

**RoadInfo: Advanced Traveller Information for the Greater Toronto Area**

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## **Abstract**

There is a growing demand for traveller information in Canada, and this demand has thus far been met primarily by the private sector (i.e. local broadcast media outlets). Canadian municipalities increasingly find themselves under pressure to provide more and better traveller information to the motoring, transit-riding, and walking public. This paper showcases the City of Toronto's successful RoadInfo system and demonstrates the potential benefits and pitfalls of developing a telephone-based ATIS system.

RoadInfo is a telephone-based traveller information system providing service to the public within the City of Toronto and across the Greater Toronto Area. With joint funding from the City of Toronto and the Ministry of Transportation for Ontario, RoadInfo has been providing planned event information, pedestrian operations information, comment capabilities, and limited live road closure information to area residents and businesses for over 10 years.

The paper briefly reviews the benefits to be derived by ATIS systems, the development of RoadInfo system, the features RoadInfo provides, and its range of potential applications (e.g. from traveller information to public health advisories).

The paper then identifies ATIS industry developments related to telephone-based services, and in particular, discusses the U.S. 511 standards, and the movement towards similar standards in Canada.

The paper then outlines the 'lessons learned' through industry ATIS deployments, and through the development of the RoadInfo ATIS. Developed in an era preceding the term 'ITS', RoadInfo has overcome many of the common industry roadblocks to implementing a fully functional ATIS. Challenges in providing real-time information, changing roles for staff, managing contracted staff, and the industry challenges in developing a profitable ATIS business model are each discussed.

The paper will conclude with a description of the potential development path for the RoadInfo system.

**1. BACKGROUND**

The Greater Toronto Area is a bustling urban environment containing over five million people. The area generates a significant number of personal commuting and business / commercial trips on its road infrastructure each day. Responsibility for the broader road network is shared between local municipalities, regional (county-level) authorities, and the Province of Ontario. Generally, the City of Toronto is responsible for the major arterial and local road network within its City limits, while the Ministry of Transportation for the Province of Ontario (MTO) is responsible for the major freeway network (e.g. Highways 400, 401, 404, 409 and 427). The exceptions to this rule are the Don Valley Parkway and the F. G. Gardiner Expressway, two freeway routes under the jurisdiction of the City of Toronto.

Both the City of Toronto and MTO operate Advanced Traffic Management Systems. The City of Toronto's Road Emergency Services Communications Unit (RESCU) manages the two freeway routes under their authority. It uses automatic incident detection (AID) algorithms and CCTV to monitor, detect and confirm problems on the network. Communication and operational links road dispatch, police services, and urban traffic control systems allow the City to better manage the road system. RESCU disseminates information to the public via Dynamic Message Signs (DMS), a website, fax subscriptions, pager subscriptions, and RoadInfo. MTO's COMPASS system performs a similar function for the Provincial highways and disseminates information to the public via DMS, website, fax subscriptions, and RoadInfo.

RoadInfo is a telephone-based Advanced Traveller Information System (ATIS) that is operated by the City of Toronto with partial funding support by MTO. It has been providing planned event information, comment capabilities, limited live road closure information, and general travel information to the public across the Greater Toronto Area for over 10 years.

ATIS are automated systems that provide travellers with the information they need to make decisions on traveling route, mode and schedule. On its own, or in support of other transportation systems (e.g. Incident Management Systems, Advanced Traffic Management Systems, etc.), ATIS gives public operating authorities a critical means of communicating with the public and with other public agencies. In so doing, they improve safety by improving incident response times and allowing motorists to avoid problem areas.

The use of ATIS is typically highest in highly congested urban areas (such as Vancouver, Toronto and Montreal) but is slowly entering into the mainstream in mid-sized and smaller centers, particularly where there is a high percentage of inter-jurisdictional commuting. There are growing public demands and expectations concerning ATIS services, and these expectations are (for the most part) met by the private sector in the form of radio drive-time traffic reporting and television CCTV feeds. Canadian municipalities will increasingly find themselves under pressure to provide more and better traveller information to the motoring, transit riding, and walking public, either directly, or through broadcast media.

The benefits associated with ATIS systems are listed in **Exhibit 1**, as follows:

**Exhibit 1. Typical ATIS Benefits**

For the Traveling Public	For Public Agencies
<ul style="list-style-type: none"> <li>• Saves travellers time</li> <li>• Helps motorists avoid congestion</li> <li>• Reduces stress related to uncertainty</li> <li>• Increases safety</li> </ul>	<ul style="list-style-type: none"> <li>• ATIS are supportive of other ITS infrastructure investments (e.g. incident management systems)</li> <li>• Allows the authority to better manage the road network</li> <li>• Increases safety</li> </ul>

This paper will showcase the City of Toronto's successful RoadInfo system by briefly reviewing the development of the RoadInfo system, describing the range of features and potential applications, and demonstrating the potential benefits and pitfalls of developing an ATIS system. The report will then discuss ATIS industry standards and describe the potential development paths for RoadInfo in the future.

