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A Market Analysis of the Commercial Traffic Information Business

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Foreword

The following is one of a series of papers developed or produced by the Economic Analysis Division of the John A. Volpe National Transportation Systems Center as part of its research project looking into issues surrounding user response and market development for selected Intelligent Vehicle-Highway Systems (IVHS) products or services. The project, sponsored by the Federal Highway Administration's Office of Policy Development, was one part of FHWA's 1992 Institutional Issues Program entitled -- "Public Acceptance and Markets for Various Consumer IVHS Services". John O'Donnell of the Volpe Center and James March of FHWA served as Project Managers for their organizations.

The objective of the Volpe Center project was to better understand factors affecting the development and deployment of selected advanced traveler information products and services (ATIS). The Center addressed the objective by examining the development of markets for selected ATIS-related products and services and reviewing factors affecting the public acceptance and user response to existing traffic information services.

Deployment of many of the newly emerging and projected IVIIS products and services will depend upon consumers purchasing and otherwise choosing to make use of advanced traffic and travel information products and services. Through four different projects, each with a distinctive approach to understanding consumer response and market demand, the Volpe Center explored the question: Given the opportunity to buy a product or subscribe to a service that promises to deliver traveler information, will the consumer perceive that there is sufficient benefit to be gained to justify the investment?

The Volpe Center and FHWA jointly conducted a workshop in the Fall of 1992 to discuss issues involved with assessing the market for IVHS products and services. The objectives of the workshop were to help define a research program which would address measuring user acceptance and response to ATIS products and services and the role market research plays in understanding emerging markets for new or unknown products and services.

The results of the workshop are reflected in the four research tasks initiated as part of this program and the seven papers which comprise it. The four task areas are summarized below. Copies of the papers will be provided upon request to the Volpe Center.

TASK 1. Industry Methods for Assessing Consumer Response to New Products/Services

The first project was designed to answer the question of how consumer response and market demand are measured in the commercial sector, where these market demand questions are fundamental to the survival and success of the business. This project has two parts. The first is a primer on how consumer marketing research is done in the commercial sector. The second presents three case studies that examine how three current high-technology communications and travel products applied marketing research in preparation for market release.

Report 1A. *A Primer on Consumer Marketing Research: Procedures, Methods, and Tools*

The Volpe Center developed a marketing research primer which provides a guide to the approach, procedures, and research tools used by private industry in predicting consumer response. The final two chapters of the primer focus on the challenges of doing marketing research on "revolutionary" products, or those products which the consumer has had no direct experience with, as is the case with most IVHS products and services. This primer was designed to provide the non-marketing researcher with a good understanding of how this particular type of human behavior research is pursued.

Report 1B. *Case Studies of Market Research for Three Transportation Communications Products: Electronic Toll Collection, Advanced Vehicle Inform-afion and Location, and Cellular Telephones*

Three case studies were undertaken to demonstrate the application of marketing research to products which are analogous to ATIS products and services, to learn from the market experience of these three ATIS-analogous products any lessons which might be applicable to future ATIS research, and also to demonstrate the uncertainty - despite good research design and assumptions - of marketing research predictions. The case studies were written by Thomas Parish of Arthur D. Little, Inc.

TASK 2. *ATIS Market Research: A Survey of Operational Tests and University Research*

The challenge of marketing research is much more difficult where the consumer has not had direct personal experience using the proposed product in daily life. The operational tests provide an excellent opportunity for gathering consumer response and market demand information from "experienced" consumers. The Volpe Center team surveyed the operational tests that were extant or complete (as of 8/93) to learn whether any consumer response/market demand information had been collected and analyzed. The survey was extended to include government-sponsored university research projects so as to provide a more complete overview of the current national research program in relation to this question.

TASK 3. *A Market Analysis of the Commercial Traffic Information Business*

What kind of traffic information is available to consumers right now? How do consumers respond to current offerings? What are the market/economic fundamentals that underlie this market?

The traffic information services business is well-established and a study of its market fundamentals yields insight into consumer response to ATIS as well as providing useful information to policy makers who are considering the future role of government in this arena. This report describes how traffic information is gathered, processed, packaged, wholesaled, and retailed on the variety of platforms which are available on the market today.

TASK 4. Laboratory Simulation of ATIS for Testing Drivers' Response

This project was formulated to explore the feasibility of enhancing existing laboratory or PC-based driver decision simulators which have the ability to gather revealed preference data and test drivers' decisions in the presence of traffic information. Such simulators, it was hypothesized, could supplement operational tests as a source of consumer response and market demand data. The work was performed at MIT under the leadership of Professor Moshe Ben-Akiva.

Report 4A. *State of the Art of ATIS Driver Simulators*

The project was divided into three parts. The first, covered in this report, reviewed all existing driver simulators to learn whether any were sufficiently sophisticated to be used, as is, to reliably test drivers' response to traffic information.

Report 4B. *A Review of ATIS Operational Tests*

The design of any laboratory-based simulator is based upon a model of how individuals respond to stimulus, in this case ATIS products. To construct a model, one must first study the natural behavior of live subjects in an actual ATIS driving situation. Report 4B looks to the existing and completed ATIS operational tests to learn whether data has been produced that is suitable for the purposes of developing or improving ATIS models.

Report 4C. *A Modeling Framework for User Response to ATIS*

This report focuses on the information required to support the development of a modeling framework for driver response to ATIS. In it, the author identifies the stages of user response to ATIS, outlines the key factors associated with each decision, and discusses the data which would be required to complete the model, and thus construct a reliable, durable driver simulator.

Executive Summary

This document examines the private sector traffic information marketplace in the United States -its beginnings, history, economics, business operations, functions, products, and possible future directions -particularly as it relates to the individual consumer. The intent is to provide public policy analysts and decision-makers with an overview of this profitable, established, yet little-documented IVHS market. Traffic information is a central element in the emerging ATIS marketplace; analysis of the commercial traffic information industry can provide insight into the prospects for future ATIS products and services.

A major portion of this document relies on a four-part functional model to categorize, analyze, and describe in detail the activities of the companies and consumers that make up the traffic information business. The model's four categories are *traffic data collection, traffic data processing for wholesale distribution, traffic information broadcasting or retailing,* and *the traffic information consumer* At each of these levels of activity, data is collected or received, and a function is performed that adds value (e.g., "processing," "distribution").

Since traffic reports first appeared on morning commute radio in major U.S. urban areas in the mid-1950s, the commercial market in traffic information services has become national. Today, radio broadcasts are still the bread-and-butter of the traffic information business; traffic information is broadcast commercially in at least 62 cities across the country. Annual revenues in this, the largest, market segment have been estimated as high as $100 million, and broadcasters estimate that the audience for traffic information has grown to about 120 million listeners today.

The successful growth of this market niche can be attributed to several environmental and social factors. Increased urban (and inter-urban) traffic congestion; increased technological ability to gather, process, and broadcast timely traffic reports; and, consumers' measurable preference for increased amounts of "situational" information. The underlying market hypothesis is that consumers tune in, or subscribe, to services that fulfill their demand for an array of situational information, especially news, sports, weather, and traffic, regardless of their ability to act upon the information.

The traffic information business environment is defined in part by the presence of traffic congestion. Less traffic equals less market. The market area with the most traffic information products/services available to consumers is the Los Angeles-San Diego region, which ranks as one of the nation's most congested traffic areas. However, consumers' experience of traffic congestion is measured subjectively, relative to local experience. Even a low traffic congestion region relative to Los

Angeles may be congested by comparison to its own historical experience, and thus support a certain level of traffic information broadcasting business.

The market's structure is largely defined by businesses that collect qualitative traffic data, relying on both public and proprietary sources, "process" the traffic into ready-for-broadcast traffic information segments, and sell commercial sponsorship of the information to advertisers for broadcast over radio, television, and cellular phones. Both the information gatherer/processor businesses and the retail-level broadcasters of traffic information see traffic information primarily as a vehicle for sales of *other* products and services. And while there is very little data available in the public domain that describes consumer response to either the advertising or the traffic information itself, it may be safe to assume -given the breadth of the market and the size of estimated revenues -that advertisers continue to place a high value on traffic information's popular appeal as a sales vehicle.

Radio traffic information broadcasts are very short, typically thirty to sixty seconds, with a ten second advertisement embedded within the announcement. Radio stations which feature traffic information will broadcast updates every ten minutes throughout the day. Cellular and other telephone broadcasts are longer and generally provide route-specific information through a key-pad selection. The traffic information is qualitative, delivered by the human voice (or in text), and updated at intervals that are determined by the broadcaster (versus situational on-demand updates). Some cellular phone companies use live traffic managers to deliver information to their subscribers, and include route guidance. Traffic information quality is determined by the speed of proprietary communications, surveillance, and processing technologies, and enhanced by access to public traffic information surveillance systems. Local and regional government agencies observe formal and informal reciprocal arrangements with traffic information businesses in which the parties agree to the exchange and confirmation of traffic information.

As was noted earlier, the majority of traffic information consumers (primarily employed commuters) do not pay directly for the information they receive. The cost of gathering, processing, packaging, and broadcasting traffic information is absorbed into products/services by radio and television advertisers, or borne by the cellular phone companies. To date, only a few products have come on the market that are selling traffic information directly to consumers; so far, these entrepreneurial efforts have been mounted largely in California -where traffic congestion is among the nation's highest and publicly-generated traffic information is among the nation's best and most accessible -with mixed results.

New commercial platforms include pagers, telephones, second audio program receiver (an audio-only television receiver), and fax. The market's evolution to date could be said to "piggyback" on existing technology, having migrated previously from communications medium to medium (radio to television to cellular phone). Among the newly emerged direct-sales traffic information products, none deliver the

information on new communications platforms; instead, they take advantage of existing consumer-oriented communication media, where the medium is familiar to the consumer and has established value. None of the new traffic information products require the consumer to purchase a single-purpose hardware platform. Either the platform already provides other services and information and traffic has been added to the bundle (e.g., cellular telephones and pagers), or the platform also provides other benefits in addition to traffic (e.g., audio reception of television broadcasts).

