

**A MODEL FRAMEWORK FOR FACILITATING COOPERATION
BETWEEN AGENCIES IN THE IMPLEMENTATION OF ATMS**

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SUMMARY

As congestion continues to increase on America's highways, Advanced Traffic Management Systems (ATMSs) are becoming more attractive to cities throughout the country. The benefits of an ATMS include reducing accidents, delay time, emissions, and fuel consumption. An ATMS works in real-time and includes traffic monitoring, surveillance, incident detection, and rapid-response incident management. It also includes the ability to make adjustments to roadway operations to accommodate diverted traffic or traffic congestion and the ability to relay information to those who need it. The goal of the system is to create an interactive traffic control system with information available to all the parties involved, including drivers.

Accomplishing this goal requires interagency cooperation. It is essential that the agencies responsible for operating the roadways and those responsible for law enforcement be included. Since most large urban areas include a large number of local jurisdictions, it is possible that a large number of agencies can be involved in the ATMS.

The key issues of ATMS cooperation can be summarized in the following categories:

- Relationships between participating agencies;
- Relationships between the ATMS and the participating agencies;
- The well being (health) of the ATMS; and
- Public relations/public information.

Problems can occur at the agency head level or at the working level. Differences in geographical jurisdiction, governmental level, and functional jurisdiction can complicate the cooperation issue even more. Overcoming the obstacles to cooperation is essential if the benefits of ATMS are to be fully realized. This can only be done by gaining the support and trust of the agency heads and building confidence and trust at the working level. It is therefore necessary for a framework to be put in place early which will foster the cooperation of all parties involved throughout the designing, testing, and implementing of an ATMS.

The principle objective of this study was to develop a framework for fostering a lasting and effective spirit of cooperation between agencies involved in an ATMS. This framework could then be adapted by an agency contemplating a new ATMS to fit its particular situation. Past and current experience was used in the development of a framework which is able to function at all stages in the development and implementation of an ATMS.

Information for this paper was gathered through a survey of seven agencies operating ATMSs in varying levels of development with differing areas of greatest success. They were asked to answer questions regarding their assessments of major issues affecting the ATMS, their existing framework for cooperation, and their successful and unsuccessful attempts to foster cooperation.

The results were used to develop the model framework for cooperation. The following elements are included in this model framework:

1. Put the cooperative framework in place as soon as possible.
2. Seek out potential team members.
3. Build the system as a team effort.
4. Hold regular meetings as needed.
5. Use review and approval meetings when they can be of help.
6. Maintain interagency communications links.
7. Be careful in setting up the original memorandum of understanding.
8. Provide some kind of updates to team members, especially agency heads.
9. Encourage joint funding efforts.
10. Start with small win/win projects.
11. Include research and development if the opportunity arises.

Finding common goals and working toward them is the best way for agencies to move forward with cooperation. All agencies can agree on the goals of increasing transportation safety and efficiency. When the ATMS deals with the details of what agencies want, one other clear goal should be kept in mind: An ATMS should help every agency do its own job better while providing clear benefits to transportation users.

The reader should be warned that these are general suggestions derived from the experience of existing ATMSs. Each urban area and hence each ATMS is unique and what is best for one may not be the same as what is best for another. The reader must also note that priorities may change with time for an ATMS. Before using the suggestions of this paper, anyone wishing to establish an ATMS should do some further research. This paper can never take the place of visiting ATMS sites, talking to professionals who have had dealings with ATMSs, and studying local laws and customs.

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INTRODUCTION

As congestion continues to increase on America's highways, Advanced Traffic Management Systems (ATMSs) are becoming more attractive to cities throughout the country.

Advanced Traffic Management Systems (ATMSs)

The Traffic Engineering Handbook lists six characteristics of an ATMS:

1. It works in real time.
2. It responds to changes in the traffic flow.
3. It includes areawide surveillance and detection.
4. It integrates management of various functions, including transportation information, demand management, freeway ramp metering, and arterial signal control.
5. It involves collaboration of transportation management agencies and jurisdictions involved.
6. It includes rapid-response incident management strategies.

The goal of the system is to create an interactive traffic control system with information available to all the parties involved, including drivers (1).

The Need for Inter-Agency Cooperation

Inter-agency cooperation is essential to the effectiveness of an ATMS. Agencies which may be involved in an ATMS may differ in three ways: geographic coverage, government level, and function.

Large urban areas in the United States include many different local jurisdictions (cities and counties) and sometimes more than one state. It is not unusual for a commuter to cross several jurisdictional boundaries in the course of his daily commute to and from work. It follows that a decision in one area can have an effect on the traffic conditions in an adjacent area. It is therefore obvious that traffic management must be done on a regional basis, crossing jurisdictional boundaries, to be effective.

Different levels of government should also cooperate. The state, county, and city levels are each responsible for some part of the urban area's transportation system. A truly comprehensive system must include all of them as required to cover the major routes in the transportation system. Regional authorities, such as toll road authorities and transit authorities, also play an important role in the transportation system and should not be ignored. Finally, Federal funding is often the principle source of money, giving the Federal level an involvement as well.

An ATMS requires the integration of various functions and the inclusion of agencies which differ by functional jurisdiction. Highway/traffic agencies are essential participants since they are responsible for building and operating the highway system. The law enforcement agencies responsible for incident investigation and traffic control on the ATMS facilities must be included for the ATMS to be effective in incident management. The demand management aspect

often means that the transit agency becomes involved as well. Other agencies may be involved as well. These vary according to the nature of the government systems of the area and the particular goals of the ATMS.

Problems That Must Be Overcome Regarding Cooperation

The key issues with an ATMS that involve cooperation can be summarized in the following categories:

- Relationships between participating agencies;
- Relationships between the ATMS and the participating agencies;
- The well being (health) of the ATMS; and
- Press relations/public information.