## 2. DEVELOPMENT HISTORY OF ROADINFO

The City of Toronto's RoadInfo automated interactive telephone system was initially established in 1993. It was one component of a traffic management strategy to support the six-year \$100 Million reconstruction of the Gardiner Expressway and Lake Shore Boulevard bridges over the Humber River.

The City had determined that its practice of advertising lane and roadway closures in newspapers was not cost-effectively getting the message to the intended audience, nor was this technique able to react quickly enough to changes in construction schedules.

After a brief review of the commercially available products, the City chose to develop its own system that could be tailored to provide the message content and structure able to best deliver both voice and fax messages that could be updated without interrupting the availability of the system to callers.

## 3. HOW DOES ROADINFO WORK?

As with virtually all other ATIS, RoadInfo is more than just a piece of software. It is an entire process for delivering traveller information to its users and stakeholders. Specifically, there are three main parts to the process, and their relationship is illustrated in **Exhibit 2**:

**Data collection** – In this part of the process, raw conditions data are collected from various sources, including field equipment and other agencies, by a wide variety of automated (e.g. automatic incident detection) and manual means (e.g. road patrollers).

**Data Fusion** – Here, raw data is reworked into a format that suits the needs of the various RoadInfo users. Once detected or authored, the raw data is communicated to a central ATIS system where it is repackaged (or fused) into information products that will be of use to ATIS customers.

**Information Distribution** – In this last part, the information products are delivered to the end customer through a variety of dissemination systems (e.g. telephone, fax, etc.).

Due to the time requirements involved, and limited staff resources, the City of Toronto (as lead agency) retained a 'RoadInfo Contractor' (i.e. IBI Group for 2002-2005) to perform the tasks of Data Fusion and Information Distribution. In addition to these tasks, the RoadInfo Contractor is also responsible for system maintenance, performance management, and quality control measures for the system and process.

### 3.1 Data Collection

Data is collected from a number of sources including:

- MTO and City field devices (i.e. AID and CCTV);
- Field patrol personnel via the RESCU and COMPASS dispatch centers;

- Emergency services personnel coordinate with the COMPASS and RESCU centres in the event of emergency operations; and
- Broadcast media (such as CityTV) have reciprocal arrangements with the City to provide their data in exchange for video feeds. Less formally, radio broadcasts are also monitored.

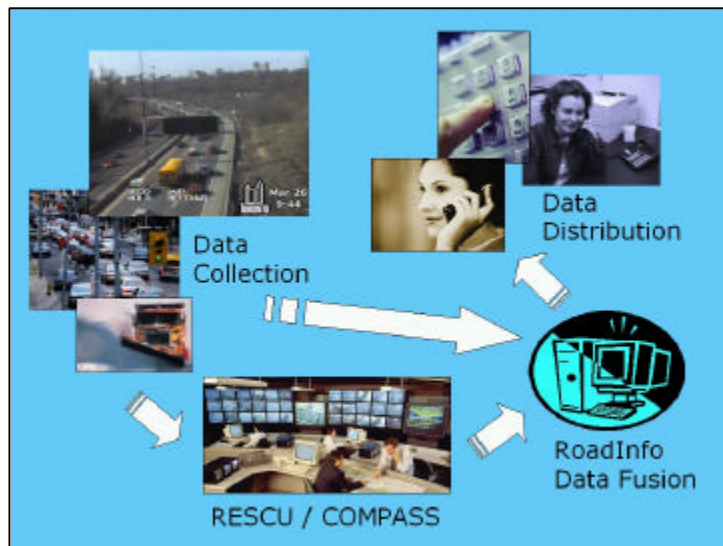
The RESCU and COMPASS systems act as a clearinghouse for the data. Specifically, data collected by field equipment (typically an automated process) and data generated by field personnel such as road patrols, permit sections, etc. (typically a manual process) is first collected at one of these Dispatch centers prior to being forwarded to the RoadInfo Contractor.

Other data is provided directly to the RoadInfo Contractor from City of Toronto personnel and systems without being routed through the RESCU or COMPASS systems. These data typically relate to snow clearing activities and static messages related to public service announcements (e.g. street events, instructions for the use of Flashing Don't Walk, pedestrian pushbuttons, pedestrian signal timing, promotional programs, travel directions to attractions, etc.).

### 3.2 Data Fusion

The next step in the RoadInfo process is the data fusion task. Depending on the level of automation, this component of any ATIS process can be very time consuming. With RoadInfo, there are a number of manual data inputs that rely on personal contact.