The federal government exerts a limited amount of direct influence on the business activities of this market through regulatory activities and through the IVHS program. Currently, the industry operates relatively freely in terms of standards defining the exchange of traffic data. The national IVHS program has helped to promote entrepreneurial awareness of traffic business potential, and is exerting influence on the market through its field operational tests and the IVHS America committee activities.

Market development issues that some traffic information companies discuss include: consumers' unwillingness to pay for information which they believe they can get free of charge through radio; and, consumers' reluctance to alter their behavior to incorporate new and unproven information products -such as phoning or ordering a fax for pre-trip traffic information. Industry representatives agree that consumers will pay for traffic information only when it's up-to-the-minute accurate and directly relevant to their immediate travel needs. Similarly, industry representatives have concluded that traffic information, in and of itself, is not a compelling service and must be bundled with other information services to be marketable.

Nevertheless, the increased technological sophistication of communications platforms of all types, coupled with apparent consumer demand for all types of timely information, suggests that traffic information will become more common as a feature among the information services packages offered to communications subscribers.

Based on current market developments, we can predict several traffic information market trends. First, the current trend is towards the addition of route-specific traffic information onto existing communications platforms as a value-added feature. This can be expected to continue onto computers, personal digital assistants, RBDS radios, and any electronic mobility product with receiver capability. Second, specialty travel products, such as mobile and in-vehicle computerized maps, will expand their service bundles to incorporate traffic information. Finally, in the absence of government regulations to the contrary, it can be expected that new companies will enter the traffic information surveillance niche by installing proprietary electronic infrastructure capable of continuously broadcasting quantified traffic information. Information in this form would enable advanced navigation products to incorporate real-time traffic information into routing algorithms and provide consumers with real-time guidance on the fastest route.

Contents

Appendices

Exhibits

1. Introduction

Purpose

The purpose of this paper is to describe the private sector traffic information marketplace, and in so doing, provide public policy analysts with a broader understanding of the existing traffic information market and how it works.

Traffic information was chosen as the subject of this paper because it is central to the emerging Advanced Traffic Information Systems (ATIS) marketplace and because it provides an example of an established and profitable Intelligent Vehicle Highway System (IVHS) business niche. This focus was selected because the mobility information needs of the consumer segment and its willingness to pay for traffic information services have been only sparsely documented to date, even though such information could be critical to the successful development of ATIS products and services in the coming decade.

Our focus is on traffic information products or services that are on the market and that primarily target individual consumers, rather than commercial transportation companies or drivers. Commercial traffic information companies are currently providing consumers with traffic information using existing technology on established, nearly universally accessible communications platforms (e.g., radio, television, conventional telephones).

industry sources estimate that 120 million listeners - or half the U.S. population - tune into traffic reports at least once during the day.

Background

Private-sector market studies have established that radio listeners value traffic information and prefer stations that broadcast traffic reports. For this reason, radio broadcast traffic reports provide commercial radio stations with a competitive advantage in attracting advertising revenue. In the approximately three decades since the first traffic reports were broadcast in major U.S. cities, the traffic information reporting business has grown into a profitable industry with companies that operate in 62 metropolitan areas across the U.S.

The current commercial traffic information market is founded on the premise that consumers' desire for traffic congestion information is similar to their desire for neys, weather, and sports information. Traffic information that suggests route or time alternatives in response to an "incident" or unusual road conditions is considered useful, but the absence of travel alternatives does not necessarily diminish the value consumers place on traffic information. Rather, it appears that listeners value

information, regardless of their ability to act on it. Radio listener surveys cited by marketing research firms affirm this premise.

Travelers value and use traffic information in various ways. To some extent and under certain conditions, traffic and transit information that is accurate and timely will influence travelers' mode of travel, departure time, and route. For example, in a 1992 Chicago area transportation study cited by Shadow Information Systems, 85% of motorists surveyed said they alter their behavior after hearing a traffic report. A survey performed by Smart Route Systems in the metropolitan Boston area (1993) indicates that 30% of the users surveyed "frequently" change their travel behavior after using the "SmarTraveler" traffic information service, and 96% change "occasionally." In the absence of more specific data from the drivers themselves, our examination of the traffic reporting services marketplace can provide preliminary insights into the value of this pre-trip and en route travel planning information to the traveling public.

Approach

The approach taken in developing this paper involved:

- A search through periodical literature for articles describing various aspects of the existing and projected traffic information market, including consumer response to and valuation of traffic information.
- Reviewing public data describing state and local traffic information collection methods and traffic congestions levels.
- Identifying and interviewing U.S. companies that are currently collecting, processing, or providing traffic information to the private consumer market.
- Identifying and interviewing companies known to be readying a product for entry into the traffic information consumer market.

Because this is a highly competitive market, dominated by closely-held private companies, only a limited amount of information exists in the public domain. This paper draws heavily on a series of interviews that took place primarily between July and November, 1993. Those respondents who agreed to be identified by name and company affiliation are listed in Appendix A. Others agreed to share information only if assured of complete anonymity and confidentiality. For this reason, there are a number of assertions in this paper that of necessity must remain unattributed to any source.

Scope

This paper describes the commercial U.S. traffic information marketplace. It begins with an overview of the current marketplace and includes a brief history of commercially broadcast traffic reports, a description of the economic basics of the current business, a discussion of several external factors that influence business operations, and a four-part functional model of the traffic information business.

Section 2 offers an overview of the current traffic information market by providing a brief history of the business, a description of the basic traffic information business model, and a discussion of the external market-related conditions influencing the business -particularly the traffic conditions, technology, local and regional government, and the federal government. The section concludes with a model of the traffic information services business, providing a schematic representation of the functional activities of the business as a whole.

Section 3 describes the business of producing and selling traffic reports. It is split into subsections corresponding to the incremental stages of gathering, processing, and broadcasting traffic information, and concludes with a subsection on the consumer. This section introduces the established traffic information businesses and describes the way in which their information is "retailed" as an element of radio and television programming, and -more recently -as a value-added component of cellular phone service.

The fourth section surveys the new traffic information products and businesses that have emerged on the market since initiation of the IVHS program in 1991. Traffic information is now available commercially on information delivery platforms such as telephones, fax machines, pagers, and dedicated receivers. Subsections focus on the specific business and product, describing the mechanics of the business, how the information is collected and sold, and who pays for it.

Section 5 concludes the paper with an analysis of changes in the traffic information marketplace since the IVHS program's advent in 1991. Subsections describe potential trends in payment, communications platforms, and new business development; new market forces; and -based on interviews with company representatives — characteristics of emerging traffic information products.

2. The Current Commercial Traffic Information Marketplace

This section offers an overview of the current traffic information market by providing a brief history of the business, a description of the basic traffic information business model, and a discussion of the external market-related conditions influencing the business -particularly the traffic conditions, technology, local and regional government, and the federal government. The section concludes with a model of the traffic information services business, providing a schematic representation of the functional activities of the business as a whole.

The Beginnings of the Business

Traffic reports first appeared during morning commute radio shows in major U.S. cities, such as Los Angeles, New York City, and Chicago, in the mid-1950s. The first programs were produced by the radio stations themselves and paid for by program advertisers. One early initiator of radio traffic reports said that he began his traffic feature because "conditions were right": traffic congestion was considered a problem, commuters tuned into their car radio for news and weather on their way to work in the morning, traffic reports would provide information that the consumer was interested in listening to, and greater numbers of listeners who listened for longer periods of time would attract more advertising money to the station.

Since the inception of the business, traffic congestion has worsened and traffic surveillance technology has improved, but the basic business of broadcasting traffic in formation has not changed: program managers decide the content and duration of traffic broadcasts, and and the in formation is supported by advertising.

Traffic information was broadcast only during rush hours. The information was collected by a reporter in a plane or helicopter collaborating with a broadcast person on the ground. The geographic region covered and the frequency of the report updates were limited by the high cost/earnings ratio of the endeavor, as well as by weather conditions. The timeliness of the broadcast was limited by the capabilities of the transmission technologies of the time.

The cross-country spread of radio broadcast traffic information is said to be due to a general recognition among station managers that -as a result of traffic tie-ups -commuters listened to traffic reports, and thus were likely to be listening when the sponsor's advertisement was broadcast. As commuters were, by definition, employed (and frequently the owners of automobiles), they apparently represented an attractive advertising audience. Reliable estimates-for the size of the traffic information audience (or market) in the 1950s and early 1960s are not available.

The first traffic network was established in 1963 in Philadelphia by the Atlantic Refining (later, Atlantic-Richfield) Company. The ARCO "Go Patrol" traffic information network collected traffic information for all of metropolitan Philadelphia, and supplied the information to subscriber radio stations in exchange for air time attribution to the Atlantic Refining Company.

While each city and traffic business has a story of its own, Houston provides a good example of the economic, transportation, and market conditions that supported development of the traffic information network business. Traffic conditions in Houston in the mid-1970s were then considered among the worst in the nation. The expansion of the oil industry had produced dynamic economic and population growth in the region, resulting in historic levels of traffic congestion. The radio stations were not generally perceived as providing sufficient, reliable traffic information. One radio station employee reported that his station gathered its reports on traffic information by "looking out the station window." Following a summer in which several traffic disasters had gone unreported, an entrepreneur, then employed in advertising sales for a radio station, decided to offer a more comprehensive, centrally organized, dedicated, traffic reporting network.