The potential for problems exists at both the agency head level and the working level. These are often rooted in differences in geographical jurisdiction, governmental level, or functional jurisdiction.

Each agency involved with an ATMS has its own individual mandate spelled out in its legal charter. Cooperation allows the ATMS to enjoy the advantages of the diversity of legal responsibilities. This same diversity, however, means that it involves agencies with different, and even conflicting, priorities. This seems to be the most difficult issue for ATMS officials.

Overcoming the obstacles to cooperation is essential if the benefits of ATMS are to be fully realized. This can only be done by gaining the support and trust of agency heads and upper level management and by building confidence and trust at the working level. It is therefore necessary for a framework to be put in place early which will foster the cooperation of all parties involved throughout the designing, testing, and implementing of the ATMS.

Objectives

The principle objective of this study was to develop a framework for fostering a lasting and effective spirit of cooperation between agencies involved in an ATMS. This framework could then be adapted to the particular situation of a new ATMS. Further objectives are as follows:

1. Help agencies starting new ATMSs take advantage of lessons learned from the experience of agencies with current ATMSs.
2. Note the good and bad ideas related to cooperation tried in the past by agencies with ATMSs.
3. Incorporate past and current experience in the development of the framework.
4. Suggest a framework that is able to function at all stages in the development and implementation of an ATMS.

Scope

This paper will be limited to the issues of cooperation between government agencies for Advanced Traffic Management Systems and the strategies for dealing with them.

Method of Study

Information for this paper was gathered primarily by conducting a survey of seven agencies with an ATMS. In the survey, questions were asked about the following subjects:

1. Member agencies.
2. Major issues affecting cooperation.
3. Existing framework to promote cooperation between member agencies.
4. Most successful efforts to promote cooperation.
5. Least successful efforts to promote cooperation.
6. What would be done differently if given the chance to change the framework.
7. Any further advice for officials beginning a new ATMS.

This survey was sent out by facsimile after an initial phone call. The survey form is shown in the appendix of this report. Additional information was gathered by reviewing past literature and by talking to individuals knowledgeable about the subject.

Organization of Report

The body of this report is divided into five major sections. The first describes the agencies which may be involved in an ATMS. The second gives background information about the seven ATMSs used for the survey. The third explores the major issues involved with ATMS cooperation. The fourth section gives the results of the part of the survey regarding major issues and comments on trends observed. The fifth section contains analyses of strategies that have been used by ATMSs in the past. The Summary of Findings section summarizes the findings from the research of this study. Finally, the recommended framework is given in the final section of this report.

AGENCIES INVOLVED AND THEIR ROLES

To be successful, an ATMS should include the agencies responsible for freeway and surface street operations and those responsible for law enforcement on these facilities. Exactly which agencies are involved depends upon the needs, laws, and customs of the urban area in question and the goals of the ATMS. Each agency has its own particular role and priorities to fulfill, and an understanding of these is essential if the cooperative effort of the ATMS is to succeed.

State Department of Transportation (DOT)

The state DOT is the agency charged with providing a transportation system for the efficient movement of persons and goods throughout the state. It is responsible for the design, construction, maintenance, and operation of the state highway system, which includes nearly the entire freeway system. Most urban areas are covered by only one state DOT, and none in this country are divided among more than three. As a statewide agency, the state DOT extends far beyond the urban boundaries, often including other urban areas which have an ATMS in place or proposed. This means that state DOTs are regional in scope, crossing the boundaries of the various local entities within and beyond the urban region. With their regional scope and their control over the freeway system, it is little wonder that they often play a leadership role in an ATMS.

Local Traffic Agencies

Local traffic agencies are city and county departments of transportation or their equivalents. They are charged with the construction, maintenance, and operation of roads and streets within their local jurisdiction which are not part of the state highway system. They have responsibility for the operation of most at-grade arterials in any urban area, and this often includes state highways other than freeways. Unlike the state highway agency, each of these normally covers only a part of the urban area. Their responsibilities are to their individual cities or counties, not to the urban region as a whole. It is possible that one city or county may have goals which are contrary to the interests of the residents of another city or county within the urban area, leading to some degree of local rivalry. The numerous cities within a single area can form a complex patchwork. Houston, Texas, for example, is perforated by eight smaller communities and nearly surrounds four others. The cooperation of cities and counties is needed because the diversion of traffic during incidents may require the use of the surface street system. The participation of the local level of government also allows for a complete system that may include the entire arterial network.

Law Enforcement Agencies

Law enforcement agencies are charged with enforcing the law, protecting the public safety, and keeping order in situations requiring their direction. In regards to highways, law enforcement agencies are further charged with the investigation of incidents and with being in control at an accident scene. These agencies include the state highway patrol, county sheriff's departments, and city police departments. Which agencies are involved with the ATMS varies

from state to state because any of the three may have jurisdiction over the freeways. The primary responsibility of law enforcement agencies in an ATMS is with incident investigation and clearing. The ATMS assists law enforcement by diverting trips away from the incident location and, through its incident detection capabilities, informing law enforcement officers of incidents much faster than would otherwise be possible. The ATMS benefits from law enforcement cooperation since this allows for rapid-response incident confirmation, management, and clearing.

Transit Authority

The transit authority, like the state DOT, is charged with providing for the efficient movement of persons within the urban area. Unlike the state DOT, the transit authority does this by providing buses or rail vehicles for people to ride rather than by providing roadways for drivers of personal vehicles. Often, the transit authority is regional in scope with member cities and counties. Sometimes, however, the transit authority is owned and operated by a single city or county. Having the transit authority as part of the ATMS allows for the inclusion for an important transportation mode in the system. Further, increasing bus ridership or high occupancy vehicle (HOV) use is considered on way of reducing air pollution and congestion, and the transit authority is the agency interested in increasing use of these alternatives to the single occupant vehicle (SOV). For the ATMS, buses can further help the system by serving as vehicle "probes." They can report delay problems and accidents on streets which don't have sophisticated traffic monitoring equipment. The ATMS can benefit transit by informing transit operators and patrons of delays. It can also be used as a marketing tool for HOV lanes by monitoring speeds and travel times on both HOV and mixed use lanes. Information about travel time savings can be passed on using an Advanced Traveler Information (ATIS) system to would be SOV drivers.