#### Exhibit 2. The RoadInfo Work Process Flow



The data fusion task involves systems to receive the data that arrives in various formats (e.g. email, fax, telephone, etc.) and reformatting it to be readily used by the data dissemination technologies used by RoadInfo. For RoadInfo, this involves taking the various emailed and faxed forms, voice mail messages, and telephone calls, and:

- Authoring plain-English vocal messages (and French messages for MTO issues) that are of use to the public;

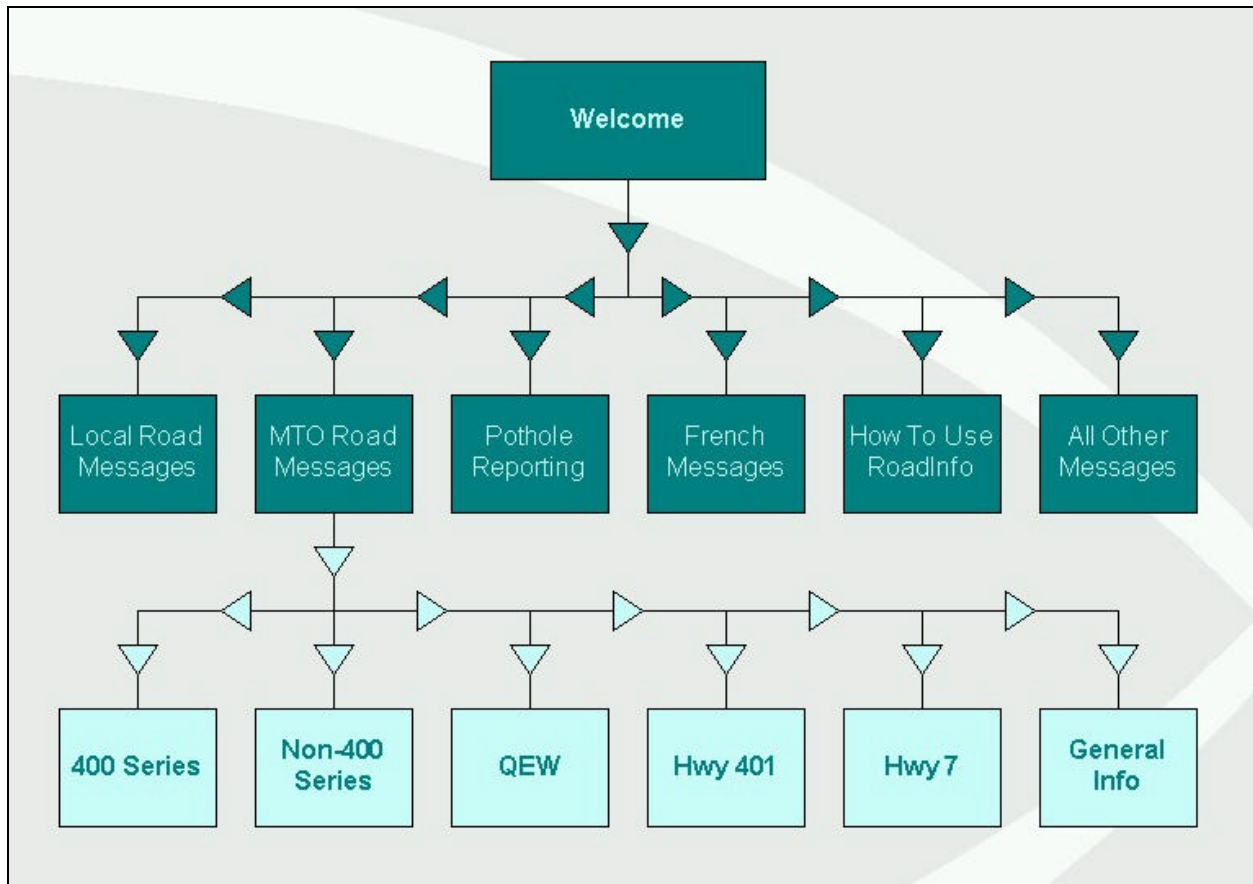
- Combining this text with the current date and time, standard introductions, concluding statements, and instructions; and
- Recording these 'fused' messages onto the RoadInfo system and/or loading fax information into the system.

### 3.3 Information Distribution

RoadInfo currently provides users with two means of retrieving information from the system. Audio messages and fax information can both be accessed via the RoadInfo telephone interface. The RoadInfo telephone interface, offered through a local and toll-free number (416-599-9090 or 1-888-599-9090) is an automated attendant system. The messages are organized into a menu tree of "audio message

boxes". **Exhibit 3** illustrates the higher-tiers of the current RoadInfo menu tree. It should be noted that this menu structure is continually updated to reflect current needs.

### Exhibit 3. RoadInfo Menu Tree Configuration



Each audio message provides two things: (a) traveler information specific to that menu item (e.g. local road reports, QEW, etc.) and (b) instructions concerning further menu options. For example, the Welcome Message provides a brief description of what RoadInfo is, and explains the primary sub-menus that the user may choose. Specifically, the menu provided in the Welcome Message directs users to the 'primary branches' for City of Toronto streets, MTO roads (for English and French messages), a pothole reporting voice-mail system, and general information regarding the system.

