



U.S. Department
of Transportation

Research and
Special Programs
Administration

SYSTEMS MANAGEMENT AND OPERATIONS IN THE PLANNING PROCESS

REVIEW OF THE COLUMBUS, OHIO METROPOLITAN AREA

August 2000

David W. Jackson
David Rutyna
Allan J. DeBlasio

Volpe National Transportation Systems Center
Economic Analysis Division

Prepared for

U.S. Department of Transportation
Federal Highway Administration
Office of Metropolitan Planning and Programs

FOREWORD

This paper was prepared by the U.S. Department of Transportation's (U.S. DOT) John A. Volpe National Transportation Systems Center (Volpe Center) for the Federal Highway Administration's (FHWA) Office of Metropolitan Planning and Programs. Mr. David W. Jackson of the Volpe Center's Economic Analysis Division is the principal author. Mr. David Rutyna, EG&G Services, and Mr. Allan J. DeBlasio, the project leader, provided additional support. Mr. Brian Gardner of the Office of Metropolitan Planning and Programs provided the direction for this project. Mr. DeBlasio should be contacted concerning comments on this report at (617) 494-2032.

Systems Management and Operations in the Planning Process

Columbus Metropolitan Area Summary

Introduction

The John A. Volpe National Transportation Systems Center (Volpe Center) is assisting the Federal Highway Administration's (FHWA) Office of Metropolitan Planning and Programs in assessing the level that management and operations (M&O) aspects of projects and programs are currently involved in the metropolitan transportation planning process. While the Intermodal Surface Transportation Efficiency Act of 1991 regulations identified M&O as one of nearly two dozen planning factors, the Transportation Equity Act for the 21st Century (TEA-21) places much more importance on M&O benefits and costs in the formulation of plans and programs. The goal of the legislation is improved regional decision making, resulting in the coordinated delivery of products and services that provide safer, more reliable travel.

The FHWA recognizes that there is no single blueprint for managing and operating complex transportation systems throughout the vast variety of U.S. metropolitan areas. Efforts must be tailored to meet the unique needs of each region. In turn, the region's goals and objectives for operating the system should stem from the consensus of a strong planning process. It is expected that the FHWA will work through the metropolitan planning organizations (MPOs) to lead the delivery of this TEA-21 provision and, once established, to follow its progress.

The Volpe Center team has studied four metropolitan areas – Columbus, Ohio; Des Moines, Iowa; Portland, Oregon; San Diego, California – to ascertain how these areas are considering M&O within their project development and planning processes. All four of these areas were selected because they are notable as having a very strong regional focus; are deploying a significant level of intelligent transportation systems (ITS), transportation demand management (TDM), and transportation systems management projects that are very operations-intensive projects; and their transportation planning process are seen as progressive. This paper summarizes the findings from discussions with transportation professionals from the Columbus Metropolitan Area.

Planning Documents

Although not explicitly referenced in many planning documents, M&O are included in various ways within the work and projects cited in the regional planning documents. Available planning documents were reviewed to assess if any analysis of post-deployment M&O were conducted, how M&O issues were being documented, and if there was any indication how much experience and understanding the MPO staffs had with M&O functions. This section describes the findings from the review of the planning documents.

Planning Work Program (PWP) for Fiscal Year (FY) 1999 - Based on this 1998 Uniform Planning Work Program (UPWP), there appears to be numerous opportunities for the staff of the Mid-Ohio Regional Planning Commission (MORPC), the MPO for the Columbus Metropolitan Area, to provide extensive input into many of the activities from the operating agencies. This opportunity for MPO input seems especially strong for the transit activities. The MPO staff is working with the Central Ohio Transit Authority (COTA) on a Downtown ITS Study and a Strategic Transit Plan. MORPC staff is also looking at operational efficiencies in its freight movement and intermodal studies. The PWP indicated an increasing reliance on management programs. The MPO is heavily involved in the creation of these systems. The PWP noted that the MORPC is also increasing its database development and support. The MORPC database includes physical and operational characteristics of transportation system.

Of special interest, the PWP does list the development of a Cost Allocation Plan. The development of this Plan will entail the MORPC staff to examine indirect costs not readily identified for a particular grant, contract, project, function, or activity, but necessary for operating. With the exception of the Cost Allocation Plan, no planning projects listed in the PWP are targeted specifically to M&O issues. However, an underlying theme throughout the document is that it is important to consider full impacts and costs. This theme was reinforced with the realization that projects need more than capital costs and additional operations funding is not secure.

Transportation Improvement Program (TIP) of the MORPC for FY2000-03 - This 1999 TIP is a traditional document that lists each agency's project priorities, but unlike many TIPs, this TIP provides some detail as to how projects were derived. The agencies that contributed to this TIP recognized in this document that M&O activities need to be supported, but no details were given how to determine or fund M&O. The document firmly states that a new emphasis has been placed on operations and system preservation projects. Included within these type projects are ITS projects. ITS projects are prominently noted in the TIP as part of the TDM category of projects. It was stated in the TIP that the operations and preservation-type projects are typically small and relatively low in cost, thereby reducing their significance to many of the policy-makers. It is important to see the cumulative impact from these many small projects in order to truly understand their positive influence on the transportation network. Unlike the region's transportation plan, the TIP does not detail the link between management-type projects and more M&O.

Both the MORPC and the Ohio Department of Transportation (ODOT) have established their own project selection processes that incorporate fiscal limitations. The ODOT staff and state Transportation Review Advisory Committee (TRAC) primarily review the large-scale projects placed in the Major Expansion / New Project Program category. This is a diverse category that includes all major new projects or upgrades to existing facilities that are traditional highway improvements and those large transportation projects linked to economic development. Two of the project selection criteria under this category are economic development, accounting for 30% of the total weight, and existing conditions. Only the MORPC project selection criteria were listed in the TIP. None of the MORPC criteria were related to M&O commitments:

- 1) Financial / Funding
- 2) Economic Development
- 3) Safety
- 4) Social Impacts
- 5) Environmental Impacts
- 6) Transportation Efficiency
- 7) Accessibility / Connectivity
- 8) System Preservation.

Regional Transportation Plan (RTP) Draft 1999 Update – The *Vision 2020 Transportation Plan*, adopted in May 1998, mentions M&O and preservation costs throughout the document. It is obvious that the operating and planning agencies considered long term and continuous costs when developing this RTP. The RTP details the link between management-type projects and the need for more M&O. It was noted that only aggregate agency M&O costs are provided because it is difficult to separate M&O costs for each individual project. MORPC is, however, heavily involved in data collection to improve project analysis and determine how much is actually being spent on M&O. MORPC management envisions adding M&O information to the central database that the MPO manages for the region. In addition to data management, access management – the ability to control ingress, egress, and traffic flows - and ITS project categories were two areas specified in the RTP where the MPO can aid in the management of the transportation system.

ITS Integration Strategy for Central Ohio (July 1999) – This recently completed document contains the area’s regional ITS architecture. This work builds on the work begun with the 1997 *ITS Strategic Plan for Columbus*. The MORPC used its latest ITS study on ITS Consensus Building for Central Ohio, funded by the ODOT District 6 and the FHWA, as an opportunity to create a regional process to involve as many stakeholders as possible. The consensus-building process included representatives from 25 public agencies, professional organizations, and private companies. In response to TEA-21’s requirement that all ITS projects conform to the National ITS Architecture, MORPC expanded the scope of the consensus building project to include an ITS integration strategy.

