Multiple responses OK. – Probe to get as many as possible.)**

1__web surfing 2__chat rooms 3__news/discussion groups
4__e-mail 5__read papers/magazines 6__course-related assignments
7__exchange of files 8__research related to courses 9__banking/stock trading
10__online games 11__MP3/ music 12__shopping/auction sites
14__online travel 15__Internet-telephony 16__course registration
17__government business 18__information search 19__other
99__no response

24. We want to know if there has been any change in the amount of time you spend on various activities since you started using the Internet? Are you spending more time/ less time or there has been no change in the ……

	(Check one only, read out list.)			
	Spend more time now than before	Spend less time now than before	No Change	No response
Amount of time *spent talking on telephone, including long distance calls*?	1	2	3	9
Amount of time spent in the *library for course related assignments*?	1	2	3	9
Amount of time *spent online*?	1	2	3	9
Amount of time spent *watching TV or videotapes*?	1	2	3	9
Amount of *travel for school related activities*	1	2	3	9
Amount of *travel for work related activities?*	1	2	3	9
Amount of *travel for shopping activities?*	1	2	3	9
Amount of travel for social activities such as *visiting friends, clubs, restaurants*?	1	2	3	9

25. Are you currently taking any distance courses (telecourses) offered via TV or Internet?

1__No 2__Yes

26. If Internet/web courses such as WebCT courses were to be offered more fully by URI, would your enrollment in these courses affect any of the following:

	(Check ONE response)		
Number of days you travel to URI?	0　No	1　Yes	9　Don't know
Number of days you work while taking classes?	0　No	1　Yes	9　Don't know
Place where you live while you finish your classes?	0　No	1　Yes	9　Don't know
Types of transportation you use for travelling to URI?	0　No	1　Yes	9　Don't know
Types of transportation you use for travelling to work?	0　No	1　Yes	9　Don't know

27. Do you use Internet/World Wide Web so that you avoid traveling to campus now?

    1__No   2__Yes

   If **NO**, what are your intentions for the future? (Read out list):
     0__I DO NOT intend to use Internet/WWW to avoid travel to URI in the next academic year /don't know
     1__I DO intend to use Internet/WWW to avoid travel in the next semester
     2__I DO intend to use Internet/WWW to avoid travel before the current Spring semester is over

   If **YES**, how long have you been doing it? (Read out list):
     3__I have been using Internet/WWW to avoid travel since this semester started.
     4__I have been using Internet/WWW to avoid travel since at least last semester.

28. For you to use Internet or Web to avoid traveling to URI, how important are the following statements to you even if you don't use them now? Are they not important, slightly important, somewhat important, very important or extremely important?

To use Internet/Web to avoid travelling to URI, it is …… that	(Check ONE only, read out list.)				
	Not Important	Slightly Important	Somewhat Important	Very Important	Extremely Important
I save money	1	2	3	4	5
It take more time to finish my degree	1	2	3	4	5
It give me more flexibility regarding courses	1	2	3	4	5
It increase my choices of things to do	1	2	3	4	5
I be in less control of my life	1	2	3	4	5

29. Do you have a PC available for your use at your current residence?

    1__Yes   2__No → **GO TO Q33**

30. During the last month, on average how many days per week did you use the computer at home? **(Check one only, read out list.)**

    1__<1 day/week   2__1 day/week   3__2 days/week   4__3 days/week
    5__4 days/week   6__5 days/week   7__6 days/week   8__7 days/week
    9__Not used in last month

31. Do you have a connection to the Internet on your home computer?

    1__Yes   2__No **→ GO TO Q33**

31a. What kind of connection do you have currently? **(Check <u>ONE</u> only, read out list.)**

    1__Dial-up Modem   2__Cable Modem   3__ISDN   4__DSL
    5__Ethernet   9__Don't know

32. On an average day, how many minutes do you spend on the Internet/World Wide Web at home? **(Check <u>ONE</u> only, read out list.)**

    1__1-30 minutes   2__31-60 minutes   3__60-90 minutes
    4__90-120 minutes   5__121-180 minutes   6__180+ minutes
    9__Don't know

(SKIP Q. 33 AND GO DIRECTLY TO DEMOGRAPHICS)

33. If you had access to the Internet/World Wide Web in the future, what would be your primary uses of the Internet? **(Multiple responses OK. – Probe to get as many as possible)**

    1__web surfing   2__chat rooms   3__news/discussion groups
    4__e-mail   5__read papers/magazines   6__course-related assignments
    7__exchange of files   8__research related to courses 9__banking/*stock trading*
    10__online games   11__MP3/music   12__shopping/auction sites
    13__online travel   14__Internet-telephony   15__course registration
    16__government business   17__information search   18__other
    19__No intention to use Internet in the future

<u>Demographics</u>

34. Would you please tell me your age group? **(read out list.)**

    1__< 18   2__18-19   3__20-21   4__22-24   5__25-34
    6__35-44   7__45-54   8__55 or above   9__no response/refused

35. How many people are there in your household? **(Check one only, read out list.)**

    1__one   2__two   3__three   4__four
    5__five   6__six or more   9__no response/refused

36. May I ask what your major or college is**: _____**

37. How would you describe your current residence? **(Check <u>ONE</u> only, read out list.)**

    1__dorm/fraternity/sorority   2__parents/family home   3__own home
    4__rental(off-campus housing)   4__other, **specify:_____**   9__no response

38. Do you have a vehicle for your own personal use while attending URI? **(Check <u>ONE</u> only, read out list.)**
    1__own car   2__can use family car   3__can use friend/roommate car
    4__no car   9__no response

39. Number of vehicles in your current household while attending URI: **(Check <u>ONE</u> only, read out list.)**
    0__none   1__one   2__two   3__three   4__four
    5__five   6__sixe or more   9__no response

40. What Town **and State** do you live in now while attending URI?

    _____

41. What State do you live in permanently?

    1__RI   2__MA   3__NJ   4__CT   5__NH   6__NY
    9__Other_____

Thank you very much for your time and responses.