The Business Basics: Who Pays Whom for What

Today's traffic information business is dominated by the radio broadcast traffic report, and the basic business model employed is fairly uniform among all traffic information network companies. The traffic networks collect and process traffic information for broadcast by client radio stations, sell embedded advertising time to regional and national companies, and then provide the entire package free of charge to the subscriber radio stations. The traffic networks earn money on the advertising. The radio stations exchange advertising air time for traffic information, because traffic information broadcasts increase the size of the listening audience, thus expanding the station's commercial "reach." This is generally described as a "barter business" because no money changes hands between radio station and traffic network company. Where the traffic network's client is a cellular phone company or other type of reseller, either a fee is paid for the information or advertising/fees are exchanged.

In this radio broadcast-based business model, there is no direct charge to the consumer. The cost of traffic information is included in the price of the products and services advertised. Where the platform for information services is the cellular phone, there is no additional charge to the caller for access to the service, but there is usually a charge for air time.Other traffic information services -and there are very few-such as those delivered by fax, pager, or on a dedicated device, carry a separate subscriber access or purchase fee. [More information describing the economics of these newer platforms is included in Section 3 of this document.]

Factors in the Traffic Information Business Environment

The traffic information business environment is defined in large part by the presence of traffic congestion and the accessibility of traffic information. Government plays a role, both locally -through its own traffic information collection activities -and nationally, through its regulatory activities and IVHS program commitments (e.g., IVHS field operational tests and IVHS America advisory activities). Communications technology influences the business environment because its capabilities determine the speed and accuracy of traffic information broadcasts, through its role in information reception (at the driver's end), and through its overall affect on network capabilities. The growth of the traffic information broadcasting business over the past thirty years roughly parallels increased traffic congestion and our ever-increasing technological ability to capture, quickly process, and broadcast traffic information. Theoretically, in regions where traffic congestion is greatest and where good quality government-collected traffic information is available to companies inexpensively or at no charge, there will be found the largest number of new traffic information businesses entering the market.

Traffic congestion is relative: A commuter in New Haven tunes in to traffic reports to avoid a five minute delay over the "Q" bridge as avidly as a Marin County driver tunes in to avoid a 40 minute delay over the Golden Gate Bridge.

Traffic Congestion

The business value of traffic information increases as the size of the listening/subscribing audience increases. The greater the traffic congestion, both temporally and geographically, the bigger the presumed market for traffic information services. Thus, more broadcast time would be devoted to traffic reports in the more congested city, and more traffic information businesses would be interested in providing those reports. For an overview of the factors influencing the traffic information services business environment, it is useful to look at national traffic congestion indices of how much traffic congestion has increased over time, and in which regions currently the traffic congestion is worst.

Various measurements of motor vehicle density indicate that traffic congestion has increased profoundly in the approximately 40 years since the first traffic report was broadcast. The total number of vehicle miles traveled (VMT) per year in the U.S. has increased nearly 470% -from 458 billion VMT in 1950 to 2,147 billion in 1990 — with more of the increase occurring in urban areas.[1] While VMT is not itself a determinant of congestion, and the early decades' growth in VMT was partially ameliorated by the increased quality and mileage of national highways, the overall growth of the VMT highlights the general trend. Exhibit 1, following, presents selected national demographic and travel trends for 1977,1983, and 1990, from the

[1] **U.S. Department of Transportation,** *Summary of Travel Trends, 1990 Nationwide Personal Transportation Survey,* **Publication No. FHWA-PL-93-012 HPM-40/12-92(10M)E**

USDOT *Summary of Travel Trends, 2990 Nationwide Personal Transportation Survey. This* data provides further evidence of increased single-occupancy automobile travel over time.

Exhibit 1. Selected National Demographic and Travel Trends, 1977 - 1990[2]

Characteristic	1977	1983	1990
Persons per Household	2.83	2.69	2.56
Vehicles Householddper	1.59	1.68	1.77
Nc Vehicle	15.3%	13.5%	9.2%
One Vehicle	34.6%	33.7%	32.8%
Two Vehicles	34.4%	33.5%	38.4%
Three or More Vehides	15.7%	19.2%	19.5%
Licensed Drivers per Household	1.69	1.72	1.75
Vehicles perLicensed driver	0.94	0.98	1.01
Workers per Household	1.23	1.21	1.27
Vehicles per Worker	1.29	1.39	1.40
Daily Vehicle Trips perHousehold	3.95	4.07	4.66
Daily Vehicle Miles Traveled per Household	3297	32.16	41.37
Average Vehicle Trip(miles)	8.34	7.90	8.87

Obviously, certain parts of the country endure much heavier traffic congestion than others. In 1991, California, Texas, Florida, and New York had the highest annual VMT, with California registering over twice the VMT of New York.3 A more sensitive measure of traffic congestion, the Roadway Congestion Index (RCI), combines the daily vehicle-miles of travel per lane-mile (DVMT) for freeways and arteries in a ratio comparing the existing DVMT to calculated DVMT values identified with congested conditions. In 1990, four of the ten most congested cities in the U.S. as measured by RCI were located in California: Los Angeles, San Francisco-Oakland, San Diego, and San Bernadino-Riverside. Similarly, four of the ten fastest congestion growth urban areas between 1982 and 1990 were in California. The complete lists of the ten most congested urban areas and the ten fastest congestion growth areas follow.4

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2 Ibid.

3 USDOT Office of Highway Information Management, Highway Statistics, 1991, Table VM-2, September 1992.

4 "Estimates of Urban Roadway Congestion - 1990" -Research Report 1131-5, Tables S-l & S2. Texas Transportation Institute, The Texas A&M University System, College Station, TX 77843-**3135**

Exhibit 2. Ten Most Congested Cities: 1990 (Roadway Congestion Index)[5]

Urban Area	Roadway Congestion Index	Rank
Los Angeles, CA	1.55	1
Washington, D.C.	1.37	2
San Fran-Oak, CA	1.35	3
Miami, FLA	1.26	4
Chicago, Ill	1.25	5
San Diego, CA	1.22	6
Seattle-Everett, WA	1.20	7
San Bernadino-Riv, CA	1.19	8
New York, NY	1.14	9
Houston, TX and New Orleans, LA	1.12	10

Exhibit 3. Ten Fastest Congestion Growth Areas: 1990 (RCI)[6]

Urban Area	1982	1990	% Change
Atlanta, GA	0.89	1.11	25
Dallas, TX	0.84	1.05	25
Minn-St. Paul, MN	0.74	0.93	26
Seattle-Everett, WA	0.95	1.20	26
Los Angeles, CA	1.22	1.55	27
Sacramento, CA	0.80	1.02	27
Washington, D.C.	1.07	1.37	28
San Fran-Oak, CA	1.01	1.35	34
Salt Lake City, UT	0.63	0.85	35
San Diego, CA	0.78	1.22	36

[5] Ibid.

[6] Ibid.

Technology Timeliness, Accuracy, and Coverage

Technology enters the traffic information business equation in relation to three issues: timeliness, accuracy, and coverage. Old or wrong traffic information is valueless to consumers, and old communications technology limited the speed with which multiple sources of traffic information could be received, verified, processed, and broadcast. Also significant is the question of geographic coverage. Each additional coverage locus adds to the cost of the service and must contribute to earnings proportionately. But, according to an industry source, failure to report a significant traffic incident -especially if the competition has picked it up -can cause listeners to switch information sources permanently.

In any survey or focus group of traffic information consumers, the participants uniformly value timeliness, accuracy, and situational relevance as the most important attributes of traffic information reports. Newer traffic surveillance technologies, such as cameras, loop detectors, and electronic probes, require less time for transmission and validation. Computers quicken information processing and rebroadcasting times. Greater accuracy is also a function of advances in embedded roadway technology (e.g., loop detectors and other roadway sensors) -itself largely dependent on the public sector for installation and maintenance. Nevertheless, it should be noted that, despite increased speed and accuracy of information collection, transmission, processing, and broadcasting:

- No company provides "real-time" (or instantaneous) traffic information.
- The dominant medium for traffic information delivery remains the human voice.
- Traffic congestion is described in largely qualitative terms (e.g., "heavily congested" vs. actual traffic speed).

Scope of coverage is an economic decision that depends on good communications technology. Once a decision is made to provide coverage of a certain region, desired frequency of coverage generally determines which technology to deploy. Aircraft can provide less intensive monitoring, "probe" vehicles can be used for somewhat more intensive coverage, and camera emplacements (e.g., above tunnel entrances, at rotaries, on well-situated overpasses) can provide ongoing monitoring of key positions. The economic factors influencing this decision are many, including the tradeoff between cost of coverage and risk of an "incident," and the presence of a significant traffic-defined submarket.

Local and Regional Government

Local and regional government agencies are frequently traffic information providers. In California, for instance, quantitative data generated by the publicly installed/maintained electronic infrastructure enhances the quality and value of the traffic report. Traffic networks will create formal and informal agreements with individual public agencies for the exchange and confirmation of traffic information. Thus far, such arrangements are made without benefit of national standards or guidelines. For the most part, traffic information is provided to private companies free of charge; frequently, in exchange, recipients agree to assist the agencies with traffic information-or emergency broadcasting when needed. In parts of the country where travel and traffic patterns overlap multiple regional jurisdictional boundaries, the presence of a private traffic information service reportedly is of help in coordinating the exchange of information among government agencies. Again, such exchanges are not currently governed by any standard -whether for collecting or disseminating traffic information.

In New York,one traffic company is working with local government agencies exploring the economic potential of suburban traffic sub-markets, where major commercial developments have created localized traffic congestion. Traffic in formation would be delivered on kiosks in office lobbies and shopping malls, via e-mail in offices and on local radio stations, with payment by subscriber companies, mall management, stores, and advertising.

New York offers an example of public-private reciprocity, between a major traffic network company and TRANSCOM (New York and New Jersey Transportation Operations Coordinating Committee). TRANSCOM provides the private network with an incident alarm beeper; in return, the private network provides TRANSCOM with modem access to their central traffic computer. During rush hours, the two groups are in frequent communication. Similarly, INFORM (Information for Motorists) on Long Island provides access to its traffic information, but charges a nominal fee for the service. In California, electronic access to CALTRANS's (California DOT) map-based computerized tracking system is available free of charge to commercial traffic networks and other traffic businesses.