There were three purposes for the *ITS Integration Strategy*. First, the document would enable local jurisdictions to plan future projects that integrate with existing and other planned projects being developed by neighboring jurisdictions. Second, the *ITS Integration Strategy* would enhance vital interagency and inter-jurisdictional communications. Third, the *ITS Integration Strategy* would provide a means for local agencies to convey to policy leaders the benefits of ITS and encourage support. In the completed ITS document, deployment has been emphasized, not long-term operations. The document stresses the functional interaction of equipment, components, and systems, not the related M&O issues. However, the document does describe data sharing needs and procedures to integrate ITS efforts, exchange data, and share information, all of which will ultimately benefit M&O functions.

The Transportation Management Committee was established by MORPC to focus on education, information sharing, and provide assistance with the development of the *ITS Integration Strategy*. In an attempt to gather additional information, the Transportation Management Committee was divided into three subcommittees of traffic, transit, and safety stakeholders. The subcommittee meetings often included tours of key local transportation centers, providing points of reference needed to tackle the issues that arose during the development of the regional

architecture. These subcommittees were tasked to inventory current and planned ITS programs within each subject area and mapped out their potential interactions. This work resulted in functional flow diagrams that are the primary components of the regional ITS architecture for the Columbus Metropolitan Area.

Discussion of M&O by Agency

Representatives from the MPO, the state DOT, the regional transit agency, and the principal local government were contacted for this study on M&O. Each agency has varied perspectives on what functions are included within M&O, the proper role of the MPO in M&O analysis and activities, and if the Federal Government should require M&O analysis in the planning process. This section discusses these and other thoughts regarding M&O activities that are specific to each public agency represented in this review.

MPO – Mid-Ohio Regional Planning Commission

The MORPC planning jurisdiction comprises 34 local governments and all or parts of 7 counties. The MORPC transportation planning area covers all of two counties (Franklin, Delaware) and townships within two other counties (Fairfield, Licking). The planning area has a population of 1.5 million. Relative to areas of comparable population, this metropolitan area's transportation system does not involve an extensive number of agencies. A second MPO in the area, the Licking County Area Transportation Study, covers the Newark-Heath urbanized area, east of Columbus.

The MPO representative stated that the MORPC defines "operations" as the ability to effectively staff and run the system. Operations represent the "nuts and bolts" of running the system. The MORPC's greatest foray into M&O activities has been with the intermodal activities in the region, the region's ITS program, and the management systems cited in the planning documents. The MPO became involved in freight and intermodal operations because the ODOT only had limited focus on this issue until recently. While the MPO staff cannot do a lot to directly improve freight operations, the staff has tried to raise relevant issues and educate other key parties involved as to how to improve operational efficiency. The MORPC staff sees the role of educating key operators on how to improve operational efficiency being applied beyond freight operations to the regional transportation network. As the lead advocate for ITS, it is imperative that the MPO staff understands M&O impacts. The MORPC representative maintained that the MPO should not be directly involved in M&O activities. MPO staffers, however, must raise M&O issues within a regional context and link these activities to the regional planning process. The MPO should present M&O activities as activities that affect more than just individual agencies and may impact the region.

The feeling of the MPO staff is that some review of M&O costs should be required during the capital planning process. A planning official said that it should be the responsibility of regional transportation planners to ask more than just "How much does it cost to build?" If the MPO staffs are going to venture beyond the basic questions that are typically used in the capital

development process, then the MPOs must also do more to support the operating agencies after the post-deployment phase of each operations-intensive project.

State DOT –Ohio Department Of Transportation, Office of Urban and Corridor Planning

The ODOT has 12 district offices. The ODOT District 6 manages the state roads in the Columbus area, but this district's region is much larger than the MPO jurisdiction. The ODOT Central Office is likewise located in the Columbus Metropolitan Area. Of all of the ODOT districts and divisions, the work performed by the Office of Urban and Corridor Planning out of the Central Office best ties M&O issues with the metropolitan planning process. The ODOT ITS program was recently moved from the operations division to the planning division. A number of the traffic engineers moved from operations to planning when the ITS program was reassigned, enabling the planning division staff to acquire a greater understanding of operations. In addition, one staff member from each district and one staff member from the Corridor Planning Office are assigned as liaisons to each of the MPOs in the state, further linking the ODOT with the metropolitan planning process.

A representative from the ODOT Central Office remarked that the ODOT has been following the federal definitions of "operations" and "maintenance," specifically used to identify infrastructure needs. ODOT does currently differentiate between infrastructure development and maintenance. Planning, design, and building of highways are all functions included under infrastructure development. Maintenance is the actions involved in keeping the existing infrastructure going. The state agency is just now trying to determine what the "management" aspect would entail. The official noted that management has increased in stature since the deployment of ITS. Management is required when these technical systems are deployed and operating. A transportation official from another agency perceived both the ODOT and state legislators to be wrestling with how to manage ITS in the most efficient manner. The ODOT official would like to see the ODOT stress an on-going commitment to manage the entire transportation system. The interviewee added that ODOT administrators would not have any problems adapting to changing semantics by the U.S. DOT from "operations and maintenance" to "management and operations" because the agency is already performing these new functions. New definitions may actually aid ODOT staff in categorizing management functions.

The ODOT representative saw the MORPC having a primary role in mainstreaming the review of M&O issues in the planning process. This role includes facilitating regional concepts and coordinating the discussions of M&O issues. The ODOT official believed that some requirement for M&O consideration in the transportation planning process is necessary, especially because of the increase in operations-intensive projects, such as ITS. Some analysis will make it easier for policy-makers, engineers, and planners to compare the true costs of traditional capital projects with those projects that are applying advanced technologies.

Transit –Central Ohio Transit Authority

COTA service area covers all of Franklin County, which is a majority of the Columbus Metropolitan Area. COTA provides bus service on almost 60 fixed routes throughout Franklin County. COTA is developing a number of operational enhancements. The transit agency is

currently in the process of replacing its radio system with an 800 MHz system that includes automatic vehicle location (AVL) technology. COTA staff is also developing a real-time bus arrival system and a transit signal priority program with the City of Columbus. Finally, there are extensive plans for a multimodal transportation terminal to be constructed in downtown Columbus.

Since the formation of COTA in 1972, the MORPC has served as COTA's long-range planning agency. COTA also has a Planning Department that performs a variety of short-range research and related responsibilities, including route selection, scheduling, and ITS administration. Planning Department personnel also work with the MORPC on the long-range issues. COTA staff handles the actual operations of the authority. A COTA administrator commented that M&O is not strictly defined, but these are specific functions to be handled internally by COTA departments. COTA Planning staff works very closely with COTA Operations staff. When there are major changes to service, all departments at COTA cooperate to determine what staff and other resources are needed. The Operations Department covers both the fleet and the facilities, and includes maintenance responsibilities. Under the Operations Department, COTA maintains a dispatching and communication facility from which the transit services are managed. Consultants are used for design work for all projects because there is no engineering staff within COTA.

The transit representative said that MPO staffs should be trained to understand M&O issues in order to assist local agencies in planning for long-term operations. The MPOs should use their funding and programming capabilities to ensure that investments would continue to be efficient after the capital-funding phase. While the transit agency representative sees value in a federal requirement to review M&O, the transit official would like any regulations to minimize oversight of the transit operations by the MPO. The transit agency would like the MPO to develop the process for M&O consideration, but the operating agencies themselves should develop and provide the documentation for any M&O review required.