Emergency Agency

Emergency agencies are those whose authority pertains to one or more types of emergency. Fire departments, which are responsible for any case involving fire, are an example of this type of agency. Other agencies involved with planning for and managing major emergencies, such as hurricanes or hazardous material spills, also fall into this category. Major emergencies may require diversion of traffic from major routes, and the ATMS can provide a means for accommodating this diversion. Inclusion of emergency agencies allows for a complete team ready for any incident which might occur.

Research Agency

Research agencies conduct research on projects to increase the amount of knowledge and understanding of given subject. For an ATMS, they can develop and test new ideas and evaluate the effectiveness of the system. For the research agency, this work can help support its continuation. Since these are usually universities, association with the ATMS can also provide an opportunity for faculty and students to gain real-world experience to assist in the training of students.

Federal Highway Administration

The Federal Highway Administration plays an indirect role in an ATMS by administering federal funding. In this role, the FHWA reviews projects for which federal funding is proposed. Through its charge to advise states on highway transportation matters, the FHWA may also provide technical support and advice for ATMSs.

RESPONDING AGENCIES

The responding agencies, the year in which they were started, and the stage of the ATMS are listed in Table 1. The heavy line separates the older ATMSs from the newer ATMSs. Note that there is a gap of 19 years in which none of these ATMSs were started. These two groups are used later in this report for analyzing the changes which occur in priorities and performance with time. Discussions of these ATMSs are presented in this section.

Table 1. Year Started and Status of Responding of ATMSs.

ATMS	Year Started	Status
Los Angeles	1971	60%-70% Complete
INFORM	1972	Full Implementation
Minneapolis	1972	Ongoing Implementation
Milwaukee	1991	Under Construction/Partially Operational
TRANSMIT	1991	Under Construction
Houston	1993	Under Construction
New York City	1994	Study Stage

Los Angeles

The Los Angeles ATMS is noteworthy for the relationship between the California Department of Transportation (CalTrans) and the California Highway Patrol (CHP). In fact, these two agencies have a statewide memorandum of understanding establishing a "Transportation Management Center Master Plan" for the state (2). The success of this ATMS in relations at the working level is also well known and highly regarded. All this is in spite of the fact that agencies continue to maintain separate control centers (3).

INFORM

INFORM is an ATMS for the northern Long Island, New York, corridor. It was begun as an operational field test with the following objectives: "to solve existing operational problems, to serve as a demonstration of what can be done, to serve as a National training ground, and to provide a facility on which research and development testing can be performed to advance the state of the art" (4). This test was carried out under the direction of the Federal Highway Administration. Today, INFORM is in full implementation under the direction of the New York State Department of Transportation (5).

Minneapolis

The ATMS for the Minneapolis/St. Paul area is part of Guidestar, a statewide ITS program administered by the Minnesota Department of Transportation. This ATMS is lead by the Traffic Management Center, an agency under the Minnesota DOT's Metro (Minneapolis/St. Paul) Division (6). Over the past 22 years, this system has expanded and come to be regarded as a model for others to follow.

Milwaukee

The Milwaukee Freeway Traffic Management System (FTMS), also known as "MONITOR", is currently under construction (7) with full operation expected to begin next year. The system was begun in January 1991, but it had originally been recommended by a study in 1978. After further studies had recommended it, the project got underway in January 1991 (8). This represents a case where starting the ATMS was delayed until officials were convinced of its need.

TRANSMIT

TRANSMIT (TRANSCOM System for Managing Incidents and Traffic) is a system under construction in the New York metropolitan area. It is an operational field test to be conducted by the Transportation Operations Coordinating Committee (TRANSCOM), a coalition of 15 New York City area agencies in the states of New York, New Jersey, and Connecticut (9). TRANSMIT directly involves six of these agencies and will test the use of electronic toll and traffic management (ETTM) technologies to collect traffic data. This data, which includes travel times and speeds, will be collected along 19 miles of two toll roads: the New York State Thruway (in New York) and the Garden State Parkway (in New Jersey). The data will then be used for traffic management purposes. After the test is complete, it will likely become a project of the two toll road authorities (10).

Houston

The ATMS in Houston is part of the Houston Intelligent Transportation System (HITS). HITS includes planning and implementation for a wide variety of ITS projects in the Houston area. The ATMS is administered by the Greater Houston Traffic Management Center, a consortium of the state, county, and city DOTs and the transit authority (11). Law enforcement and emergency management agencies are also involved with this ATMS (12).

New York City

The New York City Freeways ATMS is a cooperative effort of the New York City DOT and the New York State DOT. It is currently in the study stage. When completed, it will coordinate the operation of the freeways within the city, the Computerized Vehicle and Traffic Control System (VTCS) on the city's arterials, and the freeways beyond the city limits. This system will be linked with TRANSCOM, the regional coordinating agency in the New York Metropolitan Area (13).

MAJOR ISSUES

Eleven issues were identified as being of importance in the development of a cooperative framework for an ATMS. These issues can be grouped into four major categories:

- Relationships between participating agencies;
- Relationships between the ATMS and the participating agencies;
- The well being of the ATMS; and
- Press relations/public information.

All of the issues are interrelated and it would be unwise to assume that a particular issue involves only one of these categories. The eleven issues identified are discussed in the following section.