RoadInfo provides for significant user navigation flexibility. The system is structured such that each message box in the system, regardless of its 'depth' within the menu tree, is assigned a unique three-digit message access code. To navigate within RoadInfo, users listen to menu options and enter the pound key (#) followed by the three-digit message number for the program they desire to hear. The use of the pound key allows users already familiar with the system to jump directly to any message of use to them by entering its three-digit message access code. Using the menu tree in **Exhibit 3** as an example, a user may access the messages and submenus for Highway 401 directly by entering the pound key (#) and the three-digit access code (e.g. #401) upon hearing the system Welcome message.

The system also provides for significant user access flexibility that is of benefit to the operating authority. The system has a total of 48 access lines (and can be configure for more) that allow issue-specific hotlines to be established. For example, the City of Toronto operates its 338-SNOW winter road

maintenance information line over the same system. To the user, 338-SNOW appears to be a completely separate entity – a different number, a different introduction, and a different menu structure. Unlike the main RoadInfo menu tree, the 338-SNOW line uses a standard automated attendant menu tree (e.g. 'Press 1 for information on...'). However, this is all accomplished with the same RoadInfo software.

As of Spring 2003, the RoadInfo system is also being modified to provide a fully bilingual (English and French) user interface for all MTO services provided on the system.

#### 4. ROADINFO FEATURES

RoadInfo provides both 'live' and 'static' road condition information. 'Live' information is data loaded immediately to the system and continually updated (normally automatically) and 'static' information is loaded as needed and updated less frequently (normally a manual process). The majority of the information contained within the system is currently static information. Specifically, RoadInfo provides the following static data types:

##### Exhibit 4. Static Information Provided by RoadInfo

Information	Update Frequency	Coverage
Road & lane closures for the current date	Twice Daily	Toronto & MTO
Planned Capital works (organized by quarter-year)	Quarterly with updates as required.	Toronto & MTO
Scheduled special events (e.g. street events / carnivals and parades)	As required.	Toronto
General traffic information (e.g. instructions for the use of Flashing Don't Walk, pedestrian pushbuttons, etc.)	As required.	Toronto
Fax messages for special event routes, large construction projects, and community service announcements.	As required.	Toronto & MTO

As noted in **Exhibit 4**, users may obtain certain types of information by fax. By navigating to the appropriate message box, and entering a fax number at a prompt, the system automatically responds by sending the user the corresponding message information. This is particularly effective for describing maps (e.g. marathon and parade routes) and long static messages (e.g. directions to attractions).

RoadInfo provides live information for major lane and road closures. This information is relayed directly to the RoadInfo Contractor by the RESCU and COMPASS operators. The RoadInfo Contractor then coordinates updates with the RESCU and COMPASS operators until the event is finished.

RoadInfo also provides public comment line capabilities for a range of public interests (e.g. Pothole Reporting and Litter Reporting). The RoadInfo Contractor then transcribes the messages and forwards these to the attention of the appropriate City of Toronto personnel.

## **5. ROADINFO BENEFITS**

Generally stakeholders who use traveller information fall into three broad categories: (a) the traveling public, (b) public sector agencies, and (c) the private sector. Each of these stakeholders are able to derive significant benefits from the RoadInfo system.

### ***5.1 Public Benefits***

The general commuting public want to know how their commute route is operating. This allows them to make decisions regarding departure time and route. This is particularly true where the commuter has route options. RoadInfo is effective in this regard because it is the only ATIS operating with live traffic information in the GTA, and its combination of provincial and municipal road information provides commuters with information on multiple routes both within and outside of the City of Toronto. But studies have also shown that even when route options are limited, knowing what lies ahead reduces stress for the motorist [1].

The general public may also exercise their right to request action on matters of concern to them by leaving comments on the system concerning a range of issues.

### ***5.2 Public Agency Benefits***

RoadInfo allows both the City of Toronto and MTO to better manage their road infrastructure. The system assists these authorities in managing travel through periods and locations of high congestion. Also, through its comment line capabilities, the system acts as a form of detection for required road and plant repairs and litter removal within the City of Toronto.

The statistical tracking features of the RoadInfo system also allows the City of Toronto to use RoadInfo as a Performance Management tool.

Most importantly to an operating authority, RoadInfo improves safety by allowing travellers to make informed decisions regarding routes that will help them to avoid congested areas.

As the coverage of live data improves on the RoadInfo system, public transit and para-transit agencies will also be able to use RoadInfo for making service decisions.

### ***5.3 Private Sector Benefits***

Local broadcast media (radio and television) subscribe to RoadInfo to enhance the services provided to their listening / watching public. The RoadInfo road closure and lane restriction information supplements their news and weather information to provide a better service that their customers will view as more comprehensive.

Commercial trucking has a similar interest to the transit operators. They are interested in the factors that may affect the delivery of their goods or services.

Similarly, large employers are interested because it affects both their workforce access and egress, and their ability to deliver their goods or services.

