



## **Driver Decision Making in Response to Alternate Routes**

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*Transportation Literature Searches are prepared for WisDOT staff and investigators to identify completed research and other authoritative information in an area of interest. The citations below are representative, rather than exhaustive, of available English-language studies on the topic. Primary online resources for the literature searches are OCLC's [WorldCat](#) and [TLCat](#), TRB's [TRID](#) database, the National Transportation Library ([NTL](#)), and other academic, engineering and scientific databases as appropriate.*

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**Topic/Problem Statement:** Examining drivers' decision-making process in response to the availability of alternate routes to avoid lane restrictions or closures.

**Keywords:** Route choice, route selection, route diversion, en route diversion behavior, alternate routes, traffic diversion, driver behavior, decision making.

### **Summary**

The issue of driver route choice has been studied fairly extensively as part of the body of research on intelligent transportation systems. A few studies cited in this literature search focus directly on **Route Choice Analysis**, while many other studies address driver decision making as part of research on designing **Advanced Traveler Information Systems** such as 511 systems. Driver route choice is also a key component of **Traffic Network Modeling**. Finally, this literature search includes a few citations of **Federal Resources** related to implementation of alternate routes.

### **Citations**

*Links to online copies of cited literature are provided when available. Contact the WisDOT Library to obtain hard copies of citations.*

### **Route Choice Analysis**

**Title:** **Route Choice Under the Microscope: Process-Oriented Analysis of Decision Making**

**Author(s):** Petr Senk

**Date:** 2010

**Source/URL:** *Transportation Research Record: Journal of the Transportation Research Board*, No. 2156, pages 56-63

**Description:** 8 pages

**Abstract:** This study demonstrates a process-oriented approach to the analysis of decision making through the example of the interactive route choice problem. The core of the work consists in the design of the methodological framework, combining the psychological research method of thinking aloud for acquisition of data concerning cognitive processes generated in the course of decision making and the method of semantic content analysis for their processing and for drawing inferences. Results show that the process-oriented analysis of decision making has the potential to disclose facts hidden beyond the observed behavior. The analysis of process data obtained during laboratory experiments showed that the set of strategies applied by subjects is much more diverse than is assumed in most existing models of route choice. Subjects compared travel times on alternate routes to choose the fastest one, updated actual travel times by exploratory route switching, insisted on habitual choice of one route, anticipated choices of others to get to the minority side, and so forth. These results suggest that the diversity in observed behavior may be to some extent caused by the diversity in individual portfolios of applied choice strategies.

**Title: Effects of a Smart Work Zone on Motorist Route Decisions**

**Author(s):** R. Bushman, Curtis F. Berthelot, J. Chan

**Date:** 2004

**Source/URL:** *2004 Annual Conference and Exhibition of the Transportation Association of Canada: Transportation Innovation—Accelerating the Pace*

**Description:** 13 pages

**Abstract:** To manage traffic more effectively in and around work zones several agencies have begun using Smart Work Zone systems. This technology measures current traffic conditions approaching the work zone and uses portable roadside signing to advise drivers of reduced speeds ahead, expected delays, and the use of alternate routes. The purpose of the system is to reduce delays and queues, reduce driver frustration, and increase driver awareness of upcoming conditions. A study was conducted of a Smart Work Zone deployment on Interstate 95 in North Carolina during the 2003 construction season to examine motorists' preference to use an alternate route when presented with real-time traffic information. When presented with advisory information drivers have the opportunity to make an informed choice to stay on the mainline or to use an alternate route. Use of the alternate route was affected by the type of information presented, with a greater response observed when specific information on the expected delay and an alternate route were provided, when compared to just the expected delay or a generic message. During periods of congestion at the alternate route exit more drivers chose to use the alternate route than when congestion was not present.

