US Department of Transportation
ITS User Acceptance Research Program

Working Paper for the World Road Association Committee on Intelligent Transport
October 12, 1996

Preface

This overview of the US Department of Transportation (USDOT) ITS User Acceptance Research Program has been prepared for the October 12-13, 1996, meeting of the World Road Association Committee on Intelligent Transport at the third annual World Congress on Intelligent Transportation Systems in Orlando, Florida. It provides a brief summary of the program, research findings where completed, and research in progress.

Introduction

Successful deployment of intelligent transportation systems (ITS) will depend upon the purchase and use decisions of a range of transportation users, including private travelers, commercial drivers, fleet managers, and public sector transportation managers. The diffusion of ITS consumer products and services, in particular, will depend upon a sufficiently large number of consumers discovering value in advanced travel information, safety, and security systems. The USDOT ITS User Acceptance Research program was developed to provide public sector planners, policy analysts, and service operators with a better understanding of how different user groups will value and deploy ITS transportation options.

The User Acceptance Research program contains three research projects, each focused on a different user group:

- Commercial vehicle drivers
- Public sector transportation managers
- Private travelers.

These user groups were identified as the first subjects for research because their acceptance of ITS is critical to widespread deployment. The National Automated Highway Consortium, jointly funded by USDOT and private partners, is also pursuing user acceptance questions, beginning with human factors research. More focused research on the issue of consumer response to the automated highway system (AHS) will begin once the AHS architecture alternatives are further developed. All USDOT ITS research is pre-competitive: It provides insight into user needs and values, but does not pursue any product development research.

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Acceptance of Commercial Vehicle Operations Services by Interstate Truck and Bus Drivers

This study, completed in August, 1995, identified and evaluated critical issues relating to user acceptance of commercial vehicle operation (CVO) services by interstate truck and bus drivers. The study had two parts. The first task comprised in-depth interviews with fifty truck and bus company executives, union representatives, government officials, trucking and busing association representatives, and manufacturers. The second task was a quantitative survey of interstate truck and bus drivers. The CVO services studied were commercial vehicle electronic clearance, automated roadside safety inspection, commercial vehicle administrative processes (including electronically purchased credentials), fleet management, hazardous materials incident response, and on-board safety monitoring.

All industry segments recognized the potential of the CVO products to make the driver's task easier, though each expressed concerns. Company executives stressed the need for industry-wide standardization and the need for the technologies to be reliable and easy to use. Union representatives expressed concern about the need for driver training. Government officials felt that the technologies will promote safety, efficiency, and greater compliance with regulations and tax codes. To attain full efficiencies, there must be standardization of requirements between the states and branches of government. Association representatives expressed concern about the potential costs of CVO products versus their benefits, and about the potential for greatly increased government oversight. Manufacturers said that technology is the future of the industry and that they are already working to increase driver acceptance of technologies through education, trials, and incorporating driver feedback into product design.

For the quantitative survey of drivers, a total of 1,582 interviews were conducted: 1,134 in-person interviews with truck drivers, 411 in-person interviews with motor coach operators, and 37 telephone interviews with truck drivers who had participated in ITS CVO operational tests. Interviews were conducted at truck stops and popular tourist attractions in New York City, Los Angeles, Orlando, Washington, DC, and Las Vegas.

The driver study showed that, on the whole, commercial vehicle drivers are receptive to and supportive of CVO services on the road and in their vehicles. However, there were concerns that certain technologies would invade driver privacy, by either the government or the driver's company. They were concerned that the systems would rely too much on computers and diminish the role of human judgement. Drivers were wary of services that promised too much and would leave them dependent on unproven technology. There were significant differences in drivers' response to the technologies depending upon driver characteristics. Older, more experienced, owner-operator truck drivers were more wary of the new technologies. Younger, less experienced, company-employed drivers (who reported spending more time slowed by administrative procedures) and bus drivers were more positive about the increased safety and efficiencies promised by the new technologies.

From the interviews conducted with drivers who had participated in operational tests of the technologies, it emerged that actual experience working with CVO technologies will likely lead to greater driver acceptance of the technology. This data suggests that placing the technologies directly in the hands of the drivers and allowing them to experience and experiment with the CVO services would be an effective way to increase driver acceptance of the technologies and reduce driver concerns about them.

Public Sector Transportation Managers' Intelligent Transportation Infrastructure Purchase Decisions

This segment of the user acceptance program is studying public sector transportation managers' Intelligent Transportation Infrastructure (ITI) purchase and deployment decisions. With the goal of providing USDOT with information on how to accelerate IT1 deployment among states and metropolitan areas, the study is assessing the opportunities and obstacles that transportation managers face in purchasing and integrating ITI products, and the factors that facilitate or impede deployment of ITI innovations. The study is currently underway and recommendations will be presented in November.