RoadInfo users also currently include taxicab operators, motor coach lines, hotels, convention centers, and major tourism attractions.



## 6. CURRENT INDUSTRY DIRECTIONS IN TELEPHONE-BASED ATIS SERVICES

A recent FHWA report by Peters [2] researched trends in ATIS delivery systems through an extensive survey of over 2300 operating authorities across the United States (with a +90% return rate). The report concluded that while websites are currently (and are expected to continue to be) the most common form of deploying traveller information in the U.S., automated telephone systems (such as 511) are expected to be the fastest growing information dissemination tool over the next three years. This is understandable in view of the current federal push to deploy 511 systems across that U.S.

As of Spring 2003, the 511 telephone number has been deployed by approximately nine states, and as many other smaller jurisdictions (e.g. San Francisco Bay area) to provide travellers with road condition and other travel information. The system is envisioned as a nationwide, multilingual "tiered information service" for multiple modes of travel, that would provide services that appear connected and seamless to the traveler passing through multiple jurisdictions.

Recently, deployment guidelines [3] were published by the 511 Deployment Coalition (including AASHTO, APTA, ITS America and FHWA) for the benefit of operating authorities considering deploying 511. The guidelines identify the 'basic' services that all 511 system should provide, and suggests 'expanded' services that would benefit users. This uniformity is important to meet customer expectations as 511 systems are deployed across the country.

The basic services identified in the deployment guidelines include two broad categories: (a) highway information, and (b) public transportation information, as illustrated in **Exhibit 5**.

### Exhibit 5. Basic Content Guidelines for U.S. 511 Deployments

Highway Information for 511 Services	Public Transportation Info for 511 Services
<p>Travel information on roads within 511 systems is to:</p> <ul style="list-style-type: none"> <li>• Provide primarily route-based information to facilitate user navigation within the phone system;</li> <li>• Focus on providing information on construction / maintenance, road closures and major delays, major special events, and weather / road surface conditions. The location, direction, severity, expected duration, and alternate routes should be provided for each of these items;</li> <li>• Provide more detail in urban areas;</li> <li>• Ensure accuracy, timeliness, and reliability; and</li> <li>• Provide automated delivery (no direct contact between callers and operators).</li> </ul>	<p>In addition to the above, public transportation information within 511 systems is to:</p> <ul style="list-style-type: none"> <li>• Provide information for all public transportation properties within the 511 area; and</li> <li>• Work in concert with existing public transportation call centers to relive call volumes on these centers (not to replace them).</li> </ul>

In describing the potential expanded services for 511 systems, the FHWA suggests that operating authorities have the option to 'go deeper, or go broader' to further explain the range of traveling options available. Going 'deeper' would provide additional layers of detail for the services already described under the basic content guidelines. Going 'broader' would introduce additional subject matter. This would potentially include tourist information, special events, parking, inter-regional services, and driving

directions, trip planners, transportation services information (e.g. carpools, HOV, etc.), concierge services (e.g. reservations), and personalized services.

The status of 511 efforts in Canada is not as advanced as the United States. Generally, the number and population of built-up areas in Canada is not yet sufficient to warrant an aggressive national program. However, recognizing that coordination with the U.S. system would be an important asset, and seeing that Canada was not actively engaged in developing its own system, ITS Canada embarked on a 'mini-survey' of jurisdictions across Canada to gauge public agency support for such a program [4]. They found that many agencies are operating some form of telephone information service, but that deployment documentation was not readily available. There was general agreement that the development of a Canadian 511 system is in everyone's interest, and that such a system should work in harmony with the U.S. 511 system. Unfortunately, as of the Spring of 2003, it was ITS Canada's understanding that the CRTC (the body with ultimate control of the assignment of N11 numbers) has tentatively assigned 511 to another use. ITS Canada was to further investigate the matter.

In the interim, the U.S. 511 Deployment Coalition's implementation guidelines, tempered with a sound understanding of potential user needs, offer sound advice for defining content and coverage within an automated telephone traveller information system.

## **7. ATIS DEVELOPMENT "LESSONS LEARNED"**

In developing RoadInfo, and the many ATIS deployments to-date, there have been many discussions regarding the "lessons learned". There is a significant body of information available on these matters within the industry. The following summarizes these lessons-learned and explains how they can act as guiding principles in the development of new ATIS, or the upgrade of existing ATIS services.

### ***7.1 When Building a Business Case for ATIS...***

One fundamental conclusion has been made with respect to ATIS Business Models: The early assumption that ATIS would be a revenue generator, and that the data assets would be of significant value to the private sector, was mistaken. To date, industry has failed to find a successful profit-driven business model [5]. In the current marketplace, ATIS has proven to not be profitable because:

- There is a weak market for the data;
- In most markets, the data offered isn't comprehensive enough to provide a 'complete package' meeting all the target customer's needs; and
- The public is reluctant to pay for services that they believe they can get for free from broadcast media (such as radio and TV).