**Title: Evaluation of Driver Reactions for Effective Use of Dynamic Message Signs in Richmond, Virginia**

**Author(s):** Jeremy L. Schroeder, Michael J. Demetsky; sponsored by Virginia DOT

**Date:** February 2010

**Source/URL:** Final Report VTRC 10-R16; [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/10-r16.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/10-r16.pdf)

**Description:** 33 pages

**Abstract:** Dynamic message signs (DMS) are used in conjunction with other media to communicate traffic conditions, general information, and recommended diversion strategies to motorists. Previous studies using loop detector data to estimate diversion rates attributable to advisory messages on DMS have found that diversion is minimal when vague messages are displayed or a distant alternate route is the only option. For motorists traveling on I-95 through Richmond in the Virginia Department of Transportation's Central Region, however, when DMS alert motorists of incidents, I-295 serves as a comparable alternate route, adding no significant travel time to through trips. This scenario provides the opportunity to evaluate the effectiveness of DMS in traffic diversion without the major concerns of added trip time and the quality of the route. This study investigated the impacts of existing message strategies to determine messages that maximize diversion for specific circumstances and to develop new messages for future deployment. An analysis was done for various message types and split into two diversion scenarios: (1) an incident on the primary freeway, I-95, encourages diversion of I-95 traffic to an alternate route, I-295; and (2) an incident on an intersecting freeway, I-295, encourages exiting I-295 traffic to remain on I-95 as an alternate route. The results showed trends where the use of particular words in messages is more effective than the use of others in achieving diversion when percentage of diverted traffic was used as the performance measure. The effects on traffic flow by drivers' reactions to non-traffic messages were also investigated. Transportation agencies are frequently asked to post public service announcements on DMS when they are not being used for traffic-related purposes. It has been suggested that these messages are a distraction to drivers and result in queuing, creating mobility and safety hazards. An analysis that used speed as the performance measure showed minimal impacts on traffic flow from the display of non-traffic messages during weekday non-peak hours. The study recommends that (1) travel time estimates for both the primary and alternate routes or the length or time of the delay be provided on DMS; (2) specific wording, as noted in the text, be used to induce diversion or simply to provide information;

(3) messages be displayed in “title case” instead of “ALL CAPS” (i.e., all letters in a word are capitalized) for low-frequency messages; and (4) left-justified or “staircase” messages be used. Further, non-traffic messages should be one-phase messages and should be displayed only during non-peak periods to minimize the potential for queuing. If the recommendations of this research are implemented, the enhanced effectiveness of diversion strategies will result in reductions of delay, fuel consumption, and emissions, as well as the potential for secondary accidents created by major incidents and other traffic flow disruptions. In 2007, the cost of delay for motorists in Richmond, Virginia, resulting from incidents was estimated at \$119 million. A modest 1 percent reduction in this cost attributable to better diversion strategies that use DMS more effectively would result in an annual cost savings to VDOT of more than \$1 million.

**Title: Real-Time Measurement of Travel Time Delay in Work Zones and Evaluation Metrics Using Bluetooth Probe Tracking**

**Author(s):** Ross J. Haseman, Jason S. Wasson, Darcy M. Bullock

**Date:** 2010

**Source/URL:** *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2169, pages 40-53

**Description:** 14 pages

**Abstract:** This paper describes the collection and use of 1.4 million travel time records that were collected over a 12-week period in 2009 to evaluate and communicate quantifiable travel mobility metrics for a rural interstate highway work zone along I-65 in northwestern Indiana. The effort involved the automated collection and processing of Bluetooth probe data from multiple field collection sites, communicating travel delay times to the motoring public, assessing driver diversion rates, and developing proposed metrics for a state transportation agency to evaluate work zone mobility performance. Collected travel time profiles were compared with traditionally measured hourly flows in both incident and nonincident conditions. Through the 12-week period over which work zone performance was measured, the work zone had 422 h of congested conditions in which travel time delay was greater than 10 min. Despite the display of real-time delay measurements to the motoring public through portable dynamic message signs, a negligible percentage of the travel probes were observed to divert in advance of the congested work zone through self-guidance. Implementation of a targeted alternate route starting the weekend of July 24 resulted in an increase of observed probes diverting along the trail-blazed route from none to more than 30%. The paper concludes by suggesting that acquisition of work zone travel time data provides a mechanism for assessing the relationship between crashes and work zone queuing. Real-time monitoring of these travel time data may also enable future contracts to include innovative travel time reliability clauses.