Relationships Between Participating Agencies

The cooperation between the participating agencies is paramount to the establishment of an effective ATMS. Agency personnel must learn to work together toward the accomplishment of the common goal. They must agree to establish the ATMS in the first place, and then they must continue the effort into implementation. Three of the eleven issues are grouped in this category.

Communications Between Members. Communication seems to be the first part of any cooperative effort. Initially, communication is part of the process by which agencies learn about each other and how to work together effectively. Later, it retains its importance as part of the working relationship.

Coordination Of Agencies. Coordination is the next step once communication has begun. Agencies must agree on standard operating procedures, responsibilities, and all other details of the ATMS which cut across agency lines. The Dallas area, for example, includes numerous cities and towns. The biggest problems facing ATMS development there were the competitiveness of the different cities in the area and the differences in the standards used by each. Once communication had begun, the cities set aside their competitiveness and adopted standards to make a future ATMS possible (14). These standards will make linking the street operations of the cities possible, allowing the development of a coordinated system. It may also prove to be a starting point for further cooperation and coordination for other city functions as well.

Conflicting Priorities of Agencies. Each agency has its own purpose for existing and related legal charge. Sometimes, the differing priorities of these agencies lead to conflicts. There are two major types of conflicts which might arise. The first is between agencies with basically the same function for different jurisdictional areas, such as adjacent cities. While the actions of one may have impacts on another, the agency taking the action may fail to assess any impacts beyond its borders. In the other type of conflict, officials of one agency see the actions of another as invading their agency's delegated authority. Resolving these conflicts is difficult. One ATMS reported that effectively dealing with this issue may require changing the legal charters of the agencies involved (3). It may be possible to avoid this extreme action by clearly defining the role of each agency and keeping the team members informed about all proposed projects so that

they may provide input to any of them. Further, every agency must be convinced of the mutual benefits of a regional system.

Relationships Between ATMSs and the Participating Agencies

These are the issues relating to the support and cooperation provided by team members to the ATMS itself. They are important because agency support must remain strong through all stages of the ATMS's development.

Support of Agency Heads. High level support is required to ensure a member agency's continued commitment to the ATMS project. Gregory Damico (3) of Los Angeles had the following comment about the importance of this issue: "Direction flows from the top. If agency heads are willing to cooperate and be supportive of an ATMS program, then the working staff level can generally do what it takes to get the job done." This issue may be complicated by changing personalities. For public agencies, a new governor or mayor often translates into new agency heads and upper level management. When these changes occur, the new managers should be educated about the ATMS and why it is important. This way, the ATMS may overcome the personality changes by gaining new supporters.

Working Level Relations. "Working level" refers to the people actually in the field--traffic controllers, policemen, and any others who work with the ATMS on a daily basis. These people must be able to work together effectively, especially in cases of incidents or emergencies. The close working relationship of staff members from different agencies in the Los Angeles area is seen as a major success of cooperation attempts there (3). Good working level relations can be forged by having staff work together on a daily basis.

Level of Trust Between Members and the ATMS. The level of trust relates to the willingness of an agency to work with and fully cooperate with the ATMS and other member agencies in the system's implementation and operation. Officials should see the efforts of their respective agencies as helping them to accomplish the purposes which they are obligated to fulfill by their legal charters. The officials must also see the system as one where their interests are represented and addressed for all ATMS projects. In this way, they trust that the efforts that are put into the ATMS are enhancing the overall performance of their agencies and providing a true benefit to the public they serve.

Concerns Over Loss of Agency Authority. In joining the ATMS, an agency gives up some of its exclusive authority to become part of a team with diverse membership. As expected, there is a reluctance for agencies to give some of the responsibility entrusted to them to a consortium of agencies. This issue, which is closely related the trust issue, includes two fears which must be addressed:

1. Will the duty of this agency to its constituents be compromised?
2. Will another agency take control over part of this agency's duties?

To address these fears, the emphasis should be on the coordination of agencies rather than on centralized control.

Well Being of the ATMS

These are the issues that relate directly to the "health" of the system. These may be considered to be internal to the ATMS, but the cooperative framework behind the system must assure that these are provided for.

Leadership. No project may be successful without the vision and efforts of good leaders. Leadership should be a high priority early on to get the project started. Later, it is needed to continue the smoothness of the operation. Leaders should have the vision to prepare for the future challenges of the ATMS.

Funding. Funding is necessary for the capital, construction, operations, and maintenance expenses of the ATMS. Funds are often provided by individual agencies with the state DOT as a major source. The most important source for capital costs and construction is the federal government, but local match is required for projects using federal funds. These funds, however, are not available for maintenance use. Combined efforts for funding are a great opportunity for agencies to build cooperative accord by using their combined resources and influence for a common goal.

Operations and Maintenance. The operational health of the ATMS relies on its effective use and proper maintenance. Each agency must faithfully execute its role and maintain the equipment used for its part in the ATMS. The importance of planning for long-term maintenance of the ATMS system components was stressed by one respondent, who pointed out that "the system will not be very useful if it cannot be maintained" (3).

Press Relations/Public Information

Getting information from the control center to the motoring public is one of the functions of an ATMS. This may include information about a coming construction or maintenance project, an incident which has just occurred, or the level of congestion currently on the freeway. This may be accomplished using an advanced traveler information system (ATIS), another component of ITS.

It is also important to use the press to disseminate information on the system elements and how they work together. Through this, the effectiveness of the system can be increased as the public builds confidence in it and learns to use it. If the public finds the ATMS beneficial, they will pressure officials to continue and even expand the system.