Municipality – Traffic Engineering and Parking Division, City Of Columbus

The City of Columbus has had over four decades of experience in managing and operating its local road network out of the traffic management center (TMC). Today, the TMC operates continuously. TMC operations are located in the Signals Operations section of the Traffic Engineering and Parking Division. The Division's other sections are Road Operations (pavement marking, signage, parking meters), Neighborhoods (traffic calming, pedestrian issues), and Planning (developer interaction and negotiations, right-of-way agreements, access management). The first signalized system in downtown Columbus was installed over a quarter century ago. The Division currently handles the design, operations, and maintenance functions of the traffic signals and control systems in the City and much of the region.

Operational issues are currently not critical, but there are significant issues arising that must be considered. While the Traffic Engineering and Parking Division performs a wide range of work, an administrator does not believe the personnel has reached a "critical mass" overload, which is one criteria for adding staff. This Division is composed of 140 employees, evenly divided between field crews and office personnel and between traffic signal operations and systems

maintenance staff. As more technical systems are deployed, more skilled employees are needed. However, it is difficult to require specialized technical expertise when staff members in the Division are needed for a wide variety of responsibilities. The agency currently has many employees that are approaching retirement. The “graying” of the Division is a problem for the City because they are losing key personnel that have a wealth of knowledge in system operations and maintenance. The Division’s operations personnel work with City planners to set budgets and try to determine what operational needs will need to be overcome.

The City representative sees the MPO having three roles in the M&O of individual projects. The first is to bring parties together to discuss M&O. The second is to assist the agencies in getting M&O funding. The third role for the MPO staff is to gather commitments for the joint funding of M&O for the systems. Through the metropolitan planning process, the MPO staff is very familiar with the activities of the local public agencies. The City interviewee would like the MPO to use this knowledge of the region to recruit agencies to share M&O for advanced technologies or other regional projects. The City of Columbus has long felt that an agency receiving federal funds should develop an M&O plan or some formal commitment. The official added that the agency distributing any M&O funds should evaluate use of the M&O funds. This would not necessarily be a responsibility of the MPO.

General Findings from Metropolitan Area Interviewees

A majority of the respondents from the metropolitan area were in agreement on a number of items related to M&O. Findings that apply broadly to M&O issues are summarized in this section. Much of the key information yielded by the interviews relates specifically to data, committees, federal requirements, and successful actions and are included in subparts to this section. The first part addresses what data are being collected, how they are shared and used, and what additional data planners and operators need to better analyze M&O. The next part highlights area committees, most often led by the MORPC or the ODOT, which have addressed M&O concerns at meetings. Opinions of area transportation professionals regarding the possible creation of a federal requirement to analyze M&O are then discussed. Lastly, there are several successful actions that appear to have worked well to increase M&O consideration in the metropolitan area and could serve as models for other metropolitan areas to follow.

- The Columbus area agencies indicate that they are ready to examine M&O issues.

The review of the Columbus Metropolitan Area has shown that there is a wide range of activities that are leading the region, as a whole, toward a formalized process to consider M&O. A number of operations-intensive cooperative projects are under design or moving toward deployment. These projects have required or will require formal inter-governmental agreements (IGAs) that will include M&O provisions regarding responsibilities and funding. The freeway management system (FMS) is being designed as a joint project by the ODOT and the City of Columbus. The MORPC is completing a feasibility study for the integrated multimodal TMC, known as the Central Ohio Regional TMC or CORTRAN. The City and COTA have issued a request for proposals (RFP) for the downtown transit signal priority and signal upgrades project. COTA has also issued an RFP for a new communications system that will include AVL, global

positioning satellite system (GPS), and automatic passenger counter (APC) technologies. A number of agencies have approached COTA management to request linking with the new communications system for various applications.

All of the planning documents developed by MORPC have referenced the need to examine M&O impacts of the various capital and planning projects being funded. The 1999 *ITS Integration Strategy for Central Ohio* outlined interest in ITS projects, funding available, and potential parties responsible for ITS deployments and system operations. It stopped short of detailing all of the M&O functions and which agencies would be responsible, but the contributing agencies see this as a next step to resolve before some of the ITS projects are deployed and operational. A couple of key transportation professionals in the area said that the planning process should be used to identify all functions to make projects successful.

- The operational costs of transit are better known than for other modes

In order to gain support for long-term operations and commit funds to provide for these operations, it is essential to have an educated forecast of what resources will be needed. The agency representatives all agreed that the M&O costs being provided in the TIP and RTP for transit projects are probably more feasible estimates than those provided for the other modes.

There are a number of reasons why the MPO and area agencies have greater knowledge of transit operation costs than for other modes. COTA conducts feasibility studies, through the use of consultants, on large projects costing \$100,000 or more. These feasibility studies help the COTA administration determine whether or not to make investments. A feasibility study will be conducted for the real-time information system. While it is rare that staff needs are calculated based on specific projects, feasibility studies still examine what resources would be needed to enable the project to perform as planned. In addition, in response to federal grant requirement, COTA staff tracks operations and maintenance costs attributed to the daily running of the transit agency. When all the feasibility studies are examined and additional information from the day-to-day operations are included, the transit agency managers have the ability to accurately estimate their M&O needs on a systemwide (cumulative) basis.

An engineer from the City of Columbus noted that during the late 1980s and early 1990s the City conducted pre- and post-deployment studies for the various federally funded demonstration projects. These studies showed these projects were needed. They also gave the City and funding agencies accurate ideas as to what resources were needed to deploy projects and operate the applications afterward. Since that time, evaluations, no longer required, have become more reactionary. They are only performed when additional focus on a project is necessary.

The ODOT staff is likewise not as familiar with all of the M&O costs that are attributable to the new operations-intensive projects, such as ITS deployments. ODOT managers are concerned with how they will pay for M&O, including how they will keep up with the changing technologies and the technological knowledge needed. There are still too many unknowns with ITS projects. The only practical experience the ODOT managers have with M&O of ITS applications is the FMS in Cincinnati, operating since 1998. It is costing ODOT about \$4 million per year for the M&O for that system. ODOT and other key agencies in the Columbus

area are not sure if this is a realistic figure to apply to the Columbus FMS. They would like the Federal Government to provide actual figures from comparable metropolitan areas.

- COTA's ITS deployments are increasing interaction between operations and planning throughout area

The planned ITS deployments by COTA are acting as a catalyst in getting other public agencies in the area to consider how to improve their own operations through technology. Agencies are waiting for COTA's advanced systems to be deployed so they might link with the transit communication system and share operating functions and expenses. Other agencies hope to piggyback with a real-time bus arrival system, an AVL system, a GPS, a geographic information system (GIS), an upgraded radio communication system, and a transit signal priority program with the City of Columbus. Beginning the summer of 2000, the privately-operated Airport Shuttle will be linked to the real-time arrival system. There is a desire to utilize the AVL system with the Columbus FMS project to record traffic flows on the arterial roads. Many potential opportunities came to light or were expanded during the work on the *ITS Integration Strategy* led by MORPC staff.

A representative from COTA remarked that the Columbus area is unique in the relationship that most agencies have with the MPO and among each other. Unlike many transit agencies that deploy and operate in a vacuum, COTA welcomes input and participation from other agencies into their projects. COTA staff has consistently shared grant proposals and planning issues with other agencies in the region. Staff found that the AVL-communication system upgrade has significantly increased interaction between COTA and both the operations and planning staffs of other agencies. Technical staff with the Franklin County Public Safety and Services Department has already checked the design of COTA's communications system to determine if trunking with their communication system is possible. Plans and agreements are being developed that will integrate the COTA system with Franklin County. This will include the sharing of some M&O functions and expenses with the County.