RITIM

_{Research Institute for Telecommunications and Information Marketing}

SEQ. NO: _

D. OPINIONS & BELIEFS

1. When you think about RI today and in the near future, how concerned are you with each of the following issues? Would you say you are extremely concerned…not at all concerned? Please ✔❑ for each statement.

	Extremely concerned				*Not at all concerned*
Growth in traffic congestion	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
Having enough good jobs	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
Conditions of existing roads and highways	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
Bringing more business to Rhode Island	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
Having good public transportation	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
Maintaining and improving our quality of life	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
Protecting community character	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

2. Please ✔❑ to tell us your degree of agreement or disagreement with each of the following statements.

	Strongly disagree				*Strongly agree*
My involvement in environmental activities today will help save the environment for future generations	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
My community is better off today than it was before	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
The road system today is more than capable of handling the traffic volume in my community than before	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
Economic growth should take precedence over environmental considerations	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
We should promote new development that mixes residential, retail and office uses	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
We should increase open space and recreation areas EVEN IF taxes increase	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
There are too many restrictions placed on residential construction in my community	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
The amount of energy I use does not affect the environment to any significant degree	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
There is nothing the average citizen can do to help stop environmental pollution	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

3. The following statements express how some people feel about time. Please ✔ ❑ to indicate your agreement or disagreement with each of the statement.

	Strongly disagree				*Strongly agree*
If I really want to buy something, I frequently make the purchase quickly and think about the consequences later.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
I tend to spend money as soon as I earn it.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

	1	2	3	4	5
I am the type of person who likes to slowly save up money in order to make large purchases.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I enjoy going shopping and buying on impulse.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I tend to think about alternatives a great deal before I buy things.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I always pay off my credit card bill each month.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
If I have purchased something through mail order, I like to have the company express mail it, so I will get it more quickly.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏

B. STUDENT STATUS &TRAVEL BEHAVIORS

4. What is you student status at URI?   1❏ Full-time   2❏ Part-time

5. At what time of day do you typically GO to classes at URI? (Multiple responses OK.)

1❏ 7-9AM   1❏ 9-11AM   1❏ 11AM-12NOON   1❏ 12-2 PM
1❏ 2-4PM   1❏ 4-6PM   1❏ 6-8PM   1❏ after 8PM

6. On a typical class day, how long does it take to reach your first class of the day from your home?
_____ (in minutes)

7. What is your primary method of transportation when you go to your classes? (✔❏ one only)

1❏ drive own car   2❏ car pool   3❏ RIPTA bus   4❏ bicycle
5❏ motorcycle   6❏ walk (☞skip to 9)   7❏ on-campus shuttle (☞skip to 9)

8a.What are the main roads you use regularly to travel to your classes at URI? (Multiple responses OK.)

1❏ Rt 1   1❏ Rt.2   1❏ Rt.3   1❏ Rt 4   1❏ Rt 5   1❏ Rt 6
1❏ Rt.10   1❏ Rt 95   1❏ Rt 102   1❏ Rt.108   1❏ Rt 112   1❏ Rt 113
1❏ Rt.117   1❏ Rt.138   1❏ Rt.146   1❏ Rt 195   1❏ Rt 295   1❏ Other

8b. What is the approximate distance (in miles) from your home to URI?
_____ number of miles   9❏ Don't know

9. What do you do during the summer months? (✔❏ one only)

1❏ Take classes at URI   2❏ Work in Rhode Island
3❏ Take classes at URI and work   4❏ Take classes at other RI schools
5❏ Take classes at other RI schools and work   6❏ Move out of Rhode Island

10. The following statements describe how some people feel about their cars. Please ✔❏ to indicate your   agreement or disagreement with each of the statement.

	Strongly disagree				Strongly agree
I prefer to drive a car with a strong personality of its own.	1❏	2❏	3❏	4❏	5❏
Cars offer me relaxation and fun when life's pressures build up.	1❏	2❏	3❏	4❏	5❏
I don't like to think of my car as being ordinary.	1❏	2❏	3❏	4❏	5❏
Driving my car is one of the most satisfying and enjoyable things I do.	1❏	2❏	3❏	4❏	5❏
I enjoy discussing cars with my friends.	1❏	2❏	3❏	4❏	5❏
Sometimes I get too wrapped up in my car.	1❏	2❏	3❏	4❏	5❏
Cars are nothing more than appliances.	1❏	2❏	3❏	4❏	5❏
I generally feel sentimental attachment to the cars I own.	1❏	2❏	3❏	4❏	5❏
Driving my car is one way I often use to relieve daily pressure.	1❏	2❏	3❏	4❏	5❏
I do not pay much attention to car advertisements in magazines or on TV.	1❏	2❏	3❏	4❏	5❏
I get bored when other people talk to me about their cars.	1❏	2❏	3❏	4❏	5❏
I have little or no interest in car races.	1❏	2❏	3❏	4❏	5❏