**Title: Analysis of Route Choice Decisions by Long-Haul Truck Drivers**

**Author(s):** John H. Knorrning, Rong He, Alain L. Kornhauser

**Date:** 2005

**Source/URL:** *Transportation Research Record: Journal of the Transportation Research Board*, No. 1923, pages 46-60

**Description:** 15 pages

**Abstract:** This study has done an empirical analysis of long-haul truck drivers’ route choice decision making as they navigate the U.S. highway network. The most important factor that has been analyzed is how long-haul truck drivers trade off between distance and time when faced with multiple routes. From information gathered from a revealed preference data set consisting of about 250,000 trucks over a 13-day period, a logistic model was constructed to describe route choice behavior when truck drivers are faced with alternate routes. The logistic model predicted the percentage of trucks that used the bypass route as a function of the perceived speed on the downtown route. The results of this study show that time is a significant factor in the decision-making process.

**Related document:**

*Basic Human Decision Making: An Analysis of Route Choice Decisions by Long-Haul Truckers*, John H. Knorrning, 2003, <http://orfe.princeton.edu/~alaik/Papers/KnorrningThesis.pdf>

## **Advanced Traveler Information Systems**

The citations in this section explore driver decision making and route choice as they relate to Advanced Traveler Information Systems.

### **Title: Using Human Information Processing Principles to Design Advanced Traveler Information Systems**

**Author(s):** C. Y. David Yang, Jon D. Fricker

**Date:** 2001

**Source/URL:** *Transportation Research Record: Journal of the Transportation Research Board*, No. 1759, pages 1-8

**Description:** 8 pages

**Abstract:** The concepts of human information processing provide design recommendations for advanced traveler information systems (ATISs). A driver's information processing model for the ATIS environment is proposed. This qualitative model explicitly depicts how drivers process ATIS information, from the moment it is received until a decision is made in response to the information. The model is supported by data collected with a driving simulator. The results of the driving simulator study indicate that, because of the limitations of human memory, drivers prefer to have short simple ATIS information conveyed to them whenever the circumstance allows. Furthermore, drivers do not always need or want visually displayed information (e.g., an electronic map) to assist them in route navigation. In unfamiliar traffic networks, a motorist's propensity to change routes is strongly correlated to the quality of ATIS information being processed. With the right amount of traffic information presented using an effective conveyance method, more drivers are likely to accept and use ATIS information and divert to alternate routes. The challenge for ATIS designers is to provide options that are acceptable to ATIS users.

### **Title: Accessibility and Use of Enhanced ATIS Features and Their Relationship to En-Route Driver Decision Making**

**Author(s):** Robert E. Llaneras, Neil D. Lerner

**Date:** 2000

**Source/URL:** *ITS America Meeting: Revolutionary Thinking, Real Results*

**Description:** 19 pages

**Abstract:** Effects of Advanced Traveler Information System (ATIS) information on driver en-route decision making were explored through the use of a real-time trip simulator which used computer-controlled video sequences of actual traffic scenes to preserve important real-world cues, and provided a range of ATIS display capabilities (navigation displays, route guidance, traffic and hazard warnings, etc.) using a touch-screen panel to enable en-route navigation decisions to be studied under realistic settings. Seventy-two locally familiar drivers, ranging in age from 18 to 86 years of age, took part in the study. The sample was equally divided between males and females. A network of freeways and surface streets were simulated and available to drivers to navigate to their destination. These trips were fully under the control of the driver in terms of route selection and were experienced in real-time under realistic time pressures. Two levels of ATIS were defined, Basic and Enhanced ATIS. Basic ATIS provided drivers with notification of incidents and congestion through the use of in-vehicle Variable Message Signs and included details about the type of incident, its location and qualitative estimates of delay (e.g., moderate delays). Enhanced ATIS provided the same in-vehicle VMS incident notification as Basic ATIS plus access to a variety of supplemental information, including: alternate route information incident details, real time traffic maps with segment travel times and system wide incident/congestion, and live traffic camera views of incidents and road segments. Drivers were randomly assigned to one of these two ATIS conditions or a comparison group that received no in-vehicle VMS notification or supplemental information. Drivers in each of the three groups were also exposed to either light or moderately heavy traffic volumes during their trip in order to examine the extent to which direct visual observation of actual traffic conditions influenced route navigation and diversion decisions.