- Home rule states necessitate more operating agreements with local agencies for ITS facilities. Use of MPOs may reduce the number of agreements.

Ohio is a "home rule" state. Within Ohio, this means that incorporated areas of 5000 or more in population have the responsibility to maintain and operate the portions of the state highways within their jurisdiction, except for the interstate system. The home rule issue is potentially burdensome for the ODOT in its sharing of some operational responsibilities of ITS facilities, such as the TMC. In Cincinnati, ODOT administrators seriously considered the management of the regional TMC by the Ohio-Kentucky-Indiana Regional Council of Governments. An agreement for MPO operation would have required individual agreements and associated legislation with approximately 20 municipalities in which the Cincinnati FMS operated. For continuity and simplicity of coordination, ODOT and the Kentucky Transportation Cabinet chose to have ODOT act as the general manager of the Cincinnati TMC and contract out for the center's day-to-day operations and management.

Based on the experience in Cincinnati, there have been discussions among the agency managers in the Columbus area regarding the M&O responsibilities for the CORTRAN. The current draft agreement calls for the City of Columbus to provide for the FMS operations and the ODOT Central Ohio District Office (District 6) would provide for the FMS maintenance using its existing staff. There is discussion that an agreement through the MORPC, as the lead regional planning agency for the transportation management area, may negate the need for individual IGAs to be developed for each jurisdictions in which the CORTRAN system would operate.

- MPOs must resolve how M&O awareness, education, and analysis fit with traditional planning role

MORPC staff is usually involved in the early part of the project planning process to determine if funds are available. It is during the early stages of a project that M&O issues should be raised. However, the representatives from the MPO and other agencies agreed that the MPO staffers have only limited experience with M&O activities and issues, which reduces their ability to assist local agencies in determining M&O needs. The Columbus officials consistently said that the MPO should gain knowledge so they can assist with these issues, if and when required.

Operating agencies see the MPOs moving away from their traditional planning roles when the MPO staff becomes too involved in the planning for operations and the actual operations. The agencies have agreed that the Columbus ITS program has provided a good opportunity for the area agencies to resolve questions about the appropriate level of involvement for the MPO. The MORPC has defined its primary ITS roles as an advocate for ITS and the facilitator for regional coordination and concepts. The public officials have seen that ITS transcend traditional barriers and contains many institutional issues that the MPO is best equipped to confront and resolve. As part of the expanded regional role, the MORPC staff must understand the M&O impacts, more prevalent with operations-intensive projects. Even with a greater understanding of what M&O issues should be considered, there are still concerns voiced by the planners and operators alike as to how this new information would fit into a traditional capital programming process.

- The MPO is seen as a valuable resource in getting M&O initiated, but having minor involvement with actual operations

Most of the operating agencies were adamant that the MORPC should not get involved in the daily operations of any of these new systems being designed and deployed. The MORPC should play minor roles in these projects. The MPO was seen as a respected third party that could be very valuable when assistance was requested with the process to get M&O initiated. The MPO has been involved as an “honest broker” with the FMS, signal priority, and other operating agreements. The MPO should bring parties together and assist in gathering commitments to fund M&O activities. MPOs can play a critical role to ensure investments will continue to work after the capital funds are depleted. An engineer from the City of Columbus noted that the MPO has not been involved in determining staffing needs by traffic engineering in the City, but could assist if required by regulations. Because of the strong relationship existing between the MPO and the operating agencies, there was little hesitation by the representatives from the operating agencies in their asking the MPO for assistance with formulating M&O needs.

- Although beneficial to know, there are still too many unknowns to confidently determine the useful life and replacement costs of many advanced technologies

Agencies need to look at life-cycle costs to get the true picture of how much each project costs. Capital projects cost more during the initial building years, then drop off significantly. ITS projects have moderate development and construction capital costs during the early years but maintain an on-going operations cost for an extended period. If these true costs were known, more accurate cost comparisons between capital and ITS projects could be made during the budget allocation process. A state official noted that ITS projects should be considered in the same light as capital projects that would add lane miles each year, except that the cost for annual operations would be substituted for the additional road length.

Traditional highway projects listed in the TIP have essentially ignored the importance of M&O, but M&O are part of the ITS project cost. While these costs have not yet been documented by project in the TIP or RTP, the MORPC staff is now looking at system costs to determine if it is worthwhile to deploy some ITS components. These costs include an estimate of when a system will need to be replaced. Area officials noted that the determination of the functional life of systems and ITS products has proven to be a very difficult task. Many ITS technologies have rapidly changed since the initiation of the ITS program in the early 1990s. Area officials agreed that it has been tough to get handle on the actual long-term use of specific products. The functions that are to be performed by these technologies, however, have remained fairly constant.

While the MPO is trying to examine all the information available for the ITS program, life cycle and replacement costs are examined at varying levels by the operating agencies. ODOT has used all the resources it could find to assist with its benefits-cost analysis of the FMS project and other ITS deployments. Among the sources ODOT staff consulted were an Institute of Transportation Engineers (ITE) publication on FMS costs that included estimates for operations and the FHWA's ITS benefits database. The ODOT representative understood the urgency in accurately gauging useful life. ODOT management projects they may have to replace its central computer and software at the Columbus TMC within five years. This replacement cost needs to be taken into account in the planning stage by the project planners at ODOT and at MORPC. COTA staff typically performs life cycle analysis in compliance with Federal Transit Administration grant requirements. The City's Traffic Engineering staff actually did look at some of the long-range costs in the early years of its signal system development as a means to justify the initial investments, but this is not being done now. Some benefit-cost analyses are performed, but true life cycle cost analysis would require looking at a 15-20 year period for the signal systems. Currently, there are no standards for useful life assigned to the in-pavement loops or the signal monitors. The controller monitors are the only items that are even on preventative maintenance schedules. Typically, the City's field technicians notify managers when replacements are needed.

- Agencies in the Columbus Metropolitan Area use intergovernmental agreements and private contracts to ensure that M&O functions will be provided.

Based on their different operating experience, the ODOT uses IGAs and contracts to avoid internal conflicts with M&O issues (e.g., adequate staffing, skills), while the City of Columbus'

use of IGAs have actually increased the workload of its staff. The ultimate goal for all of the agencies involved is that adequate M&O is provided. Rather than concern itself with staffing and greater management issues, ODOT has chosen to use professional services contracts to manage its ITS operations. ODOT administrators learned from their Cincinnati endeavors how much control to maintain over contractors and which FMS services should be farmed out. They are now applying that knowledge to the Columbus FMS initiative. ODOT has negotiated a deal with the City of Columbus for the City to operate the FMS system and ODOT to maintain the system. If operations were internally staffed by ODOT, ODOT may need to create new personnel classifications or expand the classifications already existing.

Although the ODOT would rather not provide operational services themselves, the agency's administrators have recognized the need for on-going support of systems being deployed. In February 1991, ODOT (then the Highway Department) adopted the "Guidelines for Closed Loop Justification." This is a policy that requires M&O plans to be in place before local agencies can receive funding for new signal systems. The City of Columbus likewise requires other municipalities or agencies to agree to formal terms on the handling of M&O functions prior to linking the City's signal and control systems with other agencies. The City's experience is that most municipalities do not want to operate or maintain their own signal system. Columbus steps in with an agreement to do both. The City of Columbus charges \$250 per intersection per year for signal maintenance and an annual system fee of \$1,500 to each community.