Driving along an open stretch of road seems to "recharge" me in body, mind and spirit.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
It is natural that young people become interested in cars.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
When I'm with a friend, we often end up talking about cars.	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏

11. Are you currently employed while attending URI? (✔❏ one only)

    ₁❏ Yes **(continue)**   ₀❏ No (☞**skip to 13)**

12. Is your place of employment on campus or off campus? (✔❏ one only)

    ₁❏ On campus only   ₂❏ Off campus only   ₃❏ Both on and off campus

13. Do you carpool or use public transportation to attend classes at URI *now*?

    ₀❏ No **(continue)**   ₁❏ Yes (☞**skip to 14b)**

14a. If NO, what are your intentions for the future? (✔❏ one only)

    ₀❏ I DO NOT intend to carpool or use public transportation in the next 12 months
    ₁❏ I DO intend to carpool or use public transportation in the next 6 months
    ₂❏ I DO intend to carpool or use public transportation within the next 3 months

14b. If YES, how long have you been doing it? (✔❏ one only)

    ₃❏ I have been carpooling or using public transportation for the past 3 months
    ₄❏ I have been carpooling or using public transportation for more than 3 months

15. Following is a list of reasons for using/not using car pool and public transportation. Please tell us how important each of the following statements is in your decision to car pool/use public transportation or not use it? Is it not important … or extremely important?

	Please ✔❏ for each statement				
To car pool/or use public transportation, it is …..>	*Not Important*				*Extremely Important*
That I save money	₁❏	₂❏	₃❏	₄❏	₅❏
That it take less time to travel	₁❏	₂❏	₃❏	₄❏	₅❏
That it give me more flexibility	₁❏	₂❏	₃❏	₄❏	₅❏
That it increase my choices of things to do	₁❏	₂❏	₃❏	₄❏	₅❏
That I be able to change my schedule at moment's notice	₁❏	₂❏	₃❏	₄❏	₅❏
That I listen to my own music	₁❏	₂❏	₃❏	₄❏	₅❏
That I increase control over my life	₁❏	₂❏	₃❏	₄❏	₅❏

16. How likely (very likely…..very unlikely) are you to use car pool or public transportation if any of the following changes occurred?

	Please ✔❏ for each statement.					
It is _____ that I would use carpool/ bus/ bicycle if…..	*Very Likely*				*Very unlikely*	*Not App/ Don't Know*
Special carpool lanes on I-95/I-195	₁❏	₂❏	₃❏	₄❏	₅❏	₉❏
Higher parking fees	₁❏	₂❏	₃❏	₄❏	₅❏	₉❏
Lower bus fares	₁❏	₂❏	₃❏	₄❏	₅❏	₉❏
Easily available bus schedules	₁❏	₂❏	₃❏	₄❏	₅❏	₉❏
Safe bike paths	₁❏	₂❏	₃❏	₄❏	₅❏	₉❏
Easy-to-create car pools	₁❏	₂❏	₃❏	₄❏	₅❏	₉❏
Lower bridge and highway tolls	₁❏	₂❏	₃❏	₄❏	₅❏	₉❏

Discounts on gas & other items for using carpools/public transports/bicycles	1❏	2❏	3❏	4❏	5❏	9❏

C. COMPUTER & TECHNOLOGY USE

17. Are you currently taking any distance courses (telecourses) offered via TV or Internet?
    ₁❏ Yes **(continue)**   ₀❏ No **(☞skip to 18)**

17a. If YES, is it TV or Internet?
    ₁❏ TV   ₂❏ Internet   ₃❏ Both

18. Do you currently access the Internet or World Wide Web?

    ₁❏ Yes   ₀❏ No **(☞skip to24 on next page)**

19. Where do you currently access the Internet/World Wide Web from? (✔❏ as many boxes as applicable)
    ₁❏ Work site   ₁❏ At home/dorm/fraternity/sorority
    ₁❏ Mobile   ₁❏ School/Public library
    ₁❏ Internet Café/public location   ₁❏ Other

20. On an average day, how many <u>minutes</u> do you spend on the Internet/World Wide Web? (✔❏ one only)
    ₁❏ 1 - 30 mins.   ₂❏ 31 - 60 mins.   ₃❏ 60 - 90 mins   ₄❏ 90 - 120 mins
    ₅❏ 2 – 3 hours   ₆❏ 4 - 6 hours   ₇❏ over 6 hours   ₉❏ Don't know

21. What are your primary uses of the Internet? (✔❏ as many boxes as applicable)
    ₁❏ connect to office/workplace   ₁❏ e-mail   ₁❏ web surfing
    ₁❏ news/discussion groups   ₁❏ chat rooms   ₁❏ Internet-phone
    ₁❏ read papers/magazines   ₁❏ online games   ₁❏ Listen to music
    ₁❏ banking/stock trading   ₁❏ online travel booking ₁❏ shopping/auction sites
    ₁❏ uploading/downloading files   ₁❏ information search   ₁❏ other

22. We want to know if there has been any change in the *amount of time* you spend on various activities since you started using the Internet. Are you spending more time/ less time or there has been no change in the time spent on following set of activities?