In Minnesota, we found an exception to the pattern described above. In this case, MnDOT limits its complete traffic information exclusively to a high school-based public radio station. Commercial traffic services are left to monitor the radio broadcast and incorporate any part of it they wish in their own rebroadcast. While such an arrangement provides the general public with access to comprehensive and detailed government-collected traffic information (that part of the public, at least, that listens to public radio), the arrangement also can be said to limit the access of listeners who customarily tune in commercial radio.

Another exception to public-private reciprocity as it is practiced in New York/New Jersey and California exists in Illinois. In a reversal of the usual arrangement, the Illinois DOT purchased traffic information covering parts of southwest Illinois from a private traffic information network based in St. Louis. The company installed a

computer, a printer, and a telephone hotline in the DOT offices and provided 24hour incident reports, event coverage, and intensive coverage of primary and secondary routes during the rush hours.

Federal Government: Regulations and IVHS Programs

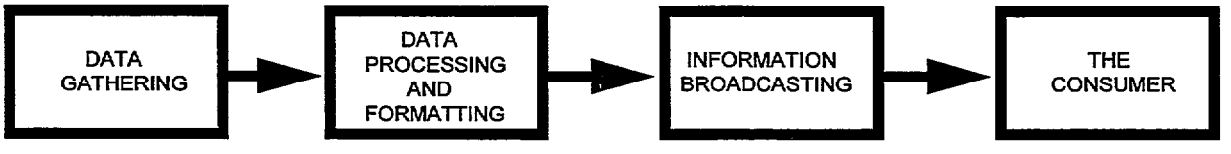
Federal regulations have a limited impact on the traffic information networks. FAA regulations affect traffic reporters' aircraft, and FCC regulations affect certain aspects of radio broadcasts and probe-to-base communications. But these regulations are not considered a significant factor in the cost of doing business; nor are they deemed a limitation to the companies' ability to provide good services.

The IVHS program's influence on the current traffic information business appears to manifest itself inversely in proportion to the size of the business. The smaller, newer traffic information businesses in this market are more involved with operational tests, and IVHS America conference and committee activities. Larger, better-established traffic network companies agree that heightened market awareness of the benefits of traffic information services will have a positive impact on their business, but their long established pre-IVHS business base places them in a more secure market position.

A Functional Mode1 of the Traffic Information Business

In categorizing the activities of the companies and consumers that make up the traffic information business, we employ a four-part model that locates companies and products in a functionally and progressively ordered four-part service delivery hierarchy. The four categories are *traffic data collection, traffic data processing for wholesale distribution, traffic information broadcasting or retailing,* and *the traffic information consumer.* In each of the first three functions, an action is being performed that adds value to the data. The consumer is included in this model because consumers are the final determinant in any business activity. Exhibit 4, below, graphically depicts these four functional areas.

Exhibit 4. The Four-Part Functional Model



The model, or taxonomy, of the business represents the major functional elements of the traffic information business. As with all models, representation can often be neater than reality. For example, both private companies and public agencies collect traffic data. Where this is the case, each may also be providing traffic information to the other. It is also common for companies to be active in more than one functional category, so a company that collects traffic data will also process the data, wholesale it, and retail it.

Following is a brief description of the traffic information activities contained within each of the four categories.

Stage 1. Data Collection

Traffic data is collected by both public and private entities. Private companies collect information from both public agencies and from their own sources. Traffic data collection activities vary regionally, depending upon geography, weather patterns, and the availability and quality of public-sector and electronically generated data.

Data collection methods include aircraft, fixed cameras, private mobile traffic probes providing periodic phoned-in reports, public mobile traffic "probes," and public transit, highway, police, and fire authorities. Where installed and maintained by the public sector, an "electronic infrastructure" can also provide traffic surveillance information.

All of the private companies cited in this report as traffic data gatherers also process and wholesale it to a broadcaster or reseller. Their income is earned either through the sale of advertising time, or through the fees paid for the information by the reseller. Currently, no private companies could be found that were operating as traffic data collectors independent of data processing and wholesaling.

Stage 2. Data Processing for Wholesale Distribution

Traffic data processing and fusion integrate the various sources of data, making the information marketable and technologically accessible. Where public agencies perform this function, most of them pass along the resultant information to both public and private entities free of charge. The private sector integrators wholesale the information to resellers and (with payment from advertisers) to broadcasters, or -infrequently -sell directly to the consumer market through their own distribution channels.

Currently, all private companies operating a traffic data processing business also sell the resultant traffic information, except where a public agency has hired a company strictly for the purposes of information processing. For example, the Georgia Department of Transportation has contracted with TRW specifically to provide traffic information integration for the 1996 Olympics Transportation Management Center in Atlanta.

Stage 3. Information Broadcasting or Reselling

Broadcasters and resellers disseminate traffic information to the consumer market through channels that include television, radio, conventional and cellular telephones, dedicated traffic information receivers, pagers, e-mail, and fax.

Both public and private entities distribute traffic information directly to consumers. Public entities generally broadcast on Highway Advisory Radio (HAR), and provide information on the telephone through the state police or local DOT centers. In the private sector, this niche is dominated by radio stations, followed by television stations, and then by cellular phone companies.

Stage 4. The Consumer

The categories employed to segment the traffic information consumer market (exclusive of commercial drivers) vary according to the product being sold, but generally traffic information consumers fall into two categories -those who spend a good deal of their working day traveling in a motor vehicle, and those who commute by car to work.

In the private sector, they study the consumer to determine buying patterns. Consumer response to traffic information has been studied by market researchers to learn whether traffic information is a compelling broadcast program feature, what impact the advertising has on traffic information consumers' product purchasing decisions, and whether the benefits of traffic information merit direct payment for the service.

3. Today's Traffic Information Business

This section describes how today's traffic information services business operates, and examines products and services currently on the market. The information is presented in terms of the four-part functional model defined in Section 2 -i.e., *traffic data collection, traffic data processing for wholesale distribution, traffic information broadcasting or retailing,* and *the traffic information consumer.* At each level of activity, data or information is collected or received, and a function is performed that adds value. Specific traffic information businesses and products are introduced and discussed in the section where their first functional activity occurs. Thus, while a business may operate in all three areas -data collection, processing, and selling — the company will first appear in the section where it begins its traffic information activities. [Appendix B lists these companies according to the functional niches they occupy.]

Collecting Traffic Information

Overview

Today the two largest companies in the business of gathering traffic information are Metro Traffic Control, based in Houston, and Shadow Information Systems, based in New Jersey. Between them, they provide traffic information to over 850 radio and television stations in a total of 62 U.S. cities and to an unknown number of cellular telephone companies. They estimate the size of their combined audience at 120 million listeners -not far below half the U.S. population. While neither of these two major players will confirm revenue estimates, an industry observer (who wishes to remain anonymous) has estimated their combined annual revenue at close to $100 million.

The business niche is not saturated by the two largest providers. There are other, smaller, local and regional traffic information networks providing services throughout the U.S. [The names and service locations of traffic information networks contacted for this study are listed in Appendix C.] There are also individual radio stations and newer entrants into the traffic information market that operate their own traffic information gathering operations.

Sources

Traffic services typically collect information on traffic conditions from some combination of company-generated sources and public service agencies. Examples of privately procured traffic information sources include aircraft patrols (industry preference is for fixed-wing aircraft rather than the much more expensive helicopters, except where prevented by local meteorological or topographical conditions), camera emplacements in key traffic positions (tunnel entrances, critical highway merges, etc.),

and privately contracted mobile "probe" vehicles. [It should be noted here that the only known commercial service on the market with its own comprehensive privately constructed infrastructure network is Traffic Master, in London.]

Traffic information-is supplemented through the monitoring of police/fire radio, direct telephone contact with police forces (some, like California's Highway Patrol, operate their own aircraft) and with information from other government bodies (e.g., bridge authorities, traffic control centers, direct transmission of data from highway sensors maintained by public authorities). Further, in many localities, there are programs under which a local radio station or a local cellular telephone operator encourages private drivers with mobile phones to call directly (free of charge) into a traffic service contractor's operations center with intelligence on traffic problems.

Several potential changes in the approach to traffic information collection and processing may affect the way business is done in the future. One is an increase in public sector investment in embedded electronic infrastructure. This could reduce the amount of proprietary traffic information collection required to cover a region, thereby lowering the upfront investment required for entry into the traffic information business and opening the business to less capitalized newcomers.

Another change in approach would be an increased proprietary investment in traffic data collection and processing technologies, which would enable competitive companies to further differentiate themselves on the basis of the quality and timeliness of their traffic information. This change would effectively raise the barriers to market entry by small businesses.

Traffic in formation networks foresee their businesses expanding in several different ways: adding news and weather to their broadcast package, establishing traffic information networks in foreign capitals, providing traffic in formation to more sophisticated mobile communications products, and developing suburban sub-markets.

A third potential change in approach may be evident in the following case: A private company installs proprietary traffic collection technologies near the infrastructure and sells the resultant data to other companies, (or to government) which then process the data into information for broadcast or resale. This change would provide newer entrants into the market with access to enhanced traffic information without the upfront expense of investing in traffic collection capability, and potentially encourage more business development in the traffic information market. Currently, no companies in the U.S. occupy this business niche.

The product of these information gathering activities varies from reports providing precise speed of travel where information is collected through electronic infrastructure, to -more commonly -qualitative appraisals of traffic density and speed.

Data Processing for Wholesale Distribution

Overview

The business activity of data processing includes both the integrating and processing of diverse sources of traffic data and wholesaling the resultant information to subscribers (cellular phone companies), broadcasters (radio and television), or resellers. As mentioned earlier, no private company currently operates exclusively as a traffic data integrator/processor, independent of information resale, except where the company is hired to do so by a public agency.