### **Title: User Preferences for Information Types in Advanced Traveler Information System Application**

**Author(s):** N. Lerner, R. Huey, Z. Zador, J. Harpster, D. Duncan

**Date:** 1998

**Source/URL:** *Human Factors and Ergonomics Society 42nd Annual Meeting, Proceedings*, pages 1200-1204

**Description:** 4 pages

**Abstract:** This paper addresses the types of ATIS information travelers prefer to acquire, and how the information influenced route choice. Hypothetical trip scenarios provided information such as primary and alternative routes, time of day, current weather, trip purpose, etc. The participant had a set of from 9 to 16 sealed envelopes for each scenario, labeled as to the type of information inside. The participant opened as many envelopes as desired, in any order, to reach a decision as to what route to take; typically, only three items of information were acquired, even

though there were no constraints on information acquisition. "Incident location" was the most often selected and opened first, but "delay" was most often cited as the most important item. Estimated travel times on the primary and alternate route were sought by some participants. Cluster analysis revealed three primary groups of individuals in terms of common information strategies. The findings are interpreted in terms of implications for the design of ATIS messages.

**Title: The Effects of Information Accuracy on User Trust and Compliance**

**Author(s):** Jean E. Fox

**Date:** 1996

**Source/URL:** [http://www.sigchi.org/chi96/Doctor-Consort/fox/jef\\_txt.htm](http://www.sigchi.org/chi96/Doctor-Consort/fox/jef_txt.htm)

**Abstract:** Designers and manufacturers of new technology must understand the factors that influence consumers' decisions to purchase new high-tech products. One important factor in the decision is how much users trust the technology. Muir [5, 6] developed a theory of how people develop trust in automated systems. Several studies have supported her model. This proposed study will provide additional data to test this theory. The application to be studied is an Advanced Traveler Information System (ATIS), which provides route navigation information to automobile drivers. The study will evaluate how inaccurate congestion information affects the users' trust in and compliance with the system's advice. These results will be important to ATIS developers, who need to know how accurate the systems must be to facilitate user acceptance.

**Title: Comparative Analysis of Spatial Knowledge and En Route Diversion Behavior in Chicago and San Francisco: Implications for Advanced Traveler Information Systems**

**Author(s):** Aemal J. Khattak, Asad J. Khattak

**Date:** 1998

**Source/URL:** *Transportation Research Record: Journal of the Transportation Research Board*, No. 1621, pages 27-35; [http://www.eng.odu.edu/transportation/khattak/01\\_Journal\\_Papers/24%20Khattak.pdf](http://www.eng.odu.edu/transportation/khattak/01_Journal_Papers/24%20Khattak.pdf)

**Description:** 9 pages

**Abstract:** Drivers' spatial knowledge and en route response to unexpected delay information are examined. Compared are behavioral responses to information across two metropolitan areas in the United States: Chicago and the San Francisco Bay Area. Comparable behavioral data were collected through handout-mailback questionnaires targeting peak-period automobile commuters. The Chicago respondents perceived higher traffic congestion levels, and more of them knew one or more alternate routes. Among the Chicago respondents, fewer received information about unexpected delays from the radio (as opposed to self-observation of congestion) and more automobile commuters diverted to their alternate routes. To understand the factors that influence knowledge of alternate routes and en route diversion in response to unexpected congestion, a full information maximum likelihood nested logit model is estimated. Results of the model indicate that longer duration of residence, higher propensity for discovering new routes, and locational characteristics tend to increase drivers' spatial knowledge. Propensity for en route diversion increases with higher than usual route travel time plus delay and shorter alternate route travel times. Drivers with higher propensity for taking risks to avoid unexpected delays are more likely to divert. The model indicates that route knowledge and en route diversion propensity is higher in Chicago than San Francisco. This implies that information-sensitive behavioral models may be context dependent. Importantly, delay information received through radio traffic reports, as opposed to other sources such as self-observation of congestion, increases en route diversion propensity in unexpected delay situations. This implies a more dynamic readjustment of commuters' route selection decisions. At the same time, the potential benefits from Advanced Traveler Information Systems (ATIS) must compete with the benefits already accruing from radio traffic information.