	Please ✔❏ for each activity.			
Since I started using Internet/WWW, I ….>	*Spend more time now than before*	*Spend less time now than before*	*No Change*	*Not Applicable*
Talking on telephone, including long distance calls?	₁❏	₂❏	₃❏	₉❏
In the library or bookstore?	₁❏	₂❏	₃❏	₉❏
Watching TV/ videotapes/DVD?	₁❏	₂❏	₃❏	₉❏
Traveling for school related activities?	₁❏	₂❏	₃❏	₉❏
Traveling for work related activities?	₁❏	₂❏	₃❏	₉❏
Traveling for shopping activities?	₁❏	₂❏	₃❏	₉❏
Traveling for social activities such as visiting friends, clubs, restaurants?	₁❏	₂❏	₃❏	₉❏

23. Do you use Internet/World Wide Web to AVOID travelling to URI now?
    ₀❏ No **(continue)**   ₁❏ Yes **(☞skip to 23b)**

23a. If NO, what are your intentions for the future? (✔❏ one only)

    ₀❏ I DO NOT intend to use Internet/WWW to avoid travel to URI in the next 12 months

₁❏ I DO intend to use Internet/WWW to avoid travel to URI in the next 6 months
₂❏ I DO intend to use Internet/WWW to avoid travel to URI within the next 3 months

23b. If YES, how long have you been doing it? (✔❏ one only)

₃❏ I have been using Internet/WWW to avoid travel to URI for the past 3 months
₄❏ I have been using Internet/WWW to avoid travel to URI for more than 3 months

24. How interested are you in taking distance courses offered via Internet/web such as WebCT courses?
Not at all interested 0…..1….2….3….4…..5….6….7…..8….9 Very interested

25. If Internet/Web based courses were to be offered more fully by URI, would your enrollment in these courses affect any of the following:

	Please ✔❑ for each statement.		
Number of days you travel to URI?	0❑ No	1❑ Yes	9❑ Don't know
Number of days you work while taking classes?	0❑ No	1❑ Yes	9❑ Don't know
Place where you live while you finish your degree?	0❑ No	1❑ Yes	9❑ Don't know
Types of transportation you use for travelling to URI?	0❑ No	1❑ Yes	9❑ Don't know
Types of transportation you use for travelling to work?	0❑ No	1❑ Yes	9❑ Don't know

26. **If URI were to offer more *Internet-only* courses, what would be your opinions regarding such courses?**
(Please ✔❑ for each statement)

	Strongly disagree				*Strongly agree*
Taking classes via the Internet will allow me to arrange my work more effectively.	1❑	2❑	3❑	4❑	5❑
Taking classes via the Internet should allow me to finish my degree more quickly.	1❑	2❑	3❑	4❑	5❑
Taking classes via the Internet will allow me to take classes I would otherwise have to miss.	1❑	2❑	3❑	4❑	5❑
Taking classes via the Internet will save me a lot of time commuting to class.	1❑	2❑	3❑	4❑	5❑
The advantages of taking classes via the Internet will outweigh any disadvantages.	1❑	2❑	3❑	4❑	5❑
There won't be serious disadvantages to taking classes via the Internet.	1❑	2❑	3❑	4❑	5❑
Student-to-student interaction is likely to be more difficult in Internet-based courses than in other courses.	1❑	2❑	3❑	4❑	5❑
Student-to-instructor interaction is likely to be more difficult in Internet-based courses than in other courses.	1❑	2❑	3❑	4❑	5❑
Classroom dynamics won't be much different in Internet-based courses than in other courses.	1❑	2❑	3❑	4❑	5❑
Class participation is likely to be more difficult in Internet-based courses than in other courses.	1❑	2❑	3❑	4❑	5❑
It's likely that the instructor in Internet-based courses will attempt to elicit student interaction more frequently.	1❑	2❑	3❑	4❑	5❑
The quality of class discussions in Internet-based courses is likely to be high.	1❑	2❑	3❑	4❑	5❑
I will take as many courses via the Internet as I can.	1❑	2❑	3❑	4❑	5❑
If I have an opportunity to take a course via the Internet, I would gladly do so.	1❑	2❑	3❑	4❑	5❑
I feel that an Internet-based course will serve my needs well.	1❑	2❑	3❑	4❑	5❑
Conducting a course via the Internet improves the quality of the course compared to other courses.	1❑	2❑	3❑	4❑	5❑
It will be easy to follow class discussions in Internet-based courses	1❑	2❑	3❑	4❑	5❑
It's likely that I will learn more from my fellow students in Internet courses than in other courses.	1❑	2❑	3❑	4❑	5❑

| Conducting a course via the Internet makes it more difficult than other courses. | 1 ❏ | 2 ❏ | 3 ❏ | 4 ❏ | 5 ❏ |

| D. | DEMOGRAPHICS (ABOUT YOURSELF) |

27. What is your sex? 1❏ Male 2❏ Female

28. What is your age? 1❏ <18 years 2❏ 18-19 years 3❏ 20-21 years
4❏ 22-24 years 5❏ 25-34 years 6❏ 35-44 years

7❏ 45-54 years 8❏ 55 or above

29. Year in school: (Please ✔❏ one only)
1❏ Freshman 2❏ Sophomore 3❏ Junior
4❏ Senior 5❏ Graduate 6❏ Other

30. Major/College: _____

31Including yourself, how many people live in your current household? (Please ✔❏ one only)
❏ 1 ❏ 2 ❏ 3 ❏ 4 ❏ 5 ❏ 6 or more