There are a number of IGAs in place that stipulate M&O responsibilities and reimbursement procedures. ODOT has lane-mile agreements with the major municipalities to maintain interstate roadways. The Cities of Cleveland and Cincinnati, however, have now discontinued their agreements, requiring ODOT to operate and maintain these interstate segments. Columbus will likely follow suit soon. The City of Columbus has an informal agreement with the ODOT for a five-year funding commitment on the development of their signal systems. The commitment includes funding M&O requirements. The City of Columbus and COTA are also discussing the need for some M&O agreement pertaining to the signal priority project. The MORPC staff's role with a number of these agreements has been as facilitator. They are in a position to tell the agencies where they should give, ensure that the compromises are made, and that each party is comfortable with the agreement.

Data

The interviewees were asked about data collection, coordination of data and information, and how data and information are being used by the transportation agencies in this metropolitan area. Responses to these questions can assist transportation professionals in understanding what data are needed to better analyze the M&O functions and impacts of the transportation networks.

- Significant amount of transportation data is already available from MORPC and other agencies, but limited operations data is available for the region.

The MORPC houses the central database that provides economic and demographic data for the region. The FY1999 UPWP lists an extensive amount of items devoted to updating and refining

this database with additional traffic counts, modal split counts, land use data, area development data, socioeconomic data, and improved GIS applications. Unfortunately, there are not significant amounts of information in the database that can be applied to M&O analysis.

COTA generates the greatest amount of operations data of any of the operating agencies. COTA gets much of its operations data from its APCs and fareboxes. A COTA official said that the COTA planners have enough labor and fleet cost data to determine costs for COTA service changes. Information from the road detectors enables the Columbus TMC staff to interpret traffic flows. City of Columbus managers also use the public complaint system reports, work orders, and maintenance reports as indicators of system performance. A number of years ago, when there were a large number of demonstration projects occurring, the City conducted post-evaluations to ensure that the intersections and corridors were operating better. Today, these are still done, but on a more informal process. Six months after the various signal projects are completed, the levels of maintenance and complaints are used as operational indicators.

- The agencies from the Columbus Metropolitan Area understand the potential benefits from the sharing of operations data.
 - Linking safety enforcement with traffic engineering
 - COTA sharing data with MORPC
 - City traffic counts shared with the MPO database
 - ITS Integration Strategy

MORPC, ODOT, COTA, and City of Columbus officials all espoused the value of sharing data to improve the operations of their agencies and the metropolitan area transportation network. The MPO has already made major efforts to get the safety enforcement personnel together with traffic engineers so they may understand each other's operation needs and share data valuable to both disciplines. COTA, which generates a great deal of data, does share ridership counts and other operations data with the MORPC. These data are incorporated into the central database. COTA likewise coordinates with municipalities and other agencies on small items, such as changing bus stop locations. The plans for COTA's new ITS components are generating additional discussion regarding what information will be collected and how to best apply this information. Traffic counts are also passed directly from the Columbus TMC to MORPC's central database. The traffic counts are used by MORPC for traffic and impact modeling.

One significant part of the *ITS Integration Strategy* for Central Ohio is the discussion and graphic presentation of potential and necessary opportunities for sharing data and information. There were great varieties of data, information, or function interaction cited in the *ITS Integration Strategy*:

- aggregate travel data
- broadcast information
- current network conditions
- driver and vehicle information
- driver instructions
- fleet to driver update
- freeway control data and status
- emergency acknowledgement
- emergency dispatch requests
- emergency notification
- emergency traffic signal control request
- emergency vehicle tracking data
- event plans
- incident command information

- incident data
 - incident information
 - incident notification
 - incident reporting
 - incident status
 - information exchange
 - intermodal information
 - local traffic control priority
 - local signal preemption
 - maintenance resource request and response
 - operational data from various sources
 - parking lot transit data
 - parking lot availability status
 - passenger and use data
 - planning data
 - remote traffic control priority
 - request for right-of-way
 - request surveillance
 - road/weather information
 - roadway information system data
 - safety management data
 - secure area monitoring support
 - secure area surveillance data
 - sensor and surveillance control data
 - signal control data
 - signal control status
 - suggested route
 - system-wide signal control data
 - traffic control data
 - traffic control priority status
 - traffic images
 - traffic information
 - traffic information for transit
 - traffic network status
 - traffic system data
 - transaction status
 - transit dispatch requests
 - transit emergency coordination
 - transit fare payment request and response
 - transit and fare schedules
 - transit incident information and updates
 - transit information
 - transit information for traffic
 - transit information request
 - transit parking inquiries
 - transit parking and schedules information
 - transit status
 - transit system data
 - transit traveler information
 - transit vehicle conditions
 - transit vehicle location data
 - transit vehicle passenger and user data
 - transit vehicle schedule performance data
 - transit work schedule and response
 - traveler requests
 - video and audio feeds.
- Planners still have data needs to assist them in M&O examinations.
 - Comparable ITS costs from other metropolitan areas
 - More data on delays, stops, and through-puts needed

The interviewees noted that there were already vast levels of transportation-related data being generated. Although this is true, the general feeling among the agency representatives was that the current data would probably not dovetail with the information necessary to satisfy many proposed federal regulations, such as traffic monitoring to validate operational efficiency. While some items such as traffic counts are automatically sent from the Columbus TMC to the MORPC central databank for traffic and impact modeling, most data being generated are not fed from the source agency into the regional planning process. An MPO official remarked that it is just dawning on the MPO staff that they must pursue an expanded role within the planning function of compiling the M&O-related data so the area officials can make educated assessments of the true cost of projects and plan how to accommodate these costs. The planners have assorted needs that must be fulfilled in order to meet this responsibility to the region.

Planners need to know what are acceptable numbers from ITS deployments and operations. Interviewees said that the planners in the Columbus Metropolitan Area do not have the long-term experience to identify M&O costs. They need more accurate numbers from areas that have a historical context. Information on the deployments and operations costs of operations-intensive projects, including anecdotal, from other metropolitan areas is needed. This comparable information should include the response to questions now being discussed by the Columbus agencies, such as how much operations data are necessary to be archived. This additional information would also be useful in the development of contracts and the analysis of private sector proposals.

More and different locally-collected data would also prove useful. Delays, stops, and throughput figures are not collected in adequate numbers to determine the direct and indirect benefits that operational improvements within an agency or among agencies provide to the public. No data regarding operating or maintenance staffing levels are passed on to the MPO. There has not been an examination of what staffing is needed after the warranties for individual system components expire. Finally, the use of traffic controllers to count traffic could be especially beneficial to planners. First, counts from controllers would allow real-time or on-demand automated counts, rather than bi-annual manual counts. Second, additional traffic patterns could be studied. And third, an expanded vehicle classification system could be used. In Cincinnati, the ODOT is now conducting automated counts using 21 classifications. The officials in the region need to determine if this use of controllers is feasible in the Columbus area.

Committees

Committees created through the MPO process and as part of the regional ITS program have provided forums for M&O related issues to be addressed, although no committees exist specifically to examine M&O issues or impacts. M&O issues do come up occasionally on a project-by-project basis. A local engineer remarked that the committee that discusses M&O issues to the greatest depth is the Ohio Section of the ITE. There is a great deal of emphasis on M&O with ITE. It has been brought up during ITE-sponsored T² (Technology Transfer) training, especially concerning liability issues. This section will examine other committees that have been responsible for increasing M&O discussions in the Columbus Metropolitan Area.