It is perhaps this last point that best explains the seemingly contradictory indications that there is a public expectation that ATIS services and products will become increasingly available, but that these services will be provided at little or no cost to the travelling public.

In the mid-1990's in the face of increasing budget pressures, the City of Toronto explored the potential to form a public-private partnership to fund the operation of the RESCU traffic management functions, including RoadInfo, via revenue generated from the sale of the real-time traffic flow information. But, as with marketplace in general, negotiations with a number of interested firms failed to result in a model where these operations could be self-sustaining.

One general example of a partial success in private-sector ATIS supply is the success of broadcast media in providing traffic reports. In addition to local news media, there are examples in the United States of nationally-based firms (e.g. Metro Networks) who provide these services. By bundling together traffic

information with additional content related to news, current events and particularly weather information, these information providers continue to find value in performing this function. However, it should be noted that traffic reports in themselves do not constitute an ATIS, and these models are only successful because they bundle content of various types to create value for their customers. The individual components (traffic, news, weather) on their own may not be sufficiently desirable to customers, and would therefore not draw the advertising revenue support necessary to make this business viable.

The end result is that ATIS continue to be implemented using public funds, either in the form of seed money to establish an operation (such as Traffic.com), or with on-going budgetary contributions (as with Smart Trek in Seattle or RoadInfo in Toronto). It is generally agreed that it currently takes public funds to implement, operate and maintain a successful ATIS.

Consequently, operating authorities must look beyond the traditional positive benefit-cost outcome in support of a business case for implementation. The extensive non-monetary benefits must be considered, including the added benefits to associated traffic management systems (e.g. control center operations), programs (e.g. travel demand management, public outreach, etc.), and safety (e.g. contributions to incident management). Quantitative, non-monetary measures of effectiveness are readily monitored (e.g. call center volumes, system access frequency, system operational time, customer satisfaction surveys, improvements to incident response time, etc.), and may be used to highlight the benefits of the system.

## ***7.2 While developing a telephone-based ATIS...***

When developing an ATIS from scratch, the big questions surround what the ATIS is supposed to accomplish. Typically, the need and justification will arise out of one or a few needs. But the system will likely fulfill more than these few purposes. Therefore, to get the 'big picture', one must begin by identifying the ATIS customers, and focusing on their needs. Customer needs should drive the overall 'vision' of what the ATIS is supposed to accomplish.

A common problem in ATIS deployment is that jurisdictions will understand they want an ATIS (based on these few high-priority items), secure some amount of fixed funding, set a schedule, and then begin to decide what it is they want the broader system to accomplish. It is important to get the planning done first so that there is a clear target to move towards. But at the same time, it is important to leave room for contingencies, as it is relatively difficult to anticipate all your needs and scheduling hurdles that might come along.

The 'vision statement' should act as a touchstone through the course of the planning phase for the ATIS. Returning to the list of user needs and periodically refocusing on your target audience will ensure that the system development resources are being used optimally. There are diminishing returns if applications are developed for people who are unlikely to use them.

Who uses ATIS? Apart from the agency stakeholders such as emergency service providers and road operating authorities, the traveling public represents the largest stakeholder group. Lappin [6] has identified the commuting motorist, aged 25-55yrs as the most common user. Her study further indicated that ATIS use increases with the users level of education and income. Usage further increased proportionally with local congestion levels and alternate route availability. In determining the target market for the ATIS, these demographic issues need to be considered.

A successful kick-off strategy for operating authorities has been to foster their ATIS development plans from within their organizations. It is a valuable asset to have senior government and/or political officials supportive of the initiative, and who will act as a voice and champion within Council.

This key support is best sustained by demonstrable successes. A reasonable work plan with achievable goals should incorporate plans for some 'early successes'. Therefore, it is important to plan and build a very achievable system, and plan for expansions at a later date. These successes will provide momentum for the project and help justify the growth of the system into further stages of deployment.

ATIS data quality and breadth of coverage are very important. The public wants a feel for the 'big picture', so completeness of data coverage is paramount [5]. To fill-in the 'data gaps', data sharing agreements between two or more agencies are typically developed through the course of developing an ATIS. For example, RoadInfo relies on the City of Toronto and MTO for its core data needs. Other potential partners include local broadcast media outlets that may be in a position to act as a data source. To this end, Memoranda of Understanding are an effective tool that may be used to ensure that mutual needs are explicitly stated, and to assign agency responsibilities. It should be recognized that this agreement process can be time consuming.

This data coverage, and the way data is presented to the end-user, will speak to the user-friendliness of the system, and the system's probability of success. For this reason, it is vitally important to make sure that the operating authority has 'got it right' before letting the product out to the public. If the product is not good enough, or if the quality lapses over time, the user will quickly lose confidence in the system and will be reluctant to use it again.

It is important to allow for ample development time. This includes the need to plan ahead for related studies, such as any required communications infrastructure, staffing resources, etc. It also includes some contingency time that is proportional to the amount of unknowns heading into the project.