32. Number of vehicles in your current household? (Please ✔❏ one only)
0❏ none ❏ 1 ❏ 2 ❏ 3 ❏ 4 or more

33. How many computers do you have in your current home? (Please ✔❏ one only)
0❏ None ❏ 1 ❏ 2 or more

34. What kind of Internet connection do you have currently? (Please ✔❏ as many as applicable)
1❏ Dial-up Modem 2❏ Cable Modem 3❏ ISDN 4❏ DSL 5❏ Ethernet
9❏ Don't know 0❏ No Internet connection

35. What is your permanent home state?

1❏Rhode Island 2❏ Connecticut 3❏ Mass. 4❏ New York
5❏ New Jersey 6❏ New Hampshire 0❏ Other

36. Are you likely to live in Rhode Island after you graduate?

0❏ No 1❏ Yes 0❏ Don't know

37. What is your current 5-digit zip code? __/__/__/__/__/

THANK YOU VERY MUCH FOR YOUR TIME & RESPONSES

RITIM

Research Institute for Telecommunications and Information Marketing

SEQ. NO: _ _

E. OPINIONS & BELIEFS

1. When you think about RI today and in the near future, how concerned are you with each of the following issues? Would you say you are extremely concerned…not at all concerned? **Please ✔ ❏ for each statement.**

	Extremely concerned				*Not at all concerned*
Growth in traffic congestion	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
Having enough good jobs	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
Conditions of existing roads and highways	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
Bringing more business to Rhode Island	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
Having good public transportation	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
Maintaining and improving our quality of life	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
Protecting community character	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏

2. Please tell us your degree of agreement or disagreement with each of the following statements.
Please ✔ ❏ for each statement.

	Strongly disagree				*Strongly agree*
My involvement in environmental activities today will help save the environment for future generations	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
My community is better off today than it was before	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
The road system today is more than capable of handling the traffic volume in my community than before	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
Economic growth should take precedence over environmental considerations	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
We should promote new development that mixes residential, retail and office uses	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
We should increase open space and recreation areas EVEN IF taxes increase	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
There are too many restrictions placed on residential construction in my community	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
The amount of energy I use does not affect the environment to any significant degree	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
There is nothing the average citizen can do to help stop environmental pollution	1 ❏	2 ❏	3 ❏	4 ❏	❏

3. The following statements express how some people feel about life in general. Please indicate your agreement or disagreement with each of the statement. Please ✔ ❏ for each statement.

	Strongly disagree				*Strongly agree*
In most ways my life is close to my ideal	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I am satisfied with my life	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏

So far I have gotten the important things I want in life	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
If I could live my life over, I would change almost nothing	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I like to continue doing the same old things I want in life	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I like a job that offers change, variety, and travel, even if it involves some danger	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I am continually seeking new ideas and experiences	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏
I would not car pool unless I was forced to. It is too inconvenient	1 ❏	2 ❏	3 ❏	4 ❏	5 ❏

B. TRAVEL BEHAVIORS

4. Which method of transportation do you *use most* when: (Please ✔❑ one only for each travel)

	Walk	Bike	Own Car	Carpool	Bus	Train	Boat	Not Applicable
Traveling to work?	1❑	2❑	3❑	4❑	5❑	6❑	7❑	9❑
Traveling for shopping?	1❑	2❑	3❑	4❑	5❑	6❑	7❑	9❑

5. Are you currently employed outside the home? 1❑ Yes **(continue)**   0❑ No (☞**skip to 16)**

5a. How many days a week do you work outside the home? (Please ✔❑ one only)

   1❑   2❑   3❑   4❑   5❑   6❑   7❑ days/week   0❑ No regular schedule

6. How much flexibility do you have regarding *the time* when you must travel to work? (Please Circle one)
   No flexibility at all   0.…1.…2.….3.….4.….5.….6.….7.….8.….9 Complete flexibility

7. *On a typical work day,* how long does it take to reach your work place?
   _____ hour(s) _____ minutes

8. What is the approximate distance (in miles) from your home to your work?
   _____ number of miles   99❑ Don't know

9. Which of the following main roads do you use to travel to work. (Please ✔❑ as many as applicable**)**

1❑ Rt 1	1❑ Rt.2	1❑ Rt.3	1❑ Rt 4	1❑ Rt 5	1❑ Rt 6
1❑ Rt.10	1❑ Rt 95	1❑ Rt 102	1❑ Rt.108	1❑ Rt 112	1❑ Rt 113
1❑ Rt.117	1❑ Rt.138	1❑ Rt.146	1❑ Rt 195	1❑ Rt 295	1❑ Other

10. How much flexibility do you have regarding *the route* you travel to get to your workplace? (Circle one)
   No flexibility at all   0.…1.….2.….3.….4.….5.….6.….7.….8.….9 Complete flexibility

11. Do you carpool or use public transportation to travel to work *now*?

   0❑ No **(continue)**   1❑ Yes: (☞**skip to 11b)**

11a. If NO, what are your intentions for the future? (✔❑ one only)
   0❑ I DO NOT intend to carpool or use public transportation in the next 12 months
   1❑ I DO intend to carpool or use public transportation in the next 6 months
   2❑ I DO intend to carpool or use public transportation within the next 3 months