- M&O discussions are not a formal part of any MORPC Committee

The MORPC is a voluntary association of 39 member governments. An independent commission composed of appointed officials from member communities and counties govern the MORPC. Over half of these appointees are elected officials and the others are jurisdiction or agency administrators. The MORPC's Policy Committee acts as the legal authority for MPO matters. The Policy Committee consists of the entire transportation planning portion of the Commission, plus representatives of the ODOT, COTA, Ohio Environmental Protection Agency, and Delaware, Fairfield, and Licking Counties. The Policy Committee usually defers most of the M&O issues to the Transportation Advisory Committee (TAC). Technical employees of the state, local, and regional member agencies, as well as representatives from the Columbus

business community and private transportation providers staff the TAC. In 1998, the MORPC leadership created the Administrative Committee to address organizational issues to support the MORPC's current and future work, including some operational needs.

- In Columbus, temporary committees, work groups, and task forces have examined more M&O issues in depth than any established and continuous committee.
 - Downtown Mobility Work Group
 - Transportation Management Committee

The MORPC and COTA established the Downtown Mobility Work Group to envision and guide development of a long-term transportation system for downtown Columbus. This group is made up of representatives from business stakeholders, cultural and consumer groups, engineering consultants, and key public agencies. The group was brought together to study circulation issues, discuss appropriate data, and make recommendations on a preferred downtown mobility plan that would be made part of the *Vision 2020 RTP*. A few issues specifically related to transit operations arose during the work group's endeavors.

The Transportation Management Committee's focus was primarily on education and information sharing. Because of its inclusiveness, this Committee was, in effect, the ITS committee for the central Ohio. The ultimate goal of the Committee was to develop the CORTRAN. The MORPC staff saw the CORTRAN as bringing together three distinct functions – safety, transit, traffic – and their distinct communications and database systems. These three areas became subcommittees at which appropriate Committee members could discuss system development issues with peers and plan specific points of interaction with the other two functions. A representative from the Franklin County Traffic Engineers Office served as the team leader for the traffic subcommittee, an official from the Franklin County Emergency Management Agency was team leader for the safety subcommittee, and a COTA manager served as team leader for the transit subcommittee. The subcommittees were initially filled on an *ad hoc* basis, based on the interests of the representatives from each agency and organization (Table 1 provides a list of participants).

The entire group would meet monthly to discuss subcommittee progress and seek consensus on next steps. Each Committee meeting consisted of a key speaker, subcommittee reports, and a lessons learned session. The key speaker topics included the ARTIMIS freeway management program in Cincinnati, the AAA Ohio's Commuter Assistance Program, and ITS and Commercial Vehicle Operations activities in Ohio. While not regularly discussed, M&O issues were brought up by a number of the Committee participants.

- Transportation Review Advisory Committee

The Ohio General Assembly created the TRAC in 1997 to bring an open, fair, quantitative system to choosing major new transportation projects throughout the State of Ohio. The TRAC is composed of the ODOT Director and eight appointees chosen for experience in transportation, business, or economic development. Historically, the TRAC has had approximately \$300 million a year to fund the design, right-of-way purchase, or construction of large transportation projects (\$5 million or more) primarily on state and federal highways. These projects must

reduce congestion, provide some economic development, increase mobility, or provide connectivity between transportation modes or major facilities.

Table 1. Regional ITS Integration Strategy Subcommittee Participants

| Traffic | Safety | Transit |
|---|---|---|
| City of Columbus | City of Columbus | City of Columbus |
| City of Gahanna | Clinton Township Police Dept. | City of Dublin |
| City of Hilliard | Columbus Division of Fire | City of Gahanna |
| City of Westerville | Columbus Division of Police | COTA |
| Columbus Division of Police | FHWA | Columbus Airport Authority |
| Central Ohio Transit Authority (COTA) | Franklin County Fire Chief's Association | Federal Highway Administration |
| Columbus Airport Authority | Franklin County Police Chief's Association | Mid-Ohio Regional Planning Commission (MORPC) |
| Federal Highway Administration | Grandview Heights Fire Dept. | |
| Franklin County Emergency Management Agency | Mid-Ohio Regional Planning Commission (MORPC) | |
| Franklin County Engineers Office | AAA Ohio Auto Club | |
| Greater Columbus Chamber of Commerce | Public Utilities Commission of Ohio (PUCO) | |
| Greater Columbus Inland Port | | |
| Mid-Ohio Regional Planning Commission (MORPC) | | |
| Ohio Department of Transportation (ODOT) | | |
| The Ohio State University | | |
| Paving the Way | | |
| Private Sector / Consultants | | |
| Public Utilities Commission of Ohio (PUCO) | | |

In the past, the TRAC has asked the MORPC and other MPOs to independently rank projects for their region. TRAC members have usually agreed with the MPO selection. The TRAC project review is a very similar process to the TIP project selection process. Both ODOT and MORPC representatives believed that the TRAC members should be educated on benefits from projects that are heavily operations-oriented. During the last round of project reviews in 1999, the TRAC deferred decisions on the CORTRAN and related projects because they did not understand these projects and how they compared with traditional improvements.

Federal Requirements

The transportation professionals interviewed from this metropolitan area were asked their opinions regarding the value of federal requirements to make M&O consideration part of the metropolitan planning process. As part of this inquiry, these interviewees discussed the type of review, if any, that should be required. The agency representatives also commented on any

M&O issues that may result from related provisional changes, such as the impacts from the National ITS Architecture, standards development, and other major planning and environmental changes.

- There was consensus that there should be some requirement that M&O issues should be considered as part of the transportation planning process.

All of the interviewees from the Columbus Metropolitan Area saw a federal requirement to consider M&O impacts as having greater positive merits than onerous impositions. An MPO planner noted that a requirement to review M&O impacts would ground planning into the reality of project costs and cause planners to ask “what if” scenarios with different levels of operations. An ODOT engineer said that there were already federal requirements for CMAQ-funded projects to have operating agreements in place that ensure these improvements will continue. At the very least, M&O reviews should be required for projects that are dependent on operations for their success, such as ITS or TDM projects. A COTA representative commented that most agencies do not care for additional restrictions, but the M&O issues have not been addressed to the level currently needed. An engineer from the City of Columbus would like the U.S. DOT to require M&O commitments for a 20-year period after the completion of the project.

- May be easier to secure long-term M&O funds if analysis is mainstreamed into the planning process

A couple of the respondents saw the opportunity to obtain funds for M&O if there is a requirement that M&O be reviewed as part of the planning process. Previously, planners have asked how much does it cost to build. However, once the facilities were built, the operating agency was stuck trying to fund operations without much thought during the capital development process. An interviewee saw the inclusion as a way to open the eyes of the policy-makers and gain support for M&O. The individual also felt that the FHWA could provide additional seed money, beyond the traditional capital funds, to enable agencies and jurisdictions to initiate M&O of new and existing systems. This additional funding should continue until the operating agencies better understand the full M&O costs and how to fund long term using more traditional operating funds.

- May be difficult for MPOs to require M&O documentation when they do not control operating funds

One concern voiced by all of the representatives of the operating agencies was who would review any M&O commitments or other documentation required by a federal requirement. In Ohio, most of the funds used for operating the transportation system currently come from the ODOT. The Ohio MPOs funnel most of the federal capital dollars to the operating agencies within the metropolitan areas. Some of the engineers, however, advanced that the operating funds also should be mainstreamed into the traditional planning process. If mainstreamed, the MPO would have more responsibility in the review of transportation projects and their M&O documentation.