Lastly, it is important to develop a clear understanding of the on-going operating and maintenance costs associated with an ATIS. Start-up costs will be associated with establishing communication infrastructure (if not already available), developing the central system facilities, and a significant amount of development effort on the part of staff. The on-going costs are associated with operating staff time, data fusion activities, stakeholder liaison, marketing, distribution systems operation and development, expansion activities, and maintenance.

### ***7.3 While operating a telephone-based ATIS...***

The primary consideration for jurisdictions considering starting or upgrading a system that provides live traffic information is the cost and management effort related to operating a 24-hour service. Depending on the degree of automation, operating and maintaining an ATIS of this nature can be labour intensive. Smaller jurisdictions without 24-hour traffic management center coverage, and without the ability to automatically collect and disseminate data, may find the provision of time-sensitive live data onerous. These jurisdictions may choose instead to focus on the benefits to be derived from a system populated with primarily static data, or consider the feasibility of outsourcing this work.

The RoadInfo experience in outsourcing ATIS operations was not accomplished without its own challenges. The processes involved with data fusion and data dissemination can be relatively specialized in their nature, and there may be a small number of local agencies with the technical skills necessary to operate and maintain an ATIS system. An open competitive process is necessary to maintain operational quality and responsiveness to the operating authority's needs.

In preparing for such a contract, it is important to carefully compose operational specifications that define the operating authority's needs, while providing the potential contractors with a basis for preparing costs estimates. The specifications should define performance measures and payment schedules, and clearly identify remuneration for start-up activities, meetings, system development, and any other overhead items not directly tied to performance and the normal operation of the system. The term of the contract should be relatively short (e.g. two years) to strike a balance between continuity in the work and providing for adjustments to the terms of the contract to reflect current needs and operational experience.

Obviously, a little advertising can go a long way to letting the public know that an ATIS is available. Studies in Boston and San Francisco [6] have demonstrated that the level of marketing for an ATIS is directly related to its usage. In Boston, users were polled to determine where they first found out about

the SmarTraveler system there, and 45% stated it was traditional broadcast media such as radio or TV ads. The usage stats there showed jumps in use with each new advertising push. In San Francisco, the TravInfo system had an aggressive advertising push in 2000 using billboards, Internet banners, radio, advertising in the regional AAA publication, and in the tour books for the Bay Area. TravInfo experienced a 73% increase in usage over the previous year. In the Spring of 2003, following a one-week advertising push on talk shows, news spots and DMS, similar efforts resulted in a 1000% increase in the number of comments left on the RoadInfo system weekly.

These marketing activities need not be seen as a discrete exercise or involving dedicated funding. Most jurisdictions currently conduct outreach to their constituents through construction notices, utility bills, and councillor's mail-outs. An effective logo (providing product branding) and associated telephone number can be effective in these instances to support and promote the ATIS as a source of transportation information and public feedback.

In operating ATIS, some U.S. jurisdictions have placed a significant amount of credit on 'product branding' for making their systems successful. For example, Washington State DOT puts significant effort into branding by ensuring that the visual and audio queues are consistent across the array of data dissemination tools the State has to offer (511 telephone line, website, printed materials, etc.). They credit their extremely high usage rates on their success in branding their useful products. The ATIS developers find that expansions and improvements to their systems are easier to justify when backed by high usage figures.

ATIS operating authorities also find that they must revisit Memoranda of Understanding from time-to-time to foster the continued support of participating agencies. Several factors may lead to the interruption of participation amongst agencies contributing data to the system. Budget cuts, changing management directions, and particularly personnel changes can all lead to data gaps, or delayed delivery of time-sensitive information.

Agreements with broadcast media must be carefully developed and maintained. The media play an increasingly important role in the distribution of traveller information. However, once data is released to the media, its subsequent use is essentially out of the operating authority's hands. To make sure that the data is presented in a manner that suits the authority, and that appropriate credit (i.e. branding) for the data stream is conveyed to the public, some form of periodic monitoring is suitable.

#### ***7.4 While evaluating a telephone-based ATIS...***

As mentioned earlier, it is difficult to apply traditional "before and after" quantitative analysis for the evaluation of an ATIS. Nevertheless, it is extremely important to build-in performance measures that will speak to the effectiveness of the system in fulfilling its stated goals. Some examples of measures of effectiveness used for the RoadInfo system include:

- Frequency of message access;
- Frequency of comments left on the system;
- Percentage of time the system is accessible by the public (i.e. measure of 'down-time' for system maintenance or faults); and
- Customer satisfaction with the system (measured through monthly surveys).

ATIS systems, like any other infrastructure, have to demonstrate their effectiveness to justify on-going support and additional funds for expansions. Too often agencies do not define these performance measures until after the system is built, and key components that would have assisted in measuring performance may have been omitted.