11b. If YES, how long have you been doing it? (✔❑ one only)
   3❑ I have been carpooling or using public transportation for the past 3 months
   4❑ I have been carpooling or using public transportation for more than 3 months

12. How likely are you to use car pool or public transportation if any of the following changes occurred?

	Please ✔❑ for each statement.					
It is _____ that I would use carpool/ bus/ bicycle if…..	*Very Likely*				*Very unlikely*	*Not App/ Don't Know*
Special carpool lanes on I-95/I-195	1❑	2❑	3❑	4❑	5❑	9❑
Higher parking fees	1❑	2❑	3❑	4❑	5❑	9❑
Lower bus fares	1❑	2❑	3❑	4❑	5❑	9❑
Easily available bus schedules	1❑	2❑	3❑	4❑	5❑	9❑

Safe bike paths	1❏	2❏	3❏	4❏	5❏	9❏
Easy-to-create car pools	1❏	2❏	3❏	4❏	5❏	9❏
Lower bridge and highway tolls	1❏	2❏	3❏	4❏	5❏	9❏
Discounts on gas & other items for using carpools/public transports/bicycles	1❏	2❏	3❏	4❏	5❏	9❏

13. Do you have to pay for parking at your job site?   1❏ Yes   0❏ No   9❏ Not Applicable

14. Is telecommuting encouraged in your workplace? (use phone/computer to complete work from home instead of

the office)?   1❏ Yes   0❏ No (☞skip to 15)

If Yes, do *you* telecommute now?   1❏ Yes   0❏ No

15. How would you describe your place of work/employer?

Type of organization**:**	1❏ Private	2❏ Government	3❏ Non-Profit
Size of organization:	1❏ < 10 employees	2❏ 10-25 employees	3❏ 26-49 employees
	4❏ 50-99 employees	5❏ 100-249 employees	6❏ over 250 employees

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C. COMPUTER & TECHNOLOGY USE

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16. Do you currently access the Internet or World Wide Web?   1❏ Yes (☞skip to 17)   0❏ No
16a. If No, are you interested in using the Internet/World Wide Web?

0❏ No intention to use Internet in the future (☞skip to 21 - Demographics)

1❏ Yes, I intend to use Internet in the future (☞skip to 21 - Demographics)

17. Where do you currently access the Internet/World Wide Web from? (✔❏ as many boxes as applicable**)**

1❏ Work site	1❏ At home/dorm/fraternity/sorority
1❏ Mobile	1❏ School/Public library
1❏ Internet Café/public location	1❏ Other

18. On an average day, how many <u>minutes</u> do you spend on the Internet/World Wide Web? (✔❏ one only)

1❏ 1 - 30 mins.	2❏ 31 - 60 mins.	3❏ 60 - 90 mins	4❏ 90 - 120 mins
5❏ 2 – 3 hours	6❏ 4 - 6 hours	7❏ over 6 hours	9❏ Don't know

19. We want to know if there has been any change in the amount of time you spend on various activities since you started using the Internet. Are you spending more time/ less time or there has been no change in the following set of activities?

	(✔❏ one box only for each activity)			
Since I started usingInternet/WWW, I ….>	*Spend more time now than before*	*Spend less time now than before*	*No Change*	*Not Applicable*
Talking on telephone, including long distance calls?	1❏	2❏	3❏	9❏
In the library or bookstore?	1❏	2❏	3❏	9❏
Watching TV/ videotapes/DVD?	1❏	2❏	3❏	9❏
Traveling for school related activities?	1❏	2❏	3❏	9❏
Traveling for work related activities?	1❏	2❏	3❏	9❏
Traveling for shopping activities?	1❏	2❏	3❏	9❏
Traveling for social activities such as visiting friends, clubs, restaurants?	1❏	2❏	3❏	9❏

20. Do you use Internet/World Wide Web to AVOID travelling to work now?

0❏ No (continue)   1❏ Yes (☞skip to 20b)

20a. If NO, what are your intentions for the future? (✔❏ one only)

0❏ I DO NOT intend to use Internet/WWW to avoid travel to work in the next 12 months

₁❏ I DO intend to use Internet/WWW to avoid travel in the next 6 months
₂❏ I DO intend to use Internet/WWW to avoid travel within the next 3 months

20b. If YES, how long have you been doing it? (✔❏ one only)
₃❏ I have been using Internet/WWW to avoid travel for the past 3 months
₄❏ I have been using Internet/WWW to avoid travel for more than 3 months

21. What is your sex?   1❏ Male   2❏ Female

22. What is your age?   1❏ 18-24   2❏ 25-34   3❏ 35-44
                            4❏ 45-54   5❏ 55-64   6❏ 65 or above

23. Including yourself, how many people live in your household?
        ❏ 1   ❏ 2   ❏ 3   ❏ 4   ❏ 5   ❏ 6 or more

24. What is the highest level of schooling you have completed? (Please ✔❏ one)
        1❏ Less than High School   2❏ High School   3❏ Vocational School
        4❏ Some College   5❏ College Graduate   6❏ Graduate School

25. What is your current occupation? (Please ✔❏ one)   9❏ Retired
        1❏ Homemaker   2❏ Student   3❏ Unskilled/Laborer   4❏
Technical/Skilled   5❏ Office/Clerical/Sales 6❏Managerial/Professional   7❏ Educator
        8❏ Other