**Title: Commuters' Enroute Diversion and Return Decisions: Analysis and Implications for Advanced Traveler Information Systems**

**Author(s):** Asad J. Khattak, Joseph L. Schofer, and Frank S. Koppelman

**Date:** April 1993

**Source/URL:** *Transportation Research Part A: Policy and Practice*, Vol. 27, No. 2, pages 101-111, [http://www.eng.odu.edu/transportation/khattak/01\\_Journal\\_Papers/44%20Schofer%20Div%20Ret.pdf](http://www.eng.odu.edu/transportation/khattak/01_Journal_Papers/44%20Schofer%20Div%20Ret.pdf)

**Description:** 11 pages

**Abstract:** Incident-induced congestion is a major source of delay and frustration for drivers in large urban areas. Advanced Traveler Information Systems (ATIS) have been proposed within the framework of Intelligent Vehicle Highway Systems (IVHS) to address one component of the incident-induced congestion problem: diversion of drivers to alternate routes. To fully utilize the potential of ATIS, transportation managers need to understand driver response to such congestion. This study examines short-term commuter response to unexpected (incident-induced)

congestion. It investigates factors which influence diversion from the regular route and return to the regular route after diversion. Discrete choice models of diversion and return behavior show that the following information and trip factors increase the probability of diversion: delay information received from radio traffic reports as opposed to observation of congestion, longer delays and longer travel times, and number of alternate routes used in the past. Further, drivers were more likely to divert if they lived in the city as opposed to the suburbs, were risk seekers, had a higher stated propensity to divert and were male. However, anticipated congestion on the alternate route inhibited drivers from diverting. Finally, drivers who had longer commute trips were more likely to return to their regular route. The most important implication for designing ATIS is that traffic information must be “customized” to account for individual differences. Specific design implications are discussed in the paper.

**Title: A Human Factors Simulation Investigation of Driver Route Diversion and Alternate Route Selection Using In-Vehicle Navigation Systems**

**Author(s):** R. Wade Allen, Anthony C. Stein, Theodore J. Rosenthal, David Ziedman, Jaime F. Torres, Abolhassan Halati

**Date:** October 1991

**Source/URL:** *Vehicle Navigation and Information Systems Conference, 1991*, pages 9-26

**Description:** 18 pages

**Abstract:** This paper describes a human factors simulation study of the decision making behavior of drivers attempting to avoid nonrecurring congestion by diverting to alternate routes with the aid of in-vehicle navigation systems. This study is the first phase of a two part project in which the second phase will apply the driver behavior data to a simulation model analysis of traffic flow. The object of the driver behavior experiment was to compare the effect of various experimental navigation systems on driver route diversion and alternate route selection. The experimental navigation system configurations included three map based systems with varying amounts of situation information and a non map based route guidance system.

The overall study results indicated that navigation system characteristics can have a significant effect on driver diversion behavior, with better systems allowing more anticipation of traffic congestion. Subject route familiarity, commercial driving experience and gender did not significantly affect the results. Alternate route analysis tended to confirm the main route diversion results, and also showed that a majority of drivers were willing to accept alternate routes suggested by advanced navigation systems. These results were consistent over three significantly different congestion conditions. Driver age was also a factor, with old drivers being more reluctant to divert from the main freeway route. The paper describes the simulation approach and summarize results on diversion decision behavior and alternate route selection.