The research is using a case study approach with 12 metropolitan areas chosen from among the 75 areas targeted for ITI deployment by "Operation Timesaver," announced in January, 1996, by Secretary of Transportation Federico Pena. The sites were chosen to represent a range of climates, age of infrastructure, public transportation modes, amount of deployed ITI, population growth, air quality, and geographic distribution. Within each metropolitan area, the study team interviews transportation managers with purchase-decision responsibilities in each of the following organizations: transit; state, county, core and suburban city transportation; state police, metropolitan planning organizations; and other authorities such as port, turnpike, bridge or tunnel. The 12 sites are Portland, OR, Philadelphia, PA, Columbus, OH, Rochester, NY, Memphis, TN, San Diego, CA, Indianapolis, IN, Salt Lake City, UT, Dallas, TX, Buffalo, NY, Charleston, SC, and Kansas City, MO.

Initial observations suggest that certain marketing activities have a greater impact on regional ITI deployment plans. IT1 scoping tours sponsored by the Federal Highway Ad-ministration, peer-to-peer meetings, regional conferences sponsored by professional organizations, ITS America state chapters, and all other organized activity that brings the region's transportation community together to address the challenge of ITI exerts tremendous influence at the local level. Federally-sponsored competitive initiatives, such as the Model Deployment Initiative (MDI) and Early Deployment Planning Studies, impact more than just the funded winners. For example, several communities that submitted MDI proposals, but were not awarded funds, report that they will go ahead with their ITI plans, albeit at a lessor funding level, because the program makes sense for their community. One significant obstacle to ITI that is frequently cited by highway authorities is the lack of an operations orientation to the road network and thus the absence of an operations budget component. This interferes with the funding of traffic and freeway management centers. Other observations suggest that certain characteristics predict interest in

ITI deployment, such as economic and population growth, and the presence of a source of locally controlled, dedicated transportation funding, such as gas tax revenues, or the proceeds of developers' fees.

The Private Traveler

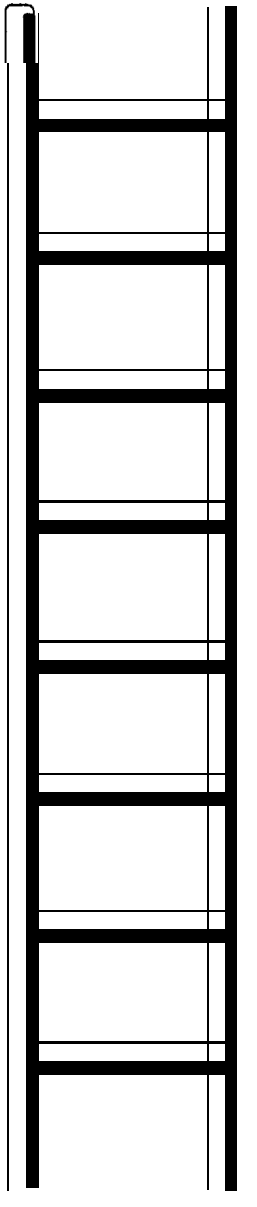
Of the three selected user groups, the private traveler represents the most diverse and least well understood in terms of motivation, purchase behavior, and use of ITS products and services. Will the traveling public make sufficient use of ITS services to have a significant impact on achieving USDOT's goals for surface transportation as articulated in the USDOT Strategic Plan? These goals include improved safety; increased capacity and operational efficiency; enhanced personal mobility, convenience, and comfort; reduction in environmental and energy impacts; and, enhancement of productivity of individuals, organizations, and the economy as a whole. This segment of the User Acceptance Research Program seeks to understand and measure the response of private travelers to those ITS products and services that depend upon their purchase or use decision for deployment: pre-trip and en-route advanced traffic and transit information, navigation and route guidance, personal security, collision avoidance, and traveler services information. This program began in November, 1995, and will be completed by September, 1997.

ITS consumer products and services are innovative; their use requires a significant shift in the user's normal habits and assumptions, and their value is difficult to imagine for those who have not experienced them. To compensate for the lack of an experienced consumer or an informed research base, the private traveler research program has begun with a basic exploration of ITS product value and use in relation to population segments and travel context. The research is being pursued iteratively, with the insight from each segment contributing to the research design and content of the next. Exhibit 1 illustrates the sequence of research activities. The first segment, completed in March, 1996, was a literature survey of all public domain ITS user response studies and several proprietary ITS marketing research studies. The second stage continues exploratory research with a sequence of focus groups convened to explore the key dimensions of traveler reactions to ITS products and services, and to learn more about how to effectively communicate the concepts. Later research segments will use surveys, data from field operational tests, and, potentially, field data from structured product use experiments.