- Documentation in TIP, where projects are specifically mentioned, may be better than in RTP

The respondents were in agreement that the TIP was the most logical document in which to record the consideration of M&O issues. The TIP (and at the state level, the STIP) is the point where the financial commitments occur for each project. The connection between capital funds and operating funds of a project should be noted in the TIP. The RTP is too broad to specify M&O costs for individual projects. In the RTP, agencies can show financial commitments through policy or supporting statements. One area official suggested that if the M&O documentation is required as part of the RTP, the FHWA could require an evaluation of how federal funds for M&O were used. This documentation could be updated every five years. A second representative from the Columbus area said that any operations-type project in the RTP should be accompanied by an M&O plan of 10-20 years in length.

- National ITS Architecture forced the cooperative and inclusive development of the regional architecture.

The *ITS Integration Strategy* was developed as a direct result of the federal requirement for conformity to the National ITS Architecture. The agencies in the Columbus Metropolitan Area saw the eventual product as more than just a regional ITS architecture. The work involved to conform to the national requirement forced a cooperative and inclusive process to be developed by the MORPC. The transportation professionals in the area believe they have attained real benefits from the functional discussions and the momentum generated by this work. Beyond the cooperative atmosphere that has been nurtured, the respondents said that the process has given their agencies a better feel of what resources will be needed by each agency in the future, including the resources to provide M&O.

- Standards could reduce M&O costs

Standards were seen as the next integral part of implementing the components of the *ITS Integration Strategy*. One area official said that the Integration Plan was the first try at applying the National ITS Architecture, but locally, the architecture can only really be enforced through the application of standards. Systems are being deployed, but standards are needed to be included in the RFPs. It is difficult to have a truly “open” architecture if standards are not developed. Two of the interviewees from operating agencies opined that standards might not be specific enough to aid in calculating M&O costs. On the other hand, standards could reduce M&O costs by easing the process to obtain spare parts or replace equipment, providing some relief during the procurement stage. Standards might allow an easier determination of equipment costs. In general, interoperability, ease of replacement, and other “plug & play” capabilities will be a benefit to M&O functions. One engineering official conjectured that standards would not require additional involvement from the planning end. Planners do not need all the details that standards provide to perform any analysis on M&O activities.

- Environmental justice is already being considered within the planning process

The MORPC has tried to apply the objectives of environmental justice for years without calling it “environmental justice.” In response to the environmental justice regulations, MORPC created an Environmental Justice Task Force to assess adverse impacts on target populations and ensure compliance of MORPC’s transportation planning process, RTP, and TIP. The Task Force work has culminated in the Environmental Justice Report, issued in April 2000. Typical of most areas, the political process has stressed high profile projects for bridge and road repair, even on voter ballots. With the Task Force, MORPC has tried to formalize the selection of system improvements and capital projects through the development of a structured process that spread out funds and projects. None of the respondents believed that the environmental justice provisions would have any significant impact on M&O or the analysis of M&O impacts. An ODOT official hypothesized a scenario whereby a formalized process might cause a shift to more ITS projects versus adding lanes or new facilities as ways to reduce impacts to communities. M&O is included within ITS projects, so a greater emphasis on M&O may be created.

Successful Actions

This section examines what positive actions have occurred by public agencies within the metropolitan area to increase or introduce the examination of M&O issues. These successful actions by a single agency or the region as a whole demonstrate steps that accelerate movement toward the consideration of M&O issues.

1. M&O and long-term costs are mentioned extensively in the planning documents.

The fact that M&O and long-term costs are discussed in a variety of planning documents demonstrates a movement toward mainstreaming M&O in the planning process. While the discussion of M&O is not limited to specific sections of these documents, the MORPC has devoted an entire section in the *Vision 2020 RTP* to operations and maintenance issues. Funding needs and projections of M&O are provided for the next 20-year period in the RTP for both roads and transit, including funding shortfalls. The TIP provides more details for the operating costs related to transit than for the operating costs related to the other capital projects. All figures provided are aggregate M&O costs, but the RTP does note that the “ODOT balances the needs of maintenance, pavements, bridges, major/new capacity projects, and operating costs when establishing its annual budget.” Among related items, the planning documents all cite the importance of sharing data to improve operational efficiency. In the final section of the RTP, titled “Ongoing and Future Issues”, the MORPC has included a role for planners that involve highlighting the total costs for projects:

We are finding that our “needs” increasingly outstrip available resources. Planners can help in this regard by helping the general public and decision-makers understand transportation expenditures and revenues. Planners can help in setting priorities for limited, traditional funding resources among highway expansion, maintenance, operations, and other modes.

2. Freight and intermodal movement planning educated MPO on public and private freight operations.

The MORPC's involvement with freight planning has been very beneficial for the MPO staff's introduction to and understanding of operational issues. Because of its proximity to half the population of the United States within a days travel, central Ohio has become a strategic commercial distribution center. Surprisingly, the Greater Columbus Inland Port handles the third highest volume of clothing-related freight in the country. The MPO managers saw a void in the integration of this strategic industry within the regional planning process and efforts to reduce impacts to the region's transportation network. In the mid-1990s, the MPO picked up void because ODOT did not have a focus on freight.

The MORPC initiated its involvement with the freight industry by working with the U.S. Customs Services to jointly study air cargo and intermodal issues, including the reduction of transfer points. The first study examined access and traffic movement in and around the freight and intermodal yards (seaport, airport, rail). The study looked at a variety of methods to monitor and improve vehicle movement, such as tagging tarmac tugs, resolving drainage issues, and revising Customs Service procedures. The 1997 report raised issues about operational situations and led to further discussion of ITS-commercial vehicle operations fleet management. In 1998, MORPC performed an in-house study that looked at operation issues related to freight. An MPO official realized that the MORPC cannot do a lot to impact freight operations, but through the studies and ongoing involvement staff has tried to raise related regional issues and educate other key parties on how to improve operational efficiency. This has included the incorporation of many of the study findings and introduction of next steps into the metropolitan transportation planning process.

3. Touring local transportation centers provides opportunities to see operations beyond their own organization and to identify integration opportunities.

Touring local centers provided architecture study participants the opportunity to look outside their own professional environment and begin to see the opportunities for integration between organizations. Seven local facilities were toured during the development of the *ITS Integration Strategy*:

- COTA dispatching and communication facility
- City of Columbus Division of Fire dispatching facility
- City of Columbus Division of Police dispatching facility
- City of Columbus Traffic Management Center
- City of Gahanna Traffic Management Center
- Franklin County Emergency Management Agency (EMA) Emergency Operations Center
- Ohio EMA Emergency Operations Center

Officials from centers outside the metropolitan area were also consulted and a few were visited by some of the key transportation professionals from the Columbus Metropolitan Area. These sites included the management centers in Houston, Seattle, and Phoenix. One of the interviewees gave credit to the visit to the Houston center as the site that was vital in initiating the discussion of M&O in the metropolitan area.

The MORPC also used scanning tours of other ports to help raise issues and respond to and generate questions concerning the freight operations in the Columbus Metropolitan Area. The MPO representative felt that scanning tours are typically underutilized and have produced big benefits for the public and private representatives that have attended them. The municipal representative said that the tours must be used as a public relations tool to increase M&O funding. The politicians and other decision-makers must not be depended on to visualize all of the needs. They must be shown the sites in the field where projects are needed and then must be shown what is involved to manage a facility properly. Visits to existing centers are valuable for the decision-makers and managers so they can see that more than capital support is necessary.