**Title: Driver Compliance with Route Guidance Advice: The Evidence and Its Implications**

**Author(s):** P.W. Bonsall, M. Joint

**Date:** October 1991

**Source/URL:** *Vehicle Navigation and Information Systems Conference, 1991*, pages 47-59

**Description:** 13 pages

**Abstract:** This paper will present results from two sources; questionnaires conducted among drivers equipped with route guidance as part of the Berlin LISB trial and analysis of decisions made by users of the interactive route guidance simulator known as IGOR. The results from Berlin show a high level of commitment by participants in the trial but nevertheless show a general reduction in usage of the equipment over time. Adherence to advice is not high on regular journeys and reflects a low opinion of the quality of routes recommended by the system for such journeys. For finding new destinations or travelling in unfamiliar areas, opinions and usage are much higher. Overall driver behaviour has not been much influenced by LISB. Our surveys provide useful information on drivers' reasons for ignoring advice and their suggestions for system enhancement. The IGOR results provide strong quantitative evidence that acceptance of an item of advice is closely correlated with objective measures of its quality. It is also a function of the drivers' familiarity with the network, his previous experience of the reliability of advice and the degree of corroboration of advice by “external” evidence such as the orientation of the advice route relative to the destination, the absence of congestion and the behaviour of other drivers.

## **Traffic Network Modeling**

**Title:** A Decision-Making Rule for Modeling Travelers' Route Choice Behavior Based on Cumulative Prospect Theory

**Author(s):** Hongli Xu, Jing Zhou, Wei Xu

**Date:** April 2011

**Source/URL:** *Transportation Research Part C: Emerging Technologies*, Vol. 19, No. 2, pages 218-228

**Description:** 11 pages

**Abstract:** To make practical use of research into travelers' behavior in route choice modeling, a link is required to connect objective travel scenarios with the subjective decisions made by travelers. Cumulative prospect theory (CPT) offers an alternative framework of route choice behavior that goes beyond the conventional expected utility theory (EUT) models. This paper develops a general travel decision-making rule utilizing CPT. It investigates the mechanism of travelers' behavior, examines the probability of applying CPT as a measure of commute utility, and establishes a general utility measurement system, the results of which are found to be more consistent with the experimental data than those of EUT-based route choice models. In addition, an approach to confirm the reference point value is suggested. The main techniques adopted in this study are demonstration analysis, a questionnaire survey, and statistical approaches.

**Title:** Empirical Analysis and Modeling of Drivers' Response to Variable Message Signs in Shanghai, China

**Author(s):** Tiandong Xu, LiJun Sun, Zhong-Ren Peng

**Date:** 2011

**Source/URL:** Transportation Research Board Annual Meeting 2011, Paper #11-2499

**Description:** 23 pages

**Abstract:** The purpose of this paper is to develop a new method suitable for analyzing en-route diversion behavior, with a corresponding Probit model to analyze and quantify the impact of various Variable Message Signs (VMSs) message content and other factors on traffic diversion, based on real-time detected traffic data in Shanghai, China. The result is then compared with a Probit model based on Stated Preference (SP) survey. To minimize the impact of varying Origin-Destination (OD) demand and travelers' route selection behavior, this method seeks to study the impact of VMS during a short period before and after a VMS message switch, using relative diversion/compliance indices to evaluate the impact of information changes, and absolute diversion/compliance indices quantitatively analyze the impact of VMS messages on drivers' en-route behavior. Traffic data from loop detectors, in use from 2003, and vehicle license plate readers, in use since 2008, are used to analyze the impact of VMS messages on drivers' en-route diversion behavior and develop an aggregated en-route diversion Probit model. Results indicate that drivers are more sensitive to travel time information than traffic congestion information. Therefore, it will be beneficial for drivers to make right route choice decision, if information suggesting alternate routes is provided and neighboring VMSs are coordinated. These results are consistent with that of SP survey. Moreover, the authors also found that time factors, off-ramp conditions, and visibility of downstream congestion significantly influence en-route behavior, which can explain the significant difference between the result from en-route model based on SP survey and the real traffic system.

**Title:** A Hybrid Tree Approach to Modeling Alternate Route Choice Behavior With Online Information

**Author(s):** Chanyoung Lee, Bin Ran, Fan Yang, Wei-Yin Loh

**Date:** October 2010

**Source/URL:** *Journal of Intelligent Transportation Systems: Technology, Planning, and Operations*, Vol. 14, Issue 4, pages 209-219

**Description:** 11 pages

**Abstract:** One popular intelligent transportation systems (ITS) element that has been deployed in various areas of the United States is variable-message signs (VMSs). Such signs are part of advanced traveler information systems, and they can help drivers make better en route decisions regarding their trips. Unlike most other ITS elements (e.g., ramp metering, advanced signals), VMSs are not supported by mandatory regulations. Consequently, the expected benefit from implementing VMSs largely depends on the response of drivers. This study explored the factors affecting alternative route choices of car drivers with VMSs on the interstate highway system. This study adopted a method called LOTUS to analyze driver-compliance behavior with VMSs. Driver behavior under information provision through VMS data has been collected using the stated-preference approach. The study showed that travel-time saving is not the single dominant factor for driver route choice under information provision. This article explores variables that are associated with driver compliance.