This study will generate several reports addressing consumer and market response issues, and an executive summary synthesizing all research findings. The reports will identify ITS "early adopter" characteristics, segment the market, predict propensity to purchase for different consumer groups at different prices, and suggest functional requirements for certain ITS user services to maximize user acceptance and deployment.

Exhibit 1. The "ladder" of sequential learning about customer acceptance of ITS applications

Step of the ladder	Examples of studies at this level	Example research issues
Large sample general population surveys	Quantitative studies, using CATI, mail, or diskette-based self-administered interviews, of representative samples of major segments of the general population	Propensity to purchase Likely patterns of use Functional requirements Price sensitivity
Genera*l population* surveys using personalized interview techniques	Quantitative studies, using personal or telephone interviews, of representative samples of major segments of the general population	Propensity to purchase Likely patterns of use Functional requirements Price sensitivity
Surveys of identified target groups for particular products/ services	Qualitative or quantitative surveys of particular occupational / industry / interest groups, concerning attitudes and behavior relevant to specific, tightly-defined products/ services	Propensity to purchase Likely patterns of use Functional requirements Price sensitivity
Generic market segmentation, to identify key groups of potential customers	Psychometric and behavioral surveys (small- or large-scale), with multivariate analysis of responses. For example: Factor analysis Cluster analysis Perceptual mapping Discriminant function analysis	Useful groupings (by demographic/ socioeconomic characteristics, current behavior, or attitudes) of potential customers Identifying "early adopter" characteristics
Revealed preference evidence	Analysis of consumer behavior with **analogous** products/services in existing markets. For example: Airline CRS use Purchase of automobile accessories (OEM and aftermarket) Trials of in-vehicle navigational aids Travel & entertainment bookings through direct on-line services	Types of purchasers Patterns of purchase and use Choice structures (what alternatives are considered, and in what order) Influencing factors in choices Price sensitivity
Qualitative work	Focus groups In-depth personal interviews	Communication of concept(s) Key dimensions of customer reactions Opinion shifts from added information/ discussion
Literature review	Analysis, data, simulation studies, and data collection methods particularly germane to ITS innovations	What's the current best understanding and practice?



Publications

Commercial Vehicle Drivers
Critical Issues Relating to Acceptance of CVO Services by Interstate and Truck and Bus Drivers, May 1995

Public Sector Transportation Managers
ITS User Acceptance on Transportation Managers: A Summary of Current ITI Deployment Knowledge, March 1996; *Marketing ITI in the Public Interest,* in process for November, 1996.

Private Travelers
User Acceptance of ATIS Products and Services: A briefing book on the current status of JPO research, March, 1996; *High Mileage Drivers ' Valuation of In-Vehicle Navigation, Traffic Information, and Personal Safety and Security Services,* in process for November, 1996.

Related USDOT User Acceptance and Market Research

ITS Consumer Market
USDOT has funded a series of studies to explain and describe the evolution of this innovative consumer market niche. Publications include: *A Market Analysis of the Commercial Traffic Information Business,* March, 1994*; Case Studies of Market Research for Three Transportation Communications Products: Electronic Toll Collection, Advanced Vehicle Information and Location, and Cellular Phones,* February, *1994; An Update of the Commercial ATIS Market,* work-in-progress, March, 1996

User Acceptance Research Guidance
USDOT provides research guidance to field test evaluations and deployment programs to support consistent and high quality user acceptance research. Publications include: *A Primer on Marketing Research: Procedures, Methods, and Tools,* March, 1994; *Applying Consumer Research Methods to ITS Challenges,* seminar proceedings, April 12-l 3, 1995; *A Practical Guide to Consumer Research for ITS Field Tests and Deployment Programs,* final draft September, 1996

Field Operational Test and Priority Corridor User Acceptance Evaluations
Each of the following USDOT-sponsored ITS field operational tests have a user acceptance research component to their evaluation. Some of the tests are complete, some are in process; an asterisk indicates where the user acceptance evaluation reports are complete: Advanced Driver and Vehicle Advisory Navigation Concept (ADVANCE), TravTek*, Boston SmarTraveler*, TravInfo, Yosemite Advanced Traveler Information (YATI), Bellvue Smart Traveler*, Guidestar (Genesis, Travlink, Trilogy), Atlanta ATIS-Kiosk Project, Atlanta Driver Advisory Systems (ADAS), Diver Information Radio Experimenting with Communications Technology (DIRECT), Seattle Wide-Area Information For Travelers (SWIFT), Atlanta Traveler Information Showcase, Houston Smart Commuter, Los Angeles Smart Traveler, I-95 Corridor User Needs Assessment*, TRANSCOM*