Processing

The commercial traffic information companies follow a similar approach to information processing. For example, information is routed from the field to a traffic information manager; depending upon the source of information it may be verified first, then it is entered into a computer, rated by level of criticality, and coded by traffic area. All systems feature a system where the age of the information on the screen is indicated by some visual cue, such as flashing light or a change in color. Traffic reporters read the information from the screen.

Faster, more sophisticated variations in information processing provide a basis for product differentiation among competing companies. These variations include computer programs that can sort and prioritize traffic and transit information according to the needs of the customer, whether that be an individual, a radio/TV station, or a cellular phone company. So, for a radio station whose listening audience is dominated by public transit users, that information would come up first; a low-power radio station in a highly congested submarket would receive local traffic information first; and so on.

Distribution

Traffic information is packaged for sale or barter to broadcasters or resellers in several different formats. Some radio stations want the reality of a live broadcast from an aircraft; some radio stations use a radio "personality" from the traffic network company who broadcasts the report under the station's name. One traffic network broadcaster may present several different traffic personalities for the different radio stations in the metropolitan market. Public broadcasting stations on FM often use the network-provided broadcasters and put the network attribution into the broadcast as a substitute for a commercial.

For television stations, information can be provided to the station in color on a map via computer, in a format suitable for broadcast. Information is also provided in text so that the television "talent" can present it to the viewing audience.

Cellular phone companies use one of two methods to deliver traffic information to their subscribers -either a live operator, or recorded. Live traffic data is generally

provided by a network-employed traffic operator situated in a traffic operations center. In some cities the the operator also provides dynamic route guidance. The agreement between the traffic network and the cellular phone company is generally defined by the duration of service and the number of operators. Where traffic information is provided by a recording, phone companies buy a package in which the traffic information has already been geographically zoned for an electronic keypad menu. Typically, the traffic network staff record the information, which may include a brief commercial attribution, either to the cellular phone company or to an advertiser.

All packages include an agreement that covers the geographic range of the coverage, the duration of each broadcast spot, the amount of advertising included with the spot, and the frequency of the updates. Where the traffic information data gatherer/ processor companies do not have the option to sell embedded advertising time -as for many of their cellular phone company customers - there is a charge to the reseller. One cellular company customer estimated the annual purchase price of a standard traffic information package to be about $100,000 a year.

One market researcher estimated* that, *in New York City, radio traffic reports attract* 55% of every *'ethnic'* listener, *55% of every blue collar worker listener, and 55% of every 25 to 54-year-old white collar business worker who reads the Wall Street Journal."

Broadcasting or Retailing Traffic Information

Overview

The broadcaster or retail level of the traffic information business is dominated by commercial radio stations, followed by television stations and cellular phone companies. A few relatively new businesses, to be described later, are also selling or broadcasting traffic information directly to consumers and on other platforms. They are Autotalk, Fastline, SmarTraveler, Shadow Fax, and Roadirector. These smaller companies' business operations provide us with examples of variations on the radio/ television/cellular companies' approach to the consumer market.

Radio

Radio stations sell advertising based on audience demographic characteristics, audience size, and listening duration. Obviously, different types of programs attract different types of listeners for differing durations. Stations that carry traffic reports attract listeners across gender, ethnicity, and income. Traffic listeners are reportedly "generally" employed. Studies indicate that these listeners stay tuned throughout the traffic broadcast, making the first and final advertising spots as attractive as those embedded in the broadcast. Furthermore, it is believed that because the traffic audience is actively listening and is prepared to act upon the content of the broadcast, these listeners are more receptive to advertisements. Thus, a radio station that provides traffic reports has a larger audience, an employed audience, an attentive audience, and a broad demographic spread.

Radio stations specializing in morning "orientation" programs (e.g., news, weather, sports, traffic information) promote the accuracy, timeliness, and regularity of their traffic reports. Commonly, a station will promote its traffic report by broadcasting it every ten minutes "on the 3s" or "on the 1s." One radio station that had not been featuring traffic as part of its program mix did some research and discovered that traffic was "universally" important to their listeners. Following the introduction of "traffic on the 8s," their audience size increased 30%.

In regions where public transportation is widely used, as in New York City, the radio traffic broadcast includes information on public transit. As might be expected, in cities where mass transit does not figure prominently in commutation patterns, it receives little attention.

Television

Television stations provide traffic reports as part of their morning orientation programming -because, as with radio, their early morning viewers are most interested in weather, news, and traffic. Similarly, broadcasters believe that traffic information enhances their audience reach and thus helps to sell advertising. Since, unlike radio, television does not travel with the viewer from the house, its prime traffic time is more limited to morning pre-comtnute hours; some stations will include traffic reports on their evening news broadcast, but they do not attach the same level of importance to it.

The marketing manager of a large cellular phone services company said that to be successful, phone-delivered traffic information must differentiate itself from radio by being available on-demand and providing drivers with real-time location -specific in formation.

Creative visuals are a critical component of television programming. Market research has established that television audiences are more attracted to real-time footage of traffic and to colorful maps than they are to a nongraphics-supported verbal report. Television stations' contracts with traffic information providers frequently include maps and live broadcast footage from traffic cameras.

Cellular Phones

The Cellular Telecommunications Industry Association (CTIA) confirmed that as of January 1993 there were 13,067,000 cellular phone subscribers. Approximately 15 of the nations' 25 largest cellular service companies, estimated to represent as many as 90% of all subscribers, provide subscribers with access to some form of traffic information. Thus, it is likely that a majority of cellular phone subscribers have access to a cellular phone company's traffic service. CTIA estimates that there will be 15 million cellular telephone subscribers by 1995.

Cellular telephone companies generally provide traffic information free of any additional charge to subscribers; callers pay for air time. In some markets, one cellular telephone company may provide the service to subscribers free of air time charge to differentiate its service from a rival cellular phone service provider. Traffic

information is usually promoted as part of a set of "starred" services, made more accessible to the driver through a shortened keying sequence. Other starred services may include dynamic route guidance, an emergency number, roadside assistance, a call-in number to report traffic incidents, sports, news, financial news, and horoscope.

Cellular phone companies say they provide traffic information as a value-added service to their customers. Although their market studies have shown that their customers find traffic information to be an important service, usage rates are reported to be fairly low, ranging from between 100 - 6,000 per month. One reason may be that few cellular phone companies report that they have done much to promote the service beyond inserting notices with their subscribers' bills. An industry spokesperson also suggested that the consumer may not perceive a valuable difference between cellular phone traffic information and radio traffic broadcasts.

Cellular phone companies have found that -because of low usage rates -traffic information does not pay for itself. Low usage rates have made some companies question whether to keep these services going. One cellular phone service provider has discontinued its starred traffic feature in two midsized markets because of low usage; this company is also considering discontinuing its service in a third, major, traffic market.

Although the cellular phone service providers interviewed did not believe that they were making money at providing traffic information, they all felt that providing it "fits" with their "image" as information providers. Cellular service companies cite four reasons for making traffic available to their subscribers:

- As a public service.
- To increase the amount of time subscribers use their phone.
- To add value to their service that differentiates them from their competitor.
- To establish themselves as purveyors of information.

Some market observers believe that the cellular telephone business market is fairly well saturated, and that - technological advances aside - the current challenge to cellular phone companies is to increase the amount of time subscribers spend on their phones.

Most of the cellular phone service providers interviewed did not see a separate market for traffic alone, and many felt that without greater service differentiation from the radio traffic broadcasts, this cellular phone-based service would show diminishing returns. One phone-based traffic information service that does its own traffic information gathering, SmarTraveler (from Srnart Route Systems of Boston), is receiving over 50% of its calls from cellular phones, up to 3,000 calls a day. A majority of these callers subscribe to a service that does not charge air time for traffic

information calls. It is premature to assess whether the SmarTraveler service is popular with these cellular phone users only because it is free and well-promoted, or whether users perceive a difference in quality between SmarTraveler's traffic reports and those that come to them over the radio.

The Consumer

The market for traffic information is ultimately decided by the traveling consumers who elect to tune-in, subscribe, purchase, or not. Some of the companies that sell traffic information to consumers, or use traffic information to sell other products and services, study their consumers to develop a socioeconomic profile in support of advertising sales. A very few companies study traffic information consumers to determine how they value traffic information, what they value about it, and where it fits into their lives.

The traveling consumer of traffic information is generally segmented by the traffic information industry into several categories according to travel-purpose, income, and occupational characteristics. The largest segment is composed of those who commute to and from work daily on a schedule that approaches the 9:00 am to 5:00 pm work day. This is the target segment for mass broadcast media. While there are subsegments of this group who take public transportation, market studies indicate that the majority commute by car. These consumers constitute an exceedingly attractive advertising market: they are employed; they are men and women; and they represent every major U.S. occupational, social, and ethnic group.

Studies indicate that these consumers listen to traffic reports every morning, often listening for traffic reports throughout their drive to work. Frequently they tune into the reports during their return trip as well. In surveys of this group conducted for radio stations by a marketing research firm and for SmarTraveler by Smart Route Systems, respondents reported that they frequently did change their route and time of departure in response to traffic information.

General, anecdotal information from market researchers and traffic information industry representatives indicates that consumers value traffic information for reasons generally related to enhanced mobility and control. Traffic information provides consumers with the ***perception*** that they can choose the fastest and least-congested route to their destination; they perceive this as increasing their mobility, saving them time and money, and eliminating the aggravation of traffic jams. When they have information and the opportunity to make choices, traffic information consumers believe themselves to be in greater control. When stuck in traffic, some consumers say that they can cope with the delay more easily because they at least know what has caused the tie-up.

Included within the larger group of commuters are those traffic information consumers who spend significantly more time in their vehicle over the course of the working day -those, for example, who are in sales, real estate, and home repair

businesses. The requirements of their work necessitate spending many hours in their vehicles and maintaining frequent contact with their clients, customers, or base offices. Members of this group are more likely to have some form of mobile communications device in their vehicles. This group, along with delivery, fleet, and other commercial vehicles, is considered by marketers to be a prime target group for carefully tailored traveler services (e.g., mayday alert, yellow pages, route guidance, automatic dispatch of car repair services). With the exception of the commercial vehicle industry, this group has not been culled out in publicly accessible traffic information market research.