**Title: A Moment of Time: Reliability in Route Choice Using Stated Preference**

**Author(s):** Nebiyou Y. Tilahun, David M. Levinson

**Date:** July 2010

**Source/URL:** *Journal of Intelligent Transportation Systems: Technology, Planning, and Operations*, Vol. 14, Issue 3, pages 179-187

**Description:** 9 pages

**Abstract:** Understanding how reliability is valued is important because it provides insight into how aims of policies that aspire to provide better transport options can be more fully integrated with user expectations. Better reliability is a desired outcome of transportation policies because it reduces scheduling costs. This study uses a stated preference survey to collect route preference data, in which each route is described by the travel time experience on it. Because travel-time decisions are made from momentary recollections of past experience, the paradigm adopted in this study is that the mode travel time rather than the mean is the important basis for travel time decisions. The authors then explore three alternate measures of reliability and use them to estimate route choice models on the basis of the stated preference data. Two of the measures, range coupled with lateness probability and standard deviation, have been explored before. A third measure based on time moment (moments of inertia) measured from the mode travel time is also proposed and tested. Each measure reveals something different about how people value different aspects of reliability. In all cases, reliability is valued highly, although differently depending on how it is defined. The values of reliability and travel time highlight that transportation policy makers can provide significant benefits to users from strategies that seek to increase reliability.

**Title: Analyzing Travelers' Intention to Accept Travel Information: Structural Equation Modeling**

**Author(s):** Chengcheng Xu, Wei Wang, Jun Chen, Weijie Wang, Chen Yang, Zhibin Li

**Date:** 2010

**Source/URL:** *Transportation Research Record: Journal of the Transportation Research Board*, No. 2156, pages 93-100

**Description:** 8 pages

**Abstract:** Advanced traveler information systems (ATIS) cannot improve the traffic environment if travelers do not accept the travel information provided by the system. To understand better why travelers accept or refuse travel information and to explain, predict, and increase travelers' acceptance of travel information, a research framework based on the technology acceptance model is developed to establish the relationship between travelers' intention to accept travel information, trust in travel information, perceived usefulness of travel information, perceived ease of its use, and other related variables. Then structural equation modeling is used to examine and analyze the relationship among these variables. The results show that the factors that significantly determine travelers' intention to accept travel information are trust in travel information, its perceived usefulness, its perceived ease of use, and information attributes. Through an examination of the direct, indirect, and total effects in the model system, it is discovered that perceived ease of use has the largest total effect on intention to accept by a standardized coefficient of 0.522, followed by trust in information (0.348), perceived usefulness (0.199), and information attributes (0.079). These results indicate the practical value of the estimated model for guiding recommendations aimed at increasing travelers' intention to accept travel information and at improving the service quality of travel information in China.

**Title: Strategic Thinking and Risk Attitudes in Route Choice: Stated Preference Approach**

**Author(s):** Michael Razo, Song Gao

**Date:** 2010

**Source/URL:** *Transportation Research Record: Journal of the Transportation Research Board*, No. 2156, pages 28-35

**Description:** 8 pages

**Abstract:** This research investigates route choice behavior in networks with risky travel times and real-time information. A stated preference survey is conducted. In it subjects use a PC-based interactive map to choose routes link by link in various scenarios. The scenarios include two types of maps: the first map presents a choice between one stochastic route and one deterministic route, and the second contains real-time information and an available detour. The first type of map measures the basic risk attitude of the subject. The second type allows for strategic planning and measures the effect of this opportunity on subjects' choice behavior. Results from each subject are analyzed to determine whether the subject planned strategically for the en route information or simply selected fixed paths from origin to destination. The full data set is used to estimate several choice models with expected travel times and standard deviations as explanatory variables. Estimation results are used to assess whether models that incorporate strategic behavior more accurately reflect route choice than do simpler path-based models.