26. What is your total annual gross household income level? (Please ✔❏ one)
        1❏ $15,000 or under   2❏ $15,001 – 25,000   3❏ $25,001 – 35,000
        4❏ $35,001 – 50,000   5❏ $50,001 – 100,000   6❏ $100,001 or above

27. How long have you lived at this address? (Please ✔❏ one)
        1❏ Less than 6 months   2❏ 6 – 12 months   3❏ 1 – 2 years
        4❏ 3 – 5 years   5❏ 6 – 9 years   6❏ 10 years or more

28. Number of vehicles in your current household:
        0❏ none   ❏ 1   ❏ 2   ❏ 3   ❏ 4 or more

29. How many computers do you have at home?   0❏ None   ❏ 1   ❏ 2 or more

30. What kind of Internet connection do you have currently? (Please ✔❏ as many as applicable)
        1❏ Dial-up Modem   2❏ Cable Modem   3❏ ISDN   4❏ DSL
        5❏Ethernet   9❏Don't know   0❏ No Internet connection

31. What is your home 5-digit zip code?   __/__/__/__/__/

AN INVITATION

We would like to invite you to join a panel of RI residents to help us further on issues of transportation and community. The panel will be contacted over the next 12 months. We will offer attractive prizes to panel participants in random drawings. If you are willing to help, please provide us with your contact information:

❏ **YES, I would like to become a member of the RITIM-URI Transportation Research Panel.**

NAME: _____

                  LAST   FIRST

ADDRESS: _____

                  NO.   STREET   APT. NO.

              _____

                  TOWN   STATE   ZIP CODE

❏ **NO, I would not like to become a member of the RITIM-URI Transportation Research Panel.**

THANK YOU VERY MUCH FOR YOUR TIME & RESPONSES

Appendix C: Sample Composition of Field Surveys

Sample Composition of URI Students' Telephone Survey

Sex:			
	Male	87	40.7%
	Female	127	59.3%
Age:			
	Less than 19 years	46	21.0%
	20-21 years	68	31.1%
	22-24 years	34	15.5%
	25-34 years	34	15.5%
	Over 34 years	37	16.9%
Student Status:			
	Full Time	170	77.6%
	Part Time	49	22.4%
Year in School:			
	Freshman	43	19.5%
	Sophomore	44	20.0%
	Junior	49	22.3%
	Senior	43	19.5%
	Graduate	40	18.2%
Home State:			
	Rhode Island	158	73.8%
	Out of state	56	26.2%
Housing Status:			
	On campus	65	29.5%
	Off campus	155	70.5%
Primary Method Of Transportation to URI:			
	Drive own car	146	66.4%
	Walk	66	30.5%
	Other	7	3.2%
Have own car for personal use while attending URI		188	87.0%
Have a PC available for use at current residence		186	84.9%
Currently Taking Distance courses		9	4.1%

Sample Composition of URI In-Class Survey

Sex:		
Male	49	46.2%
Female	57	53.8%
Age:		
Less than 19 years	12	11.3%
20-21 years	67	64.2%
22-24 years	23	21.7%
25-34 years	2	1.9%
Over 34 years	1	0.9%
Student Status:		
Full Time	99	94.3%
Part Time	6	5.6%
Year in School:		
Freshman	3	2.8%
Sophomore	11	10.4%
Junior	52	49.1%
Senior	39	36.8%
Graduate	1	0.9%
Home State:		
Rhode Island	51	48.1%
Out of state	55	51.9%
Primary Method Of Transportation to URI:		
Drive own car	78	74.3%
Walk	20	19.0%
Other	7	6.7%
Currently Taking Distance courses	13	12.3%

Sample Composition of Residents' Survey

Sex:		
Male	471	56.9%
Female	357	43.1%
Age:		
18-24 years	18	2.2%
25-34 years	65	7.9%
35-44 years	179	21.7%
45-54 years	226	27.4%
55-64 years	151	18.3%
65 years or older	185	22.5%
Household Size:		
1	144	17.4%
2	358	43.2%
3	144	17.4%
4	107	12.9%
5	52	6.3%
6 or Above	23	2.8%
Education:		
Less that high School	9	1.1%
High School	106	12.8%
Vocational School	17	2.1%
Some College	172	20.8%
College Graduate	268	32.4%
Graduate School	255	30.8%
Occupation:		
Homemaker	41	5.0%
Student	20	2.4%
Unskilled/Labor	11	1.3%
Technical/Skilled	71	8.6%
Office/Clerical/Sales	62	7.5%
Managerial/Professional	262	31.6%
Educator	80	9.7%
Other	82	9.9%
Retired	199	24.0%
Household Income:		
$15,000 or Under	38	5.0%
$15,001-$25,000	52	6.9%
$25,001-$35,000	55	7.3%
$35,001-$50,000	112	14.8%
$50,001-$100,000	335	44.2%
$100,001 or above	166	21.9%
Length of Residence:		
Less Than 6 Months	22	2.7%
6-12 Months	20	2.4%