SURVEY RESULTS

Rank by Importance

In the survey, each respondent was asked to rank the eleven issues listed earlier by importance. Table 2 shows the results broken down by newer and older systems. Table 3 illustrates the variability of the data by showing the numbers of agencies ranking each issue within particular ranges. In both tables, the issues are listed in order by the average rank for all ATMSs. These results are by no means meant to discount the importance of any of these issues. One respondent noted that they are all essential to the success of an ATMS (12).

Table 2. Average Rank of Average Rank of Issues by Importance.

ISSUES	Average Rank		
	Older ATMSs	Newer ATMSs	All ATMSs
Working Level Relations	3	1	1
Support of Agency Heads	1	5	2
Leadership	5	2	2
Communications Between Members	4	3	4
Coordination of Agencies	6	4	5
Conflicting Priorities of Agencies	2	9	6
Level of Trust Between Members and the ATMS	7	7	7
Concerns Over Loss of Agency Authority	10	6	8
Funding	9	8	9
Operations and Maintenance	8	11	10
Press Relations / Public Information	11	10	11

Performance Rating

Respondents were asked to rate their performance on a scale from 1 to 5 with 1 being best. Since the respondents had no guide to go by other than 1 is best and 5 is worst, comparing the numbers between different areas was judged to be improper. Instead, the numbers were considered to be relative measures of performance for the particular ATMS. Table 4 shows a

Table 3. Ranking of Issues by Importance (Ranges).

ISSUES	Number of Responses			Avg. Rank
	Rank 1-4	Rank 5-7	Rank 8-11	
Working Level Relations	6	0	1	1
Support of Agency Heads	4	3	0	2
Leadership	4	2	1	2
Communications Between Members	3	3	1	4
Coordination of Agencies	2	5	0	5
Conflicting Priorities of Agencies	2	2	3	6
Level of Trust Between Members and the ATMS	3	2	2	7
Concerns Over Loss of Agency Authority	2	2	3	8
Funding	2	0	5	9
Operations and Maintenance	1	1	5	10
Press Relations / Public Information	1	1	5	11

ranking of performance derived from the average rating of each issue for newer, older, and all ATMSs. Another analysis method used was to show the variability of performance. This method involved determining which issues were relative "strengths" or "weaknesses" for each ATMS. The "strengths" were those issues with the highest performance ratings and the "weaknesses" had the lowest performance ratings. No particular numbers corresponded to each designation, but each ATMS has at least one of each. For most ATMSs, there were issues with median values for performance ratings, and they were considered as being neither "strengths" nor "weaknesses." Table 5 shows the number of responses indicating an issue as being a "strength," a "weakness," or neither. Once again, comparison between agencies cannot be effectively done using this survey.

It must be noted from Table 5 that for each issue there is at least one agency for which it was rated a "strength." This suggests a potential for officials at different ATMSs to learn from each other to improve their performance in each of these areas.

Table 4. Rank of Issues Based on Performance Ratings (Best to Worst)

ISSUES	Average Rank		
	Older ATMSs	Newer ATMSs	All ATMSs
Communications Between Members	2	1	1
Working Level Relations	1	3	2
Support of Agency Heads	6	2	3
Leadership	6	5	4
Level of Trust Between Members and the ATMS	3	7	4
Funding	3	8	6
Operations and Maintenance	10	3	6
Coordination of Agencies	9	5	6
Press Relations / Public Information	3	10	9
Conflicting Priorities of Agencies	6	11	10
Concerns Over Loss of Agency Authority	10	8	10

Discussion

This section is organized by major category with short discussions about each issue.

Relationships Between Participating Agencies

"Communications between members" was ranked as being of middle to high importance. In performance, it was the only issue rated as a "strength" by all the respondents.

"Coordination of agencies" was ranked as being in the middle importance range by most of the ATMSs. In performance, it was ranked higher for the new ATMSs than for the old ones. This appears contradictory to what would be expected, but it may be due to improvements in other areas which increase their rank. It might also be a result of respondents for older ATMSs being more critical of the progress for this area.

"Conflicting priorities of agencies" was ranked as being much more important by older ATMSs than by newer ones. Older ATMSs also reported a higher performance rank for this issue. As the ATMS progresses through phases of implementation, new ideas are proposed to enhance the system. These, coupled with changes in the personalities in charge of agencies, bring

Table 5. "Strengths" and "Weaknesses".

ISSUES	Number of Responses		
	Strength	Weakness	Neither
Communications Between Members	7	0	0
Working Level Relations	5	2	0
Support of Agency Heads	4	1	2
Leadership	2	1	4
Level of Trust Between Members and the ATMS	2	2	3
Funding	3	3	1
Operations and Maintenance	3	2	2
Coordination of Agencies	2	2	3
Press Relations / Public Information	3	3	1
Conflicting Priorities of Agencies	3	4	0
Concerns Over Loss of Agency Authority	1	5	1

out the differences in the agency priorities. An example of such an enhancement is a freeway courtesy patrol. Where implemented, this type of service has proven to be both successful and popular with the general public. In some cases, however, police agency officials feel that this type of service is solely within their jurisdiction and should not be a project of the traffic management center (6, 7). It is evident that officials with older ATMSs have learned to make dealing with agency conflicts a high priority, and the extra efforts appear to have been successful.

Relationship Between the ATMS and the Participating Agencies

"Support of agency heads" was ranked 5th for the newer ATMSs, but it was ranked 1st by the older ATMSs. In performance, this ranked lower for the older ATMSs. There is one major difference defining the older and newer ATMSs: their age. The ages of the newer ATMSs range from 0 to 4 years, while all the older ATMSs have each existed for more than 20 years. What is apparent here is that the older ones have seen changes in the administrations of the participating agencies. This means that the people who originally supported the beginning of the ATMS have been replaced by new people whose support cannot always be guaranteed. The newer ATMSs, on the other hand, have seen very few changes in agency heads. Therefore, many of the agency heads who were originally convinced of the need for their agency's participation remain in charge and supportive.