**Title: Drivers' En Route Diversion Decisions Under Influence of Variable Message Sign Information: Empirical Analysis**

**Author(s):** HongCheng Gan, Xin Ye, WangSheng Gao

**Date:** 2008

**Source/URL:** *TRB 87th Annual Meeting Compendium of Papers DVD*, Paper #08-0498

**Description:** 23 pages

**Abstract:** For better supporting informed diversion decisions in case of congestion and incidents, it is important to provide drivers with detailed traffic information such as travel times on intended and alternated routes through Variable Message Signs (VMS). This paper used a stated preference (SP) approach to undertake a quantitative assessment of the potential effects of travel time information provided by VMS on en-route diversion behavior of Shanghai urban freeway drivers. Using SP data, three types of binary probit models were estimated: the model without random coefficient, the model with normal random coefficient, and the model with log-normal random coefficient. The two models with random coefficient accommodate heterogeneous taste preference for travel time savings (the difference between the regular freeway route travel time and the alternate route travel time) among drivers. It was found that drivers' en-route decision on diverting from the regular freeway route to the alternate local street route can be significantly influenced by VMS information. The impact of information is significantly influenced by the characteristics of driver, route, and VMS message of travel time. Travel time saving and drivers' driving age serve as positive factors in drivers' diversion behavior. Signal number on alternate local route, driving employer-provided public car, frequency of driving on freeway, and driver's being mid-age, serve as negative factors in diversion behavior. The findings have important implications for the operation of VMS-based advanced traveler information systems (ATIS).

## **Federal Resources**

**Title: Work Zone Public Information and Outreach Strategies**

**Author(s):** U.S. Department of Transportation

**Date:** November 2005

**Source/URL:** FHWA-HOP-05-067, [http://ops.fhwa.dot.gov/wz/info\\_and\\_outreach/index.htm](http://ops.fhwa.dot.gov/wz/info_and_outreach/index.htm)

**Abstract:** *Excerpt:* This Guide is designed to help transportation agencies plan and implement effective public information and outreach campaigns to mitigate the negative effects of road construction work zones.

**Title: Alternate Route Handbook**

**Author(s):** Federal Highway Administration

**Date:** May 2006

**Source/URL:** [http://www.ops.fhwa.dot.gov/publications/ar\\_handbook/index.htm](http://www.ops.fhwa.dot.gov/publications/ar_handbook/index.htm) See Fig. 2-12, "Resources used to inform motorists to divert to an alternate route," at [http://www.ops.fhwa.dot.gov/publications/ar\\_handbook/arh2.htm#f2-12](http://www.ops.fhwa.dot.gov/publications/ar_handbook/arh2.htm#f2-12).

**Description:** 89 pages

**Abstract:** This report describes and defines what alternate route traffic routes are and how traffic and highway agencies can implement them. The need for, planning, and execution of alternate routes with stakeholder agencies is addressed. Highway and traffic agencies, public safety agencies, and State, county and local municipalities are the target audience.

**Title: Roadway Incident Diversion Practices**

**Author(s):** W.M. Dunn Jr., R.A. Reiss, S.P. Latoski

**Date:** 1999

**Source/URL:** *NCHRP Synthesis of Highway Practice 279*

**Description:** 90 pages

**Abstract:** This synthesis report will be of interest to officials of municipal, regional, and statewide transportation and law enforcement agencies who are responsible for roadway incident diversion practices. It will also be of interest to others who interact with these agencies to achieve a better understanding of the processes, barriers, and technologies associated with alternate route plan development and deployment. This report presents state-of-the-practice information about the development, deployment, and implementation of roadway incident diversion practices. It documents specific trends in the practice, and in examining individual practices, identifies unique plans, processes, and technologies from which other agencies may find useful applications. This report of the Transportation Research Board addresses a broad list of topics and profiles successful incident diversion practices,

as reported by surveyed agencies. In particular, it focuses concern on alternate route plans for incidents that happen at random, resulting in the occurrence of nonrecurring congestion.