Little data exists in the public domain that describes individual consumer's valuation and willingness to pay for traffic information. One part of the TravTek operational test survey asked respondents to distinguish between an in-vehicle ATIS product that included traffic information and one that did not. Preliminary results indicate that the respondents were not willing to pay extra for traffic information. However, it is not clear whether the traffic information provided to TravTek participants during the operational test was reliable.

SmartRoute Systems of Boston performed several small studies of their consumers in 1992 and 1993. They concluded that there was little conscious preexisting demand for their service, and that a prolonged marketing and promotion campaign would be required to educate consumers about the service's advantages. A focus group convened during the SmarTraveler operational test, under the auspices of the independent test evaluators, indicated that callers may be resistant to advertisements in their phone broadcasts. It further appears that the callers' willingness to pay for the service may relate to their perception that the quality of the information provided is superior to radio broadcast information. Their willingness to pay may also relate to the convenience of receiving the information where and when they want it.

A Fastline company representative in San Francisco (see Fastline company description in Section 4) asserts that they have done "extensive" consumer research in developing and refining their service. Their studies indicate that consumers are very reluctant to pay for the information, willing to tolerate advertisements, and that consumers want access to a broader array of travel and mobility information, including parking availability.

RE: Willingness-to-pay. In greater Boston, Cellular One charges air time for SmarTraveler calls . For the month of October, 1993, Cellular One provided free SmarTraveler access and promoted it in their invoices. Phone calls from Cellular One subscribers shot up in October and then dropped back to pre-existing levels in November.

4. New Businesses, New Delivery Platforms

As mentioned earlier, there are several new companies with consumer traffic information products on the market. These products are being delivered via telephone, fax, pager, and dedicated traffic information receiver. SmarTraveler, Fastline, AutoTalk, Roadirector, and Shadow Fax are all on the market with a product or a service that provides consumers with traffic information. Way-To-Go was a pager-based consumer traffic information product that was on the market between 1991 and 1993; it was withdrawn from the market due to poor sales. A description of the product is included in Exhibit 5 below.

Exhibit 5. New Traffic Information Products

Product	Company	Delivery Media	Content
SmarTraveler	Smart Route Systems, Cambridge, MA	Telephone	Recorded traffic information by route or region
Fastline	Fastline, San Francisco	Telephone	Recorded traffic information by region, plus other traveler information
AutoTalk	WKK Int'l Ltd, Hong Kong, China (AutoTalk is based in Santa Clara, CA)	Second Audio Program Reciever	Recorded traffic information by region
Roadirector	Roadirector, Los Angeles, CA	Pager primarily, also phone and fax	Text route-specific traffic information and live dynamic route guidance
Shadow Fax	Shadow Information Services, Los Angeles, CA	Fax	Traffic information via fax
Way-To-Go	Way-To-Go, Berkeley, CA (currently not operational)	Dedicated receiver	Recorded traffic information by region

These products embrace a variety of market approaches and the scope of their traffic information operations cross the boundaries of the mode1 provided above. Where applicable, the following descriptions highlight the differences among them in their source of traffic information, and in their financing, revenues, and delivery format.

Several of these new products are especially interesting in the context of this paper because they are the first traffic information products directly targeting the consumer

as the source of payment. Further, the majority of these new product/services have appeared on the market in California, where traffic congestion is greatest and where good quality traffic information is available free of charge through CALTRANS.

SmarTraveler

The SmarTraveler program provides traffic and public transit information by telephone to the greater metropolitan Boston area. SmarTraveler collects, processes, and broadcasts traffic information over telephone lines by region and highway route. The information is updated as frequently as the situation merits; it can be updated within 30 seconds if necessary. Service weekdays is between 5:30 am and 7:00 pm; weekend coverage provides a list of events that may affect traffic.

Consumers can access SmarTraveler using conventional or cellular telephones. There is no additional access fee for the service. Depending on the type of phone service, callers may pay their phone company for the time spent on the line. Caller volume to date has varied from 3,000 to 6,000 calls a day, depending on weather. Currently, over half the calls originate from cellular phones.

SmarTraveler is an IVHS operational test, partially funded by the FHWA through the Massachusetts Highway Department, with matching funds provided by private sector companies. It has been operational since January 1993. Its parent company, SmartRoute Systems, also sells traffic information to local television and radio stations, in competition with the traffic networks. One of the objectives of the operational test evaluation of the service is to determine whether the service can sustain itself on a commercial basis without any form of public financial sponsorship. The answer to this question will become clear by April, 1994, when the test evaluation is complete.

Fastline

Fastline offers a phone-based traffic information service to the San Francisco/Bay area that allows callers to choose among eleven travel-related items from a touch pad menu, including traffic information by region, transit and ridesharing, public parking lot locations, Caltrans highway construction locations, area events, and air quality reports. The traffic information is purchased from Shadow Information Systems, and is updated every ten minutes during peak traffic hours. The transit and ridesharing line connects callers to thirteen regional transit agencies.

Fastline does not charge callers a fee. As with SmarTraveler, the caller pays only for line or service time, according to the type of phone subscription. The service is paid for by CALTRANS and commercial advertising. Fastline reports that its caller volume fluctuates according to weather and time of year, but the company does not provide numbers.

Autotalk

The Autotalk company broadcasts continuous, regionalized traffic information to the greater San Francisco and Los Angeles metropolitan areas through an in-vehicle, after-market Second Audio Program (SAP) receiver and a keypad. The platform is a television receiver without a screen. In San Francisco, Autotalk purchases traffic information from Metro Traffic; in Los Angeles, the company uses public sources and does the processing itself. The information is updated continuously and broadcast to the receiver over the SAP channel. The device can be tuned to receive the audio portion of any television broadcast, and programmed to interrupt when traffic news from the identified region(s) is broadcast.

Autotalk has been on the market since April 1992. It costs $129, and has no monthly subscription fee. The company's revenues come from the sale of the device, and from the sale of advertising spots. The company will not confirm sales figures.

Roadirector

Roadirector, based in Los Angeles, uses the pager as a means of providing traffic information. Subscribers have their pagers reprogrammed to receive traffic information in addition to their regular messages. Roadirector gets traffic information from established sources, including Shadow Traffic and CALTRANS, processes it according to their internal requirements, and broadcasts it continuously to the beepers. The driver selects a specific region for the beeper (which can be changed by scrolling the beeper's text line through a menu of regions), reads the information which is current, and then Roadirector beeps the en route driver with new route-specific information on congestion, road closures, time of "incidents" and an estimate of how long the road will take to clear. Subscribers can also use their cellular phones to call Roadirector for more detailed information, such as alternate route information.

Roadirector has been on the market since November 1992, covering southern California. They sell their services in a few different ways. In one arrangement, Roadirector sells its services in bulk to the pager company, which then offers the service on a subscription basis to client companies and individuals. Roadirector also sells directly to companies and individuals, and provides services on a subscription basis that can include either or both broadcast services and individual route guidance. Roadirector reports that their payment schedule is flexible, depending upon the size of the customer and the type and frequency of their information and route guidance needs. The company has a suggested retail subscription price of $15.00 per month. Finally, Roadirector is currently negotiating with a cellular phone company to provide its subscribers with cellular telephone access to traffic information and route guidance services. The company will not provide sales or subscription figures.

Shadow Fax

Shadow Fax, located in southern California, provides traffic information via facsimile to subscriber companies and individuals. The traffic information is provided and processed by Shadow Fax's parent company, Shadow Information Service. It is sold by subscription and on a per-use basis to both companies and individual consumers.

Shadow Fax was founded two years ago as Traffax; last year, it was purchased by Shadow and became Shadow Fax. Their current target rnarket is corporations. In their marketing, they stress that when employees learn about traffic congestion before leaving work, these people are more likely to continue working until traffic congestion clears. Shadow Fax is positioned to serve the afternoon return commute that is hard for major broadcasters to reach, primarily because neither radios nor television sets are normally present in the workplace. Like their competitors, Shadow Fax supplies no information on the number of subscribers.

Way-To-Go

In 1991, Way-To-Go of Berkeley, CA, brought to market a dedicated, standalone traffic information product -a specially-designed pager that provided traffic updates on demand along specified highway corridors in the San Francisco / Bay area. The unit was portable, displaying a grid map of the area. A touchpad allowed the consumer to specify present location and intended destination. The Way-To-Go pager would then announce the necessary information with a voice synthesis system.

Metro Traffic Control provided the traffic information, with a Way-To-Go employee stationed at Metro's facilities. Once the information was obtained, Way-To-Go's computer analyzed the information to predict delays and traffic flows in the region.

The Way-To-Go unit was originally priced at $200, with a monthly subscription fee of $15. It was sold through cellular phone stores. Sales were low, and the company later dropped its price to $99. About 100 units were sold in all. Way-To-Go was started in 1991, and, as of April 1993, is no longer operational

5. Conclusion: Changes in the Marketplace

The U.S. traffic information market is national. The market is expanding as new **broadcast and resale platforms are exploited. Currently, this market's structure and** service quality are largely defined by the technological capabilities and service delivery-models of the two largest traffic information gathering/wholesaling networks. In effect, most traffic information is qualitative, delivered by a human voice or in text, and delivered or updated at intervals that are determined by the reseller or broadcaster.