"Working level relations" was considered the most important issue overall. It was ranked first in importance by newer ATMSs and third by the older ones. Performance was ranked highly as well, with the older ATMSs ranking it first. The improvement in the performance rank for the older ATMSs shows the improvements which come with time as personnel get used to working together.

"Level of trust between members and the ATMS" was ranked both high and low in importance, but averaged out to be the same, seventh, for older and newer ATMSs. In performance, there was a significant increase in rank from newer to older ATMSs. The reason for this was put best by Robert Rosendahl of INFORM, "Trust and cooperation develop over time" (15).

"Concerns over loss of agency authority" was ranked lower in importance by the older ATMSs than by the newer ATMSs. The reason may be that as an ATMS becomes established, each agency more fully understands its role within the system. For this reason, it may be regarded as a lower priority. In performance, it was ranked low for both groups, meaning that there is a need for overall improvement in the handling of this issue.

Well Being of the ATMS

"Leadership" was rated more highly by the newer ATMSs. This illustrates the special need for leadership in the earliest stages of a project. While leadership remains important, other issues come to the forefront once the ATMS is more established. Then, leadership becomes more concerned with the day-to-day operations of the system rather than the initial challenges of setting it up. In performance, leadership rated in the middle range for both newer and older ATMSs.

"Funding" was ranked as having low importance by most respondents. Older ATMSs performed much better on this issue than newer ATMSs. When asked specifically about this issue, most respondents indicated that federal funds were used for the ATMS. The low rank could be due to stable funding sources, the lack of control over funding sources, or the benefits that keep the interest of those providing funding. It is also likely that the respondents consider this the concern of the sponsoring agencies responsible for the funding of a particular project or of the MPO. The improvement in the performance of the older ATMSs suggests that they have found a stable funding source. The older ATMSs can use the proven benefits of the existing system to gain support for continued funding.

"Operations and Maintenance" was ranked higher in importance by the older ATMSs, but that rank was still low. A tremendous difference exists between the performance ratings of the two groups, with older ATMSs rating their performance in this area much lower than newer ATMSs. These findings should come as no surprise. Maintenance becomes more critical with time as equipment begins to wear out or require periodic servicing. The poor ratings of the older ATMSs could reflect the fact that federal funds are not available for maintenance work. The good ratings of the newer ATMSs reflect the fact that the equipment is still new and therefore has required very little maintenance.

Press Relations/Public Information

"Press relations/public information" was rated among the bottom two in importance by both groups. This issue seems to have little to do with how well agencies cooperate, although it is an area of cooperation. In performance, older ATMSs fared much better than their newer counterparts. This shows how the relationship with the press grows with time.

COOPERATION STRATEGIES

Several strategies have been tried by ATMSs to promote cooperation among team members. This section will examine the experience that has been accumulated with cooperative frameworks in the past using the survey data and other sources that have been reviewed. These strategies will be critically evaluated in consideration for possible use in the framework to be developed at the end of this paper.

Memoranda of Understanding

Memoranda of Understanding play a role in all but one of the ATMSs surveyed. These documents list each agency involved and spell out their individual roles. In doing so, the memorandum of understanding setting up the ATMS serves as its legal foundation.

While they have been considered desirable for setting up a formal cooperative effort, one respondent criticized them for being too easily misinterpreted and for becoming obsolete over time. It was suggested that any memorandum of understanding should be only very general in nature (3). In Houston, a memorandum of understanding has been in the works, but the final wording has not yet been determined. As a result, the ATMS there has been operating "on a handshake" during its first year with much success despite the lack of a formal agreement.

In the case of INFORM, the working relationship has developed over the past twenty years to the point that the original memorandum of understanding is hardly noticed. Team members work together not because some legal document forces them to, but because they see the benefits of the system and *want* to (5). In fact, memoranda of understanding were seen as too formal for this group. If a team member suggests a change in the cooperation framework, it will be made if the other members agree without a legal document to implement it (15).

Meetings

The results indicate that holding meetings are necessary and important. Every ATMS agency responding indicated that meetings are a major part of their cooperation framework. Most held regular meetings either weekly or monthly. One held meetings only as needed. Respondents also indicated that meetings were held for groups involved with specific projects or some particular aspect of the ATMS operation.

Holding Regular Meetings

Regular meetings are general meetings held on a set schedule, usually monthly or weekly. Six of the respondents hold regular meetings as part of their cooperative framework. How often to hold these meetings was not a matter of consensus. In the case of Houston, weekly meetings are held (12). Meeting this often may be beneficial since the system is new. Five of the responding agencies with ATMSs hold monthly meetings. In the Los Angeles area, monthly meetings are held for many different groups within the ATMS, and weekly meetings are held for each project.

Holding Meetings As Needed

This is much less formal than holding regular meetings. In this system, meetings are held only as often as it is felt necessary. TRANSMIT was the only one of the respondents to hold meetings in this fashion (10). The advantage of this is that unnecessary meetings are avoided. A disadvantage for many systems is that there are fewer opportunities for officials to get together to know each other better. Since the members of TRANSMIT are also members of TRANSCOM, this issue was less of a concern than it would be for a new ATMS composed of members who have not previously worked together.

Special Meetings

TRANSMIT had great success with face to face meetings to solve particular problems. One of the problems they had was that five different agencies had to review and approve the ATMS plans. To deal with this, review and approval meetings were called. In these, everyone concerned was in the same room, allowing them to finalize the plans and specifications together (10).

In Los Angeles, coordination meetings are held frequently on specific projects throughout its phases of design and operation. This is considered one of their more successful efforts (3).

Another type of special meeting that has been used in Los Angeles with success is quarterly general discussion open forum sessions between Los Angeles County, the city of Los Angeles, the California Department of Transportation, and the media (3). Likewise, open discussion during regular meetings in Milwaukee were considered one of the greatest successes of their cooperation strategy (7). Open discussion allows issues which might otherwise be ignored to be discussed, promoting increased understanding among members.

