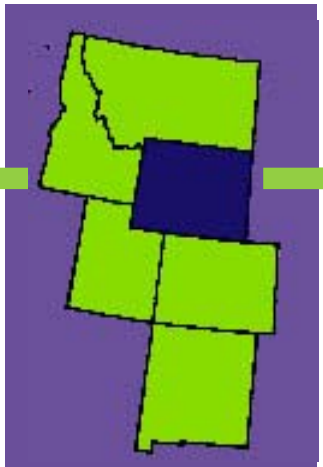

Are Intelligent Transportation Systems the Solution or the Problem?

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Have you ever been asked to justify your budget request? Have you thought, "It's inherently obvious this technology project is beneficial, but how do I prove it?" Have you struggled with the conflicting demands of higher-ups saying, "I want these new things installed, and they need to be managed and operated with your existing staff?"

These questions often represent the day-to-day experiences of both public and private participants in the transportation industry. As with most new technologies, ITS is neither the solution nor the problem. It is the application of these ITS tools that determines whether they are the solution or the problem (think of the atomic energy analogy). While many existing transportation industry tools do not provide the necessary details to address these experiences with certainty, tools exist that may provide some answers.

Management and Operations (M&O) represents an evolutionary change in the transportation industry thought process, and it is one tool that can offer improvement. It is the integration of everything ITS, and can potentially encompass the activities within an entire transportation organization. This includes not only managing, operating, and maintaining ITS devices, but also looking at how the use of these devices affect traffic flow, safety (of both travelers and transportation professionals), and construction scheduling to name a few. Most importantly to executive management and political oversight, M&O represents an opportunity to optimize the return on the public's tax dollar investment, thereby justifying appropriate budget requests.

Traditionally, transportation professionals have viewed their networks as stand-alone systems. The transportation profession was concerned only with the status of the system for which he had control. In an era where transportation users were primarily local, this view was appropriate.

To today's system user, this is a flawed operational model. More often than not, today's user is integrated into a larger, non-local transportation network. This includes the user whose commute takes her through multiple jurisdictions as well as the commercial carrier who must navigate multiple transportation networks in order to make a just-in-time delivery. These users care less about who manages and operates a portion of the network than about ensuring their trip is as efficient and as safe as possible.

Within the last decade, ITS has been promoted as a cure all for congestion and safety problems. While the technology does offer some ability to address these issues, how the technologies are applied will more directly impact the success than the technologies themselves. Other industries such as the utility industry have already developed M&O techniques that help guide this process; we can adopt these techniques to use in the transportation arena. The three steps to a successful M&O program are appropriate technology application, system operation, and system management.

The first step in a successful M&O process is the appropriate application of technology. As an extreme example of inappropriate technology application, installation of

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an intersection collision avoidance system to address a single vehicle crash problem will do little, if anything, to improve roadway safety. Likewise, a municipal water company will likely not construct five miles of infrastructure to serve an area with two houses. Rather, they might recommend the use of appropriate technologies, in this case a water well and a septic system. In these cases, the inappropriate application of technology may not only fail to solve the problem, it could commit the owner organization to long-term maintenance and operational expenses. Therefore, for either a utility or a transportation department, appropriate application of technologies (including ITS) is crucial to the long-term success of the owner organization.

The second step in a successful M&O process is the planning, from the very initial stages, for long-term system operation. This involves looking at not only the obvious personnel demands, but also the life-cycle infrastructure requirements any system will require. To accomplish this with ITS, the Federal Highway Administration (FHWA) has mandated the use of a system engineering process (23 CFR §940) while the Federal Transit Administration (FTA) references the FHWA requirements (49 CFR §600). Although a requirement for the use of Federal funds, system engineering makes good business sense.

Take, for example, the multi-state power company. Before they construct a new power plant, they conduct a full system engineering process. This includes a determination of the power plant's ultimate capacity, although the plant's initial capacity may be a fraction of the ultimate capacity. They also analyze installation location to facilitate distribution of power from the plant, access to raw fuel to power the plant, and existing infrastructure for plant management and operations. This consideration includes the personnel necessary to continually maintain and operate the plant. To gather all potentially valuable information, the power company will canvass all stakeholders, including fuel suppliers, plant customers, plant operators, and plant maintainers. This information is aggregated in a concept of operations (ConOps) that drives the development of the power plant's requirements, and ultimately the plant's design.

In a similar fashion, transportation departments can improve their systems' operations, including ITS, by developing a ConOps before deploying a system. By including system stakeholders early in this process, a successful ConOps can provide a solid foundation from which the system requirements could be derived. The system requirements will then define the necessary personnel, hardware, infrastructure, and ultimately financial requirements to successfully build, operate, and maintain the system.

Finally, the third step in a successful M&O process is system management. This is the implementation of the processes necessary to ensure the system remains operational throughout its planned life. System management therefore includes system maintenance. System maintenance may be as trivial as knowing what circuit boards and firmware are in each controller (this helps troubleshoot any performance problems) to planning for the system wide preventive maintenance necessary to keep a system running. It also includes understanding the current system, the ultimate system, and the necessary steps to move from the current system to the ultimate system. These steps must occur while the current system continues to

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operate, thus continuing to provide service and minimizing impact to adjacent systems.

Referring back to the multi-state power company, if they desire to increase the capacity of an existing plant, taking the plant offline could leave multiple customers with no power. Those customers would either be without power, or would request it from an alternate plant. This could cause demand at the alternate power plant to exceed capacity. Either option is not an attractive one. Further, if the utility did not address the increasing demand, they may introduce random rolling brownouts. Recent experience has shown the public outcry when this happens with a power utility. One reason this does not occur more frequently is that utility companies have implemented tools to more effectively manage their networks.

When it comes to transportation network, however, we have viewed regular rolling brownouts (in the form of recurring daily congestion or multi-day road closures) as a normal condition. Unfortunately, the traveling public is becoming less tolerant of these service interruptions, and is demanding a higher level of service. By integrating system management into an overall M&O program, we can begin to address these concerns while providing decision makers with the justification for required personnel and funds. Knowing what software an ITS system is running (including version number) along with the various deployed hardware components (including BIOS and firmware information) can smooth planned system upgrades and reduce unforeseen impacts to adjacent systems. Instituting a change control board can help guarantee proposed ITS additions are within accomplishing the agency's objectives.

Approval from the change control board provides decision makers with a requirement for additional capital funds and perhaps additional operations personnel. Ultimately, this can lead to better system performance, higher customer satisfaction, and more efficient expenditure of increasingly scarce financial resources.

Implementing an M&O philosophy offers the opportunity to reconcile the transportation system operation with the user's current expectations. It can provide the tools to justify budget requests, to document safety and congestion improvements, and to ensure deployed systems will remain operational. It requires a change from a traditional civil engineering highway mindset to a more current civil engineering water distribution mindset. Will it ultimately satisfy every customer? No. However, as the utility industry has discovered, an effective M&O system can create a more dependable network that customers can depend upon.

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