Greater London offers **another** *example of a developing traffic information market that bears watching. There are currently three traffic in formation products available for sale to consumers: Trafficmaster and Trafficmaster Plus, LCD maps and text providing in formation broadcast from proprietary in fra-structure, and Air Call, a pager-based service using in formation provided by the U.K Automobile Association Roadwatch service from more traditional surveillance sources. Trafficmaster also installs big screen monitors at service stations which broadcast traffic in formation sponsored by advertisers. There are two traffic information networks providing traffic in formation to radio stations, Metro Traffic and the U.K. Automobile Association. And, as of May, 1993, London Transport proposed an all traffic and transit in formation radio station. These products are testing various theories of market development, product viability, and consumer willingness-to-pay.*

Observed Changes

Worth noting is the recent increasing proximity of payment for traffic information service to the individual consumer. Radio and television broadcasts of traffic information are paid for by advertisers. Consumer payment for traffic information is embedded in the cost of the goods being advertised. The cost of cellular phone access to traffic information is embedded in the monthly subscriber fee, but, depending on the structure of the subscription, there can be a direct cost to consumers for air time. The newer traffic information products and services charge the consumer directly -Shadow Fax on a per-use basis, Roadirector on a subscription basis, and Autotalk on a one-time basis. All these products represent market experiments to determine the value of traffic information to consumers.

Second, in all instances where traffic information is offered, it is being delivered on platforms that have other uses in the consumer's life. Radio, television, and telephones -both cellular and land-line -all have established value to the consumer, independent of traffic information, although the availability of traffic information appears to enhance the value of these platforms. The three new direct-sale traffic information products are all offered on platforms that carry other information to the consumer. The failure of the Way-To-Go product has been attributed, at least in part, to the fact that it was designed for a single purpose only.

Third, the greatest concentration of new traffic information consumer products is in California, a region said to have among the nation's very worst traffic congestion problems, and some of the nation's very best publicly maintained infrastructure surveillance. While the number of new

products in this group are not staggering in their multiplicity, the trend may indicate that heavy traffic congestion and good public infrastructure information are two market prerequisites.

Fourth, traffic information services have migrated over time to new communications platforms. The service was first broadcast on radio, then appeared on television, has become a common feature among the menu of services offered by cellular phone companies, and has most recently appeared as an option via fax, e-mail, pager, and m-vehicle device. This migration is partially a result of traffic information's observed -though still unmeasured -value to mobile consumers, and partially due to an attempt by entrepreneurs to expand the market through exploration of new delivery options. If this indeed is a trend, traffic information may become an essential element -bundled in with several other information options -available to purchasers of the coming decade's electronic mobile interactive communications package.

Market Forces

The evolving market for traffic information combines market "pull" and technology and public policy "push" in the presence of the increasing environmental/economic cost of worsening automobile traffic.

On the "pull" side of the equation, there is agreement that U.S. consumers have become increasingly information-hungry. Market researchers agree that increasing numbers of U.S. consumers expect to gain access to exactly the information they want at exactly the moment they want it. Also on the "pull" side: the increasing amount of time that consumers spend in their cars. The FHWA Highway Monitoring Performance System database estimates that total U.S. urban freeway delay will increase nearly tenfold from 1,252 million vehicle hours in 1984 to over 11,000 million vehicle hours in 2005.

On the "push" side of the equation, increasingly sophisticated fixed, mobile, and portable electronic devices are appearing on the market that make access to travel, traffic, and other types of information much simpler and quicker for the consumer. Companies capable of bringing such products to market are pursuing supply-side marketing strategies to create consumer awareness of the benefits of these information and communication products.

The U.S. Congress created market "push" with the passage of the Intermodal Surface Transportation and Efficiency Act of 1991, which contains the IVHS legislation. To promote widespread implementation of IVHS services and products, Congress authorized expenditure of $660 million over the period of 5 years, between 1992 and 1997. Programs developed by the FHWA, most visibly the field operational tests, and the information sharing and advisory activities of IVHS America, are creating a locus of activity designed to promote faster development and application of advanced surface transportation technologies.

Characteristics of Emerging Products

Many emerging traffic information products, whether in beta test, public operational test, or development phase, target segments of the individual consumer market as the direct source of payment. These products' features conform to the belief that for traffic information to have greater value to individual consumers, the traffic information must possess some of the following characteristics: quantitative, up-to-the-minute, route-specific, interactive, available on demand, sold as part of a bundle of travel and other information services, and delivered on a platform that has other uses in the consumer's life.

Emerging traffic information products can be broadly split into three sets. The first will be built from existing traffic information services and established delivery platforms. They will be positioned to respond to recognized issues affecting consumers' lives. Most of the emerging products will rely on electronic communication platforms that the consumer already owns (e.g., cellular phones, cellular modems, pagers, computer e-mail, fax). They will build on consumers' experience and comfort with the platform technology, their familiarity with the benefits derived from information services, and from the payment model of other services delivered through the existing platform.

The predicted second set of potential traffic information products would require the consumer to purchase a dedicated platform for travel and traffic information. These potential products -such as a fixed in-vehicle platform -are expected to provide a set of more specific car travel-related services, such as maps, may day alert, route guidance, and yellow pages. While the first generation of these products may provide location specific traffic information, it seems unlikely that the first iteration will integrate traffic information into route guidance. The marketing for these products will build from existing consumer demand for information, control, mobility, safety, and security.

The predicted third set of products are more revolutionary and depend on changes in the methods used to collect traffic data. Private companies, it is predicted, will install and operate proprietary electronic "infrastructure" capable of collecting, processing, and broadcasting a continuous stream of quantified, digitized, traffic information; this broadcast will be capable of supporting a new array of consumer traffic information products. The "revolutionary" products would use this data to provide consumers with real-time, quantified, location-specific traffic information, on demand, on a variety of formats, and through a variety of media, including maps, text, and voice.

Appendix A: Interview Respondents

Pierre Bouvard, *Executive Vice President,* Coleman Research

Eric Braun, *Manager, North American Consultation and Research,* Frank Magid Associates

Glen Carlson, *Manager, Traffic Management Center,* Minnesota Department of Transportation

Roddy Chan, *President,* Autotalk

Shane Coppola, *Director of Corporate Development,* Metro Traffic Control

Ken Costa, *VicePresident, Radio Information,* Radio Advertising Bureau

Tom Culpepper, AAA Headquarters

Mitchell Diamond, *Market Development Manager, New Business Development,* GTE

Gary Edson, Ph.D., *President,* MetroDynamics, Inc.

Richard Enlow, *President,* InfoBanq

Paige Fairchild, *Director of Marketing,* CellularOne

Howard Goldstein, *Vice President, Planning and Strategy, NYNEX Travelers Assurance Service,* NYNEX

Sue Groth, *System Operations Engineer,* Minnesota Department of Transportation

Richard Haynes, *Vice President, Research,* Frank Magid Associates

Mike Henry, *Vice President,* Paragon Research

Brad Hildebrand, *President,* Hildebrand Communications

Brian Jorgensen, *Traffic Information Officer,* Minnesota Department of Transportation

Gary Lee, *Executive Vice President,* Shadow Broadcasting Services

Mark Licht, *Executive Vice President,* PacTel Teletrac

Benson Liu, *Product Manager,* US West New Vector Group

Walter MacDonald, *Director of Operations for Miami,* Ft. Lauderdale, *and West Palm Beach,* Metro Traffic Control

Vicki Mann, *former Director of Marketing,* Paragon Research

Frank Manson, *Vice President,* Traffic Patrol Broadcasting

Youssef Moghaddam, *Marketing Product Manager,* PacTel Cellular

Roger Nadel, *General Manager, WWJ-AM* Detroit

Michael C. Parks, *Senior Manager, Technical-Strategic Planning,* Seiko Telecommunications

William *S.* Perell, *Vice President, Marketing,* E-Fax Communications, Inc.