Communications

Maintaining Well-Established Interagency Communication Links

Six of the seven ATMSs surveyed use this strategy as part of their framework. For TRANSMIT, this has been the key strategy for maintaining cooperation (10).

Providing Team Agencies With Regular Updates of ATMS Activities

Four of the ATMSs surveyed provide formal written updates for member agencies. The Houston ATMS, however, does not provide these for members. The likelihood that information would have to be found in order to fill a newsletter in times when there is little going on was cited as the reason for not doing this (12). Weekly meetings, however, keep everyone there informed, and occasional program updates released for the Houston Intelligent Transportation System provide both team members and the general public with a progress report (11). In the case of INFORM, the consultant for the project sends a monthly progress report to all the member agencies (5). The responses indicate that it is important for the agencies involved to be informed of the activities of the ATMS, whether through meetings or periodic updates. An update of some kind, perhaps an informal memorandum, can be used to keep agency heads

informed of the activities of the ATMS. There appears to be a correlation between the provision of these updates and the support of agency heads. Those agencies which provide them generally rated agency head support higher than those that do not.

Individual Projects

Team Member Workshops

Team member workshops are held by the Los Angeles ATMS for specific projects. These keep all working on the project informed about what the other team members are doing and reinforce the work organization and plan (3).

Funding Partnerships

Funding partnerships are used in Los Angeles to leverage available resources to provide funding for ATMS projects. These give all participants an interest in the outcome of the project. All funds are programmed through the Los Angeles Metropolitan Transportation Authority, the metropolitan planning organization (MPO), to assure coordination of related projects and to stretch funding to achieve the maximum possible benefit (3). In the New York City Freeway ATMS, the state worked with the city to get approval of Federal funding for the construction and operation of the city's computerized arterial signal system (13). Working together to get funding, as in the case of New York, provides a basis for continued cooperation. ATMS projects should be coordinated to assure an orderly system. Since all federal funds must be channeled through the MPO, using this organization as the coordinating agency for funds is logical.

Project Committees

The Milwaukee ATMS has two types of committees for a major freeway construction project. There is a strategic advisory committee (SAC) at the management level, and a technical advisory committee (TAC) at the working level. These committees set up the traffic mitigation plan for the project (7).

Other Elements

Joint Staffing

The Los Angeles ATMS has found joint staffing to be a successful operation. Liaison officers from the California Highway Patrol work alongside other employees at the CalTrans Traffic Management Center (3). On the other hand, for INFORM, New York State coordinates with the police agencies through established communications links while utilizing a very successful method of operations by a consultant team (5).

Special Teams

In Houston, one of the strategies is to form teams using staff from various agencies to work on ATMS projects on a daily basis (12). This builds working relations as staff members learn to work together.

Looking for Small Win/Win Projects

This strategy was reported for the New York City Freeways ATMS. It is to first build small projects which have clear benefits to all parties involved. The objective is that by working together for these projects, a cooperative spirit will be fostered among the participants which will carry over to more ambitious projects (13). Small successful projects are also a tool to win support from officials who are skeptical of the rewards of ATMS and to build public support.

Quality Improvement Effort

In this strategy, used in Minnesota, an outside facilitator is brought in to lead discussions on the subject of improving the quality of the ATMS (6). An ATMS should welcome any improvement in quality. The extent to which the ATMS should pursue this type of program, however, is a matter of judgment given the particular needs and resources of the agencies.

Research and Development Program

Guidestar's research and development program was cited as the most successful cooperation effort involving the Minneapolis ATMS. Through this relationship, the University of Minnesota documents the positive results of the efforts and reports these to other agencies. They also work with other agencies through the system on projects to demonstrate and evaluate proposed upgrades to the ATMS. Studies such as these can be used to document benefits and to gain support (6).

Determination

This refers to a success that the state of New York had in establishing the New York City Freeway ATMS. In essence, the city of New York is unique in that it is responsible for its highways in much the same manner as a separate adjoining state. New York City initially wanted full control of the freeways in the city as well as the surface arterials with state funding to pay for the system. The state, realizing the need for a seamless traffic system, was determined to cooperate with the city so that there would be no need to build a traffic management center that would control the freeways separately from the city. As a result, the city accepted the state's offer for a joint traffic management center which would manage the freeway system and be electronically hooked up with the city VTCS arterial system (13). Thus, part of the reason for the low performance ratings in working level relations, trust, and concerns over loss of agency authority may be based on the need for participants to maintain their authority given for this ATMS on the roadways for which they are responsible (13). If a situation occurs where one essential party does not want to participate, the first strategy should be to find a way to demonstrate the mutual benefits to this agency.

Formalized Concurrent Training Given Concurrently to Multiple Agency Personnel

This idea, tried in Los Angeles, is an example of one that was unsuccessful. They were found to be unproductive because personnel were spending time at sessions that were irrelevant to them. The conclusion drawn was that more individualized training would prove more productive and efficient (3).

SUMMARY OF FINDINGS

An ATMS that is developed with continued, close cooperation will not only improve the effectiveness of the overall system, but will also improve the performance of each agency involved. An ATMS should be looked at as more than just a means of improving freeway operations. It should be seen as improving travel mobility and traffic safety through enhanced agency coordination and cooperation.

In the earliest stages of planning a new ATMS, all agencies with an interest should be brought in. As the team is being formed, there must be effective leadership, communication, and top level agency support. Also, the roles of each team member must be clearly defined. As the process progresses from planning to final design, working level relations become more prominent. During construction, frequent meetings may be necessary to keep members informed about the progress being made. In the implementation and operation of the ATMS, the issues become less and less divisive as institutions get used to working together. Eventually, they may work together as team "buddies," seeing the benefits of their cooperation as something to be desired with no fear of losing their individual authority.