60

1-2 years	67	8.1%
3-5 years	180	21.7%
6-9 years	137	16.5%
10 years or More	403	48.6%
Number of Vehicles in Household:		
None	10	…1.2%
1	176	21.3%
2	417	50.4%
3	170	20.6%
4 or More	54	6.5%
Number of Computers at Home:		
None	159	19.3%
1	473	57.3%
2 or More	194	23.5%
Type of Internet Connection:		
Dial-up Modem	454	60.3%
Cable Modem	129	17.1%
ISDN	2	0.3%
DSL	11	1.5%
Ethernet	13	1.7%
Don't Know	32	4.3%
Transportation Mode to Work:		
Walk	10	1.2%
Bike	4	0.5%
Own Car	616	76.2%
Carpool	20	2.5%
Bus	14	1.7%
Train	3	0.4%
Boat	1	0.1%
Not Applicable	140	17.3%
Transportation Mode to Shop:		
Walk	4	0.5%
Bike	2	0.2%
Own Car	797	96.7%
Carpool	13	1.6%
Bus	2	0.2%
Train	3	0.4%
Not Applicable	3	0.4%
Currently Employed Outside the Home:		
Yes	582	71.0%
No	237	28.9%

Appendix D: Publications and Presentations

Publication of Articles

The following peer-reviewed transportation research articles based on this project have either been published or are being prepared for publication through March 31, 2001:

Mundorf, N., & Laird, K. (in press). Social and Psychological Effects of Information Technologies and Other Interactive Media. In J. Bryant and D. Zillmann (Eds.). *Perspectives on Media Effects*. Mahwah, NJ: Erlbaum.

Mundorf, N., Xiao, J. J., Dholakia, R., Dholakia, N., & Zhao, M. The Impact of Internet on Travel Decisions: Results from a Student Commuter Survey at a U.S. University, submitted to *Transportation*.

Dholakia, N., Xiao, J. J., Dholakia, R, & Mundorf, N.   The Impact of Retail E-Commerce on Transportation: A Conceptual Framework, submitted to *Electronic Markets*. Under revision.

Papers at Professional Meetings

The following transportation research papers based on this project were accepted for presentation at academic/ professional meetings**:**

Dholakia, N., Mundorf, N., Dholakia, R.R., & Xiao, J. (2000, October). "Interactions of Transportation and Telecommunications Behaviors in Relations to RIIR: Modeling the User Perspective," 13th Rhode Island Transportation Forum, Kingston, RI.

Mundorf, N., & Bryant, J. (2000, November). "Virtual Mobility and Interactive Technologies," National Communication Association Convention, Seattle, WA.

Mundorf, N. (2001, April). "The Impact of Distance Education on Virtual Mobility," Eastern Communication Association, Portland, ME.

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Davis, Paul (1999), "Planners offer traffic solutions for Kingston study," *The Providence Journal*, March 30, C2.

Dholakia, Nikhilesh, Ruby R. Dholakia, Martin Laub, and Yong-Sik Hwang (1999), "Electronic Commerce and the Transformation of Marketing", in *Internet-Marketing - Perspektiven und Erfahrungen aus Deutschland und den USA*, W. Fritz (ed.), Stuttgart, Germany: Schaeffer-Poeschl.

Dholakia, Nikhilesh, Ruby R. Dholakia, and Myung-Ho Park (1999), "Internet and Electronic Markets: An Economic Framework for Understanding Market-Shaping Infrastructures," in *Internet-Marketing - Perspektiven und Erfahrungen aus Deutschland und den USA*, W. Fritz (ed.), Stuttgart, Germany: Schaeffer-Poeschl.

Dholakia, Ruby R. (1999),"Going Shopping: Key Determinants of Shopping Behaviors and Motivations," *International Journal of Retail and Distribution Management*, Vol. 27, No.4&5, 154-165.

Dholakia, Ruby R., Norbert Mundorf, and Nikhilesh Dholakia, eds. (1996), *New Infotainment Technologies in the Home: Demand-side Perspectives*, Mahwah, NJ: Lawrence Erlbaum Associates.

Dholakia, Ruby R., Birgit Pedersen, and Neset Hikmet (1997), "Married Males and Shopping: Are they Sleeping Partners?" *International Journal of Retail and Distribution Management*, 23 (3), 27-33.

Garhammer, M. & Mundorf, N. (1997), "Teleheimarbeit und Telecommuting: Ein deutsch-amerikanischer Vergleich [Telework and telecommuting: A German-American Comparison]," *Zeitschrift fuer Arbeitswissenschaft*, 232-239.

Niles, John S. (1994), *Beyond Telecommuting: A New Paradigm for the Effect of Telecommunications on Travel*, Washington, DC: U.S. Department of Energy, Office of Energy Research, DOE/ER-0626.

Niles, John S. (1997), "What Does Telecommunications Really Mean for Transportation?" http://www.silkweb.bc.ca/ite.P2.htm.

Niles, John S. (1998), "Telecommunications' Big Idea," *NTQ - New Telecom Quarterly*, 6 (4), available at http://www.globaltelematics.com/big-idea.htm.

Niles, John S. and Dick Nelson (1999), "Measuring the Success of Transit-Oriented Development: Retail Market Dynamics and Other Key Determinants," American Planning Association National Planning Conference, Seattle, April 24-28, available at http://www.globaltelematics.com/apa99.htm.

Pratt, Joanne H. (1997), *Counting the New Mobile Workforce*, Washington, DC: USDOT Bureau of Transportation Statistics, BTS97-A-01, April.