Dan Rank, DDB *Needham,* Chicago

Judith Rockvam, *Project Liaison,* Minnesota Department of Transportation

Samuel Schwartz, *Director,Infrastructure Institute* Coopers Union

Tak Sit, Director, *Sales and Marketing,* Roadirector

W. Wayne Stargardt, *Vice President, Marketing,* Pinpoint Communications

David Stein, *Executive Vice President,* Smart Route Systems

Steve Symonds, *President,* Symonds Associates

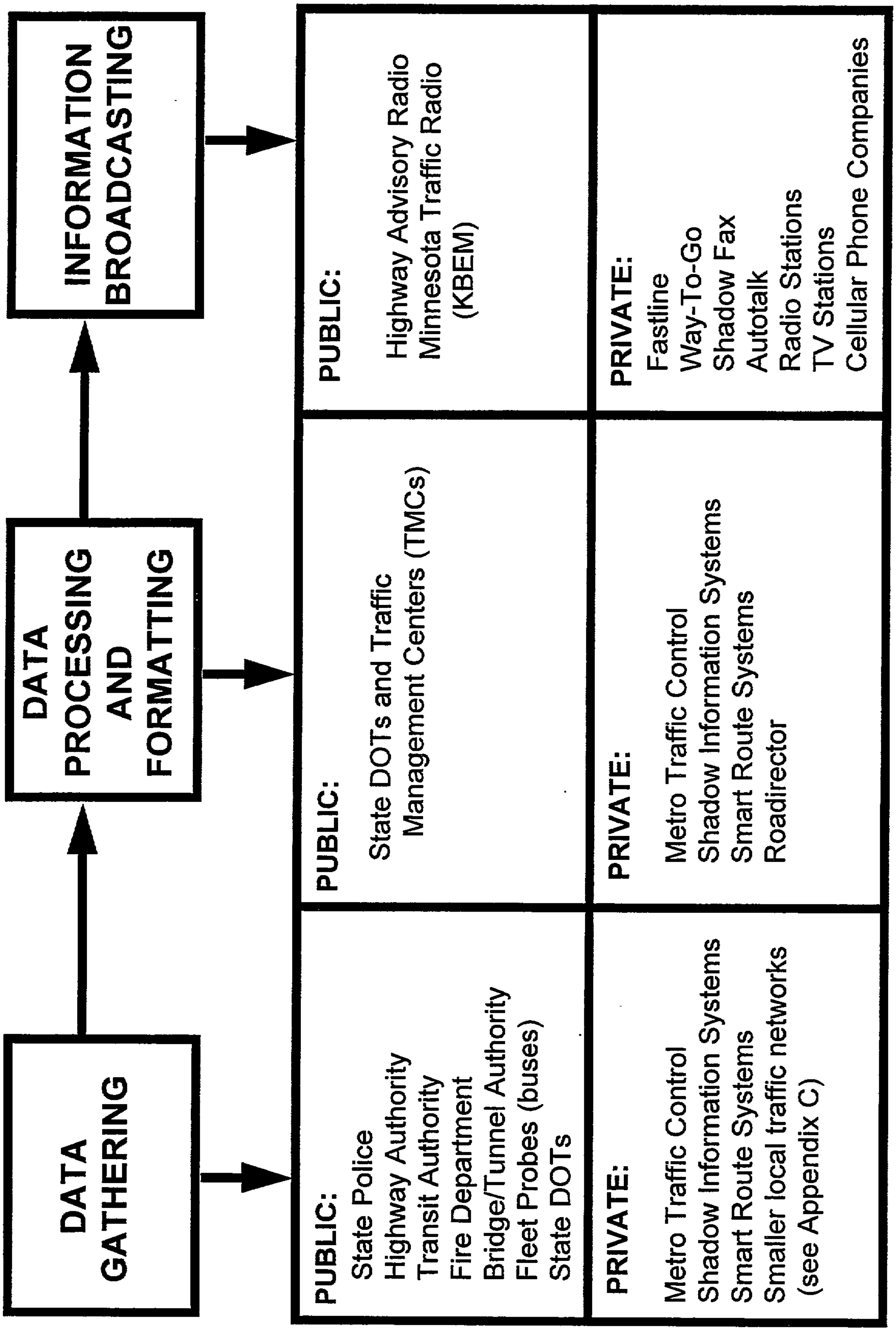
Peter Viles, *Reporter,* Broadcasting Magazine

Susan Von Daudt, *Manager, Business Development,* US West Community Link

Steve Wallenberg, *President,* Fastline

Roger Wimmer, *President,* Paragon Research

Appendix B: Traffic Information Companies by Functional Category



Appendix C: Traffic Networks and Locations

Major Metropolitan Areas Covered by Traffic Networks

Metro Traffic Control

Akron, OH
Atlanta, GA
Austin, TX
Baltimore
Boston
Buffalo
Chicago
Clearwater, FL
Cleveland
Columbus, OH
Dallas
Denver
Detroit
Ft. Worth
Ft. Lauderdale
Galveston, TX
Houston
Indianapolis
Kansas city
Long Island
Los Angeles
Miami
Minneapolis
Modesto, CA
New York City
Norfolk, VA
Oakland
Orange County
Orlando
Philadelphia
Pittsburgh
Portland, OR
Richmond, VA
Sacramento, CA
San Antonio
San Diego
San Francisco
San Jose
Seattle
St. Paul
St. Petersburg
Stockton, CA
Tacoma, WA
Tampa
Washington, D.C.
West Palm Beach

Shadow Broadcast Services

Chicago
New York City
Houston
Los Angeles
Philadelphia
San Jose

Coast-To-Coast Market Affiliates

Atlanta
Baton Rouge, LA
Birmingham
Boston
Charlotte
Cincinnati
Columbus, OH
Dallas
Dayton
Hartford / New Haven
Jacksonville, FL
Kansas city
Las Vegas
New Orleans
Phoenix
Providence
Raleigh-Durham
Salt Lake City
San Diego
St. Louis
Tuscon

Appendix C (cont'd)

Other Traffic Networks

Skyview Traffic:
- Las Vegas, NV
- Phoenix, AZ
- Tuscon, AZ
- Nashville, TN
- Louisville, KY

Traffic Watch:
- Cincinnati, OH
- Salem,NC
- Columbus, OH

Hildebrand Communications:
- St. Louis, MO
- St. Louis area

Airborne Traffic:
- Kansas City, KS

Aero Traffic:
- Salt Lake City, UT

Metro Scan:
- New Orleans, LA

AirWatch Communications:
- San Diego, CA
- Los Angeles, CA

Air Traffic Network:
- Knoxville, TN

Traffic Scan:
- Atlanta, GA
- Miami,FL

Traffic Patrol:
- Dallas, TX
- Charlotte, NC
- Raleigh-Durham, NC
- Greensboro/Winston-Salem

Smart Route Systems:
- Boston, MA

Traffic Net:
- Providence, RI
- Hartford, CT
- New Haven, CT
- Fairfield County, CT
- Springfield, MA

First Coast Traffic Center:
- Jacksonville, FL

Appendix D: Interview Guide for Traffic Networks, Cellular Phone Services, Broadcasters, and Market Research Firms

TRAFFIC NETWORKS

INDUSTRY HISTORY

What do you know about the very early traffic report services?
How did it begin? Where did it begin? Where did the info come from? Who paid for it?
What was the early market for traffic reports?

COMPANY HISTORY

How did the company get its start?
What were the opportunities/niches as seen at that time?
What year and location(s) did company begin with?
Who were your first customers?
What were the early marketing strategies?
What were sales figures in the early years? In years since?

PRODUCT/BUSINESS

How do you describe your product/service?
Where do you get your traffic information?
Are there weak points in the provider chain?
What are the guidelines for what info gets presented on air?
How was the current formula for broadcast coverage and content developed?
What are the regional/local variables?
What changes in the traffic environment cause you to change the content of your coverage? (increase in size of metro market? change in traffic patterns? awareness of potential new advertising sponsor?)
What's the cost of producing the average broadcast?
How do you establish charges for services? Have the price and methods changed over the years?
What are the unique costs of this business? Unique business risks?
Have government regulations influenced the growth of your company?

CURRENT MARKET

How many metro areas in the US receive broadcasts?
Any foreign service areas (Canada, Mexico, UK, Australia?)
Who are your customers who resell the info who are not a radio or TV station?
Any idea of how many end-users in the national audience?
What feedback from m-sellers re: what "works" and what doesn't with regards to a successful broadcast?
Any insight into the value of the traffic reports to the m-sellers?
Any information on how the information gets used by the general public?
Do you monitor the service's effect on the traveling public?
who are the market research firms who focus on this sector?
What is your approach to marketing? How do you sell your service to a prospective market area?
What are the baseline conditions that a prospective market must have to be considered for the investment? Size of population? Size of employed population?
How do you differentiate yourself from your closest competitors?

MARKET EVOLUTION

In what ways do you see your market growing or changing?
What are the forces that are influencing this change?
Who might be included in your client base in the future? For example, newer platforms: cell phones, in-vehicle devices, and portable devices, such as watches, pagers, and P DAs?
What is essential to the continued growth and good health of the company?
Has the creation of IVHS had any influence on your business? Do you expect that it will?
What do you think about the government developing national standards for the collection, content, and/or dissemination of traffic information?
Overall, how do you see this mobile market evolving over the next five years?

CELLULAR PHONE SERVICES

CURRENT MARKET

Why do you provide streamlined access to traffic information to your subscribers ?
How would you describe the different customer segments of your market?
Which segments value (or use) traffic information most?
How would you quantify the net economic value of the traffic information market to your company?
Could you put a dollar amount on the net amount of revenue that traffic information generates on a yearly basis?
How do you forsee this mobile marketplace evolving over the next 5 years?

PRODUCT/BUSINESS

What are the features of the service? (hours of operation, live or recorded, geo graphic area covered)
When did you begin providing this service?
which market areas have access to this service?
What are the distinctive features of the market in the areas where you provide this service (as opposed to areas where you don't provide the service)?
From whom do you get the traffic information? Do you alter the info in any way prior to delivery?
Who pays for the service?
Do you provide any other streamlined information services to your subscribers?
What is the volume of traffic information calls on a daily basis?
Any information on how drivers use the service? On how they value it?

TV and RADIO BROADCASTERS

CURRENTMARKET

Please describe the nature of your business
For dedicated traffic information resellers: Why did you get into this business?
For vendors who bundle: What are the other services you offer? Why did you inclu de traffic information in your menu of selections?
What is your approach to marketing? How do you sell your service to a prospective market area?
What are the baseline conditions that a prospective market must have to be considered for the investment? Size of population? Size of employed population?
How do you differentiate yourself from your closest competitors?

PRODUCT/BUSINESS

Where do you get your traffic information?
Do you alter the info in any way prior to rebroadcast?
For bundlers: What are your sources for the non-traffic information info?
What technology or framework do you use to broadcast information?
How was the current formula for broadcast content developed?
What are the regional/local variables?
What are the changes in traffic conditions or traveling patterns which may cause you to change the content of your coverage?
Who pays for the traffic information service?
How did you establish charges for services? Have the price and methods changed since first established?
What are the unique costs of providing this service? Unique business risks?
How many customers do you have?
What segments of the market describe your customers?
Any feedback from customers re: what "works" and what doesn't with regards to a successful broadcast?
Any insight into the value of traffic reports to the customers?
Any information on how information gets used by the general public?
Do you monitor the service's effect on the traveling public?
Who are the market research firms who focus on this sector?

MARKET EVOLUTION

In what ways do you see your market growing or changing?
What are the forces that are influencing this change?
Who might be included in your client base in the future?
What is essential to the continued growth of the company?
Has the creation of lVHS had any influence on your business? Do you expect that it will?
Have government regulations influenced the growth of your company?
What do you think about the government developing national standards for the collection, content, and/or dissemination of traffic information?
How do you see this mobile market evolving over the next five years?

MARKET RESEARCH FIRMS (specializing in broadcast media)

What value do broadcasters assign to real-time traffic information broadcasts?
What market research is done re: audience response to traffic reports?
What are the results?
Have you seen growth in the size of this market over the past ten years? Can you attribute it to any special factors?
How do you see this market evolving over the next five years?