RECOMMENDATIONS

The following model framework is recommended to foster continued cooperation of all agencies involved with a successful ATMS:

1. Put the cooperative framework in place as soon as possible.
This was a common high priority theme in the survey responses.
2. Seek out potential team members.
Every agency that may be involved in the future should get involved right from the start.
3. Build the system as a team effort.
Do not allow one agency to begin building part of the system on its own. Every team member should have the opportunity to provide input for every system component in which it may have any interest.
4. Hold regular meetings as needed.
These would normally be scheduled monthly, but weekly meetings may be held in the early stages if deemed necessary. Meeting on an as needed basis is an option that may be used in later stages, but this should not be done without well-established communication links and other measures to keep all team members informed between meetings.
5. Use review and approval meetings when they can be of help.
These should be held when they will speed decisions which must be agreed to by multiple agencies.
6. Maintain interagency communications links.
This may be as complicated as a dedicated fiber-optic cable to link traffic operations centers or as simple as a telephone. Whatever is used, communications should be provided to allow agencies to consult each other or discuss problems and ideas.
7. Carefully set up an original memorandum of understanding.
A memorandum of understanding should be used as the legal document behind the ATMS, but it should be flexible enough to allow for future changes which might affect the relationships of the ATMS agencies. It should also be written in terms so as not to be misinterpreted or be too restrictive on future agreements. In time, a relationship may develop that will not make much use of memoranda of understanding since the level of trust will be high.
8. Provide some kind of updates to team members, especially agency heads.
Keeping agency heads informed is key to gaining their support. This update does not necessarily need to be anything formal. A periodic memorandum or progress report is generally sufficient.

9. Encourage joint funding efforts.

Joint efforts give agencies more clout when seeking Federal or state funding. They give more agencies a stake in the project and are a real boost to the relationships of the agencies involved.

10. Start with small win/win projects.

Small win/win projects are those where the ATMS and the participants cannot lose. These provide an opportunity for building the confidence among the team members which will be needed for the more ambitious projects later on. Also, projects with clear benefits could be a key to gaining support from former skeptics and increasing public support.

11. Include research and development.

Research and development agencies, such as universities, can document the progress of the ATMS. They can also document the benefits of the ATMS, which will boost the support for the system. They also provide a means of evaluating the effectiveness of the system and recommending innovative improvements.

While each agency exists for its own particular purpose, each agency involved with an ATMS has the following common goals: a) increase the efficiency and effectiveness of the transportation system for moving people and goods and b) improving the safety of the highway system. From this viewpoint, the conflicting priorities of agencies should not be a major problem for ATMSs. As the ATMS deals with the details of what agencies want, one other clear goal should be kept in mind: An ATMS should help every agency do its own job better while providing clear benefits to transportation users.

The reader should be warned that these are general suggestions derived from the experience of existing ATMSs. Each urban area and hence each ATMS is different, and what works for one may not be the same as what works for another. The reader must also note that priorities may change with time for an ATMS. Before using the suggestions of this paper, anyone wishing to establish an ATMS should do further research. This paper can never take the place of visiting ATMS sites, talking to professionals who have had dealings with ATMSs, and looking at the unique local laws and customs of the particular area of interest.

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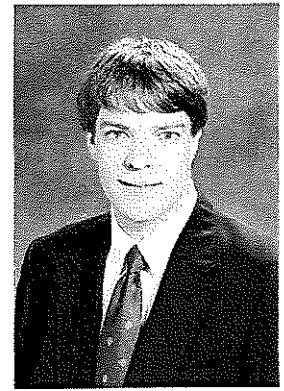
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APPENDIX

SURVEY FORM

ATMS Interagency Cooperation Survey

1. What agencies are involved with your ATMS? Were agencies added to the ATMS as the project progressed?

State: _____

Local: _____

Public Transportation: _____

Police: _____

Other: _____

2. In order of importance, rank the major issues affecting cooperation for your ATMS in the blank on the left (1 equals highest importance). Add any additional issues at the bottom. On the right, rate the performance of your ATMS in regard to each issue with 1 being best and 5 being worst.

Rank	Issue	Performance
___	Communications Between Members	1 2 3 4 5
___	Coordination of Agencies	1 2 3 4 5
___	Support of Agency Heads	1 2 3 4 5
___	Working Level Relations	1 2 3 4 5
___	Level of trust Between Members and the ATMS	1 2 3 4 5
___	Concerns over Loss of Agency Authority	1 2 3 4 5
___	Conflicting Priorities of Agencies	1 2 3 4 5
___	Leadership	1 2 3 4 5
___	Funding	1 2 3 4 5
___	Operations and Maintenance	1 2 3 4 5
___	Press Relations/Public Information	1 2 3 4 5
___	_____	1 2 3 4 5
___	_____	1 2 3 4 5
___	_____	1 2 3 4 5

2A. Please briefly comment on how you have handled these institutional issues. Please include the agency in charge and specific problems overcome.

(a) Funding:

(b) Control:

(c) Press Relations:

(d) Physical Housing of Control Center:

(e) Other Important Issues:

3. What framework exists to promote cooperation between member agencies?

___ Holding monthly meetings.

___ Maintaining well established interagency communications links.

___ Signing memoranda of understanding.

___ Providing team agencies with regular updates of ATMS activities.

Other efforts to foster goodwill between member agencies (list):

Comments:

4. What have you found most successful in your efforts to promote cooperation among agencies involved?

5. What have you have found least successful in your efforts to promote cooperation among agencies involved?

6. What would you do differently if given the chance to change the framework to further promote cooperation?

7. What further advice would you give officials beginning a new ATMS.