While some performance indicators can be readily quantified (e.g. number of messages accessed), it is difficult to quantify the overall usage. For example, the frequency of media access to the system may be quantified, but there is no way of measuring the subsequent frequency of public access to the various forms of repackaged media traveller information.

## **8. ROADINFO DEVELOPMENT PATH**

There are three distinct streams of initiatives that are anticipated to improve the overall operation of the RoadInfo system and provide its customers with a more fully-functioning ATIS. These will include improvements to (a) content, (b) coverage, and (c) delivery.

### **8.1 Content**

Currently, the City of Toronto offers traveller information via dynamic message signs in the field, a website (<http://www.toronto.ca/rescu/index.htm>), RoadInfo telephone system, data dissemination to broadcast media (particularly video images) and printed media. To promote the use of all these media, and advertise the use and benefits of the City's traveller information systems, 'convergence' of these services under a single branding profile will be pursued. In this way, the overall ATIS system, its benefits to the community, and the inter-relationship of its various component parts (e.g. RoadInfo, the ATMS, and the website), will be better understood by senior authorities, the political body, and their constituents.

To provide its customers with a better understanding of the 'big picture', RoadInfo will also soon be modified to include live congestion reporting provided through an automated feed from the City of Toronto's RESCU system. This improvement is scheduled for the Summer of 2003.

A future modification of significant benefit to the user will be operational coordination RoadInfo and the information services provided by local transit operators.

Currently, local and regional transit authorities (e.g. the Toronto Transit Commission and GO Transit, respectively) provide a substantial amount of information on their own systems, including automated telephone information systems, websites, and various forms of printed materials. Coordination with these systems will allow RoadInfo users to access these systems directly from within RoadInfo. Agreements with the transit authorities would allow reciprocal connectivity.

Lastly, and potentially the largest item in terms of expanded content is the possibility of using RoadInfo for information unrelated to transportation. This could include public health information, parks and recreation information, etc. While not currently used for these purposes, RoadInfo currently is configured with multiple redundant telephone access lines that can be dedicated to specific purposes (such as the earlier-noted 338-SNOW line). This provides an opportunity to leverage the investment in the associated hardware and software to provide services to other public departments and agencies. By way of illustration, RoadInfo was successfully configured within a matter of hours to act as an emergency information center for the City of Kingston during the Ontario / Quebec ice storm of January 1998. This event demonstrated the flexibility of the system and the speed with which it could be deployed for emergency purposes without disrupting its normal operation.

### **8.2 Coverage**

The City of Toronto's goal is to have RoadInfo provide the best services possible to all commuters within, and coming into Toronto. As of yet, only MTO and the City of Toronto are participating. However, the City hopes to supplement the data streams with more robust regional transportation representation and transit data. If the information from the adjacent Regions of Durham, York, Peel, and Halton, and the

City of Hamilton were included in the system, this would serve a combined population over five million people. Such an expansion to RoadInfo could provide the flexibility for users to select information services by route or by geographic region.

### 8.3 Delivery

As noted earlier, RoadInfo uses the telephone interface as its primary interface (pre-trip and en-route) for information delivery, and its fax service (via the telephone interface) for some additional pre-trip services.

Efforts are currently underway to introduce a more widespread use of voice-concatenated messages, thereby automating the message recording process and relieving the need for the current intensive operator recording process. A further near-term improvements may include the implementation of voice-recognition for the system to allow callers to access the system 'hands-free' while in their vehicle.

Following the convergence process noted above, a number of additional delivery systems are anticipated that would dovetail with the RoadInfo telephone interface to provide the same data over multiple delivery systems. These are illustrated in **Exhibit 6**.

#### Exhibit 6. Potential Future ATIS Delivery Systems for RoadInfo

Pre-Trip Services	En-Route Services
<ul style="list-style-type: none"><li>• Updated website services</li><li>• Television &amp; radio</li><li>• Email messaging</li></ul>	<ul style="list-style-type: none"><li>• WAP Phone (text messaging)</li><li>• PDA</li><li>• Digital Audio Broadcast (DAB)</li><li>• Pager</li><li>• Radio</li></ul>

It is anticipated that direct text-to-speech (TTS) computer voice generation will assist in the convergence exercise, as it will streamline the automation process and allow the same outputs to be delivered via multiple dissemination services.

## 9. CONCLUSIONS

There is a growing expectation on the part of the traveling public and the private sector that public agencies provide travel information. Consequently, it will become increasingly important that operating authorities recognize these growing demands, identify their stakeholders needs, and develop systems and procedures accordingly.

RoadInfo is an ATIS that has been providing planned event information, comment capabilities, and limited live information concerning major road closures and snow clearing activities for the City of Toronto for over 10 years. Its telephone-based user interface provides a delivery system with almost universal access.

Based on the considerable amount of 'lessons learned' in the ITS industry in general, and specifically in the deployment of 511 traveller information systems in the United States, the City of Toronto anticipates a promising development path for its RoadInfo ATIS.

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