4. M&O costs are major determinants in the CORTRAN feasibility study

The MORPC is one of the country's first MPOs to lead an effort like the development of the regional ITS program and TMC. MORPC plays a unique role in the project by building consensus among area transportation stakeholders on the importance of transportation technology. As part of this lead role, MORPC is facilitating a feasibility study, begun in late 1999, to determine location and design of the Regional Intermodal TMC. The CORTRAN study is being funded by ODOT. The study report will include preliminary design, determination of which of the six locations to site the TMC, the size of the building, what agencies would occupy the center, what functions would occur at the building. The report will also hit on some agency operation issues. The ODOT and MORPC representatives stated that the M&O costs are major concerns that will determine whether the project is on or not, and at what level. The examination of M&O costs is included as a task for the CORTRAN study consultant. The ODOT operations managers bear the greatest responsibility in disclosing what they consider all the costs of CORTRAN are to be. Likewise, many of the area's agencies need new facilities and are looking to co-locate within and share costs of the CORTRAN TMC. They too wish to know the total costs involved and MORPC will work with all parties to determine where operational integration could occur.

5. ODOT's 1991 Guidelines for Closed Loop Justification policy required M&O commitment before new signals systems would be funded.

Since the mid-1980s, ODOT management has been grappling with how to reduce operating costs and increase the productivity of the transportation system. In February 1991, ODOT (Highway Department at that time) adopted the "Guidelines for Closed Loop Justification" that required operations and maintenance plans to be in place before local agencies would receive funding for new signal systems. This five-page application standard was updated in January 2000 and still requires some level of assurance that the systems will remain operational:

I. Purpose This standard establishes uniform procedures with respect to the planning, design and administration of traffic signal system projects with computer control or traffic responsive features that will involve the use of State or Federal monies. It is intended to: assure that potential systems are properly planned for, in terms of manpower, training, budget and maintenance commitments...

IV. Procedures For traffic signal systems that will be controlled by PC, a report will be provided to the Department that should include the following information.

2. Maintenance Capabilities a. Discussion of maintenance methods, for example, in-house or contract... b. Description of the traffic engineering staff's experience... c. A letter from the maintaining agency stating that it is committed to operating and maintaining the proposed system and understands the commitments and costs.

3. Costs b. An estimate of increased maintenance and personnel costs and how the maintaining agency will accommodate it.

6. City of Columbus Transportation Department requires agencies linking to their signal and control system to provide M&O plans or jurisdictions must formally agree to let Columbus handle these functions.

Just as the ODOT requires M&O commitments, the City of Columbus Traffic Engineering and Parking Division also requires some form of assurance that M&O will be provided by agencies connecting to the City of Columbus' signal control system. The City requires agencies linking to their signal and control system to provide M&O plans or those jurisdictions must formally agree to let Columbus handle these functions. The City of Columbus has an agreement with ODOT that provides a five-year funding commitment for their joint signal system that would be operated by the City. A City traffic engineer said that the City and ODOT staff found that it was easier for the ODOT to comply with M&O requirements spread over a five-year period than the two-year period originally discussed. The City's boilerplate traffic signal interconnect / communications contract contains a variety of provisions that cover operations and maintenance:

The City of "x" agrees to provide signal system control equipment necessary to operate the signals and provide spare control equipment and parts to the CITY (of Columbus) to assist in maintenance of system interconnect/communications equipment (coax cable, cable passive devices, amplifiers, power supplies and communication units).

The City of "x" agrees to pay an annual system fee (lump sum for any number of signals) of \$1,500.00 (fee pro-rated on a monthly basis) for central on-line system monitoring, maintenance dispatch, and keeping of system and intersection operation and maintenance records for interconnect/communications items only.

The City of "x" agrees to pay an annual interconnect/communications maintenance fee of \$250.00 per intersection (fee pro-rated on a monthly basis). This fee will cover routine interconnect/communications maintenance response calls.

U.S. DOT Actions

While much of the discussion with the transportation professionals centered on what they have done and what they may do, the interviewees were also asked what actions officials with the U.S. Department of Transportation could take to assist metropolitan areas with their consideration of M&O. The actions could range from meeting training needs, to providing funding, to providing legislation that is both practical and easy to understand. This section reviews those actions requested by the representatives of the transportation agencies from this metropolitan area.

1. Avoid promoting ITS unless long-term M&O funding issues are addressed

A couple of respondents from the area were concerned that the U.S. DOT has created policies that support the development of ITS programs throughout the country but does not detail the critical need for metropolitan areas to examine how to keep these system running as effectively and efficiently as envisioned. Policies calling for the examination of long-term costs as key components to the success of ITS deployments must be raised to the same level as the publicity supporting these deployments. Any policy developed should make it clear to the reader that the Federal Government is examining M&O impacts from ITS projects and the consideration of M&O should likewise be a priority for local areas.

2. Guidelines on how to implement M&O need to be developed alongside any requirements.

The interviewees agreed that there are some consultants and public agencies that are aware of these M&O costs and related issues, but most agencies do not think about the long-term operations of projects until they become part of operating budgets. The U.S. DOT cannot just require regions to “show the Federal Government their long-term M&O plan.” The Federal Government must tell the local agencies how to develop such a plan. Therefore, most public sector staffs need guidelines that identify potential M&O impacts, present solutions to determining M&O needs, and offer suggestions regarding funding these needs. Any guidelines should include sample templates that demonstrate how much detail to examine M&O for each project or category of projects. The guidelines should include a list of broad critical issues that the MPO and agencies should consider related to M&O analysis. Because each agency and metropolitan area is different, variations in consideration and documentation should be allowed. Training through the MORPC or the ODOT on these guidelines should be made available and support by the U.S. DOT.

3. Scanning tours of operating and management centers from various agencies, including freight operations, should be promoted and funded.

In addition to helping illuminate the need for coordination among agencies, the scanning tours taken by the policy-makers and transportation professionals from the Columbus Metropolitan Area opened their eyes to the necessity of M&O functions attached to an ITS program. Discussions with officials from the Houston TMC were instrumental in understanding future M&O issues for the CORTRAN. Educational visits to other freight-handling ports raised issues and generated questions concerning the operations of the Columbus port. The consensus of the Columbus area officials are that nationally, scanning tours have been underutilized but produce big benefits, including initiating discussions regarding M&O.

4. Federal Government needs to provide more training on ITS equipment to ensure systems operate as promised.

The respondents understood that the Federal Government has provided a wide array of training on ITS. However, only limited training has been provided that related to ITS operations and other post-deployment needs. One individual wanted to see more follow-up training on specific pieces of equipment. The interviewee remarked that there are big gaps in what the vendors promise the systems will do and what the operation staffs are actually able to do with the systems. More training is needed for staffs to move from reality to promise. One representative commented that the Federal Government is partially to blame because of the high expectations raised by ITS publicity and educational sessions. A second official added that some type of operations training would be helpful if there is a requirement to analyze M&O aspects.

5. Provide M&O seed money for some designated projects

The final recommendation from the representatives from the Columbus area is for the U.S. DOT to provide additional funds as operations seed money for specific projects. This seed money will be used for two purposes. First, it ensures that a proper level of operations is maintained for the first few critical years. Second, the local agencies receiving this seed money should document all of the M&O functions and costs associated with this project and share the associated cost with the Federal Government. This documentation will then be placed in a national database, which can be disseminated to and accessed by other agencies.