

I-5 SOUTH/BARBUR BOULEVARD

**TRAFFIC AND INCIDENT MANAGEMENT
DEMONSTRATION CORRIDOR**

LESSONS LEARNED REPORT

Prepared for:

Oregon Department of Transportation
and
City of Portland

Prepared by:

David Evans and Associates, Inc.

March 2004

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INTRODUCTION

This lessons learned report discusses the institutional and technical issues that were encountered during the I-5/Barbur Boulevard Incident Management Demonstration Corridor project. Specifically, it evaluates the institutional issues associated with achieving cooperation among public sector agencies and documenting how they were overcome. It also discusses lessons learned on the technical and institutional issues encountered in integrating Intelligent Transportation (ITS) components as required as part of the project self-evaluation. The goal of this lessons learned report is to allow others to learn from the experiences gained through the project and complete future projects with even greater success.

PROJECT DESCRIPTION

The City of Portland (City) and the Oregon Department of Transportation (ODOT) teamed together on the I-5/Barbur Boulevard Incident Management Demonstration Corridor project in an effort to improve traffic flow along Interstate 5 (I-5) and Barbur Boulevard during times of incidents. These two routes run parallel to each other from downtown Portland to Tigard. In the event of an incident on I-5, it is possible for freeway travelers to detour to Barbur Boulevard to bypass the congestion and re-enter the freeway at another point.

The project involves deploying a new state-of-the-art incident management system along the I-5/Barbur Boulevard parallel freeway/arterial corridor from downtown Portland to the city of Tigard. The new incident management system allows cooperative use of City and ODOT field devices so they can jointly respond to incidents within the project area. An incident management operations plan was developed as part of this project containing preplanned responses that the City and ODOT can implement during different types of incidents. Infrastructure installed with the project included two variable message signs (VMS), six changeable message signs (CMS), two loop detection stations, five closed circuit television (CCTV) cameras, and the fiber optic communications media required to connect these field devices to the central traffic operation centers. Through this new system, the City and ODOT can better monitor traffic conditions and incidents through the shared use of the CCTV cameras. Messages can be posted on the variable and changeable message signs to alert travelers of incidents on I-5 and redirect them to alternate travel routes.

PROJECT ISSUES

City of Portland and ODOT staff (project partners) involved in the project were interviewed in order to identify institutional and technical issues that were encountered during the project. The results of the interviews are summarized in **Table 1**. Raw interview notes are contained in the attached appendix.

Institutional Issues

Institutional issues are non-technical impediments and challenges that may occur during a project. The institutional issues noted by the project partners are discussed in the narrative following Table 1.

**TABLE 1
PROJECT ISSUES SUMMARY**

ISSUE	REMARKS/COMMENTS FROM PROJECT PARTNERS
Coordination and Cooperation	<ul style="list-style-type: none"> ▪ All project partners believed the project team worked very well together. ▪ Project partners noted three primary reasons for successful communication and cooperation: partner agencies have a long history of working successfully together on previous projects; project roles and responsibilities were very clearly defined; and having a regional committee helped establish a shared vision for the project.
Legal/Proprietary Issues	<ul style="list-style-type: none"> ▪ No legal/proprietary issues were noted. ▪ Partners have a long history of working together and have a good understanding of responsibilities and rights of each agency.
Financial Issues	<ul style="list-style-type: none"> ▪ ODOT did not note any funding budget issues except that the operations plan cost was approximately \$10,000 more than originally expected. ODOT was able to redistribute the project budget in order to provide the additional funds required for the plan. ▪ The City did not have adequate funding to install all of the cameras and signs as originally hoped. ▪ Reusing existing cameras and poles salvaged from a previous ODOT project and the City's stockpile helped minimize project costs. ▪ ODOT noted that what helped minimize project costs the most was effective regional planning, which allowed the project to build upon infrastructure installed by other projects.
Schedule	<ul style="list-style-type: none"> ▪ There were some delays, though nothing substantial. ▪ The City's part of the project was delayed due to lack of available staff.
Staffing	<ul style="list-style-type: none"> ▪ The City had difficulties getting the staffing needed to develop their project, resulting in project delays. ▪ In terms of identifying staff to operate and maintain the new incident management system, ODOT and the City reviewed staffing availability together and it was determined that ODOT could fill in during times when the City did not have staff available.
Standards and Protocols	<ul style="list-style-type: none"> ▪ The CMS proposed on Barbur Boulevard did not comply with ODOT standards for CMSs. As a compromise, it was agreed that it would be acceptable for the City to install the non-ODOT compliant CMSs along Barbur Boulevard, provided that the City would be responsible for maintaining the signs.
Systems Integration	<ul style="list-style-type: none"> ▪ Not many issues occurred while integrating the new equipment with existing legacy systems or while integrating ODOT's freeway systems with the City's arterial control system.
Equipment Problems	<ul style="list-style-type: none"> ▪ It takes a long time to turn the CMSs on and off. The City is currently reviewing the sign system to see if this issue can be resolved. ▪ Efforts that most likely helped to minimize equipment problems included learning more about the CMS signs by visiting the factory where the signs are assembled and requiring the sign manufacturer to make one CMS sign and send it to the City for inspection and approval prior to building the remaining five signs.
General Comments	<ul style="list-style-type: none"> ▪ Overall, all partners considered the project a success. ▪ Both ODOT and the City believed that the way the roles, responsibilities, and funding were divided so that each agency would be responsible for work on their own systems, helped to make the project a success. However, ODOT noted one minor disadvantage to this arrangement; it limited the project scope. ▪ ODOT thought one other location where it may have been beneficial to install a CMS was further south on 99W near the OR 217 intersection. However, this intersection would have been the only location where equipment would have been installed outside city limits. Because of the way the project responsibilities were split, it would not have been easy to install equipment at the 99W/OR 217 intersection. The City of Portland cannot construct outside city limits, so if equipment had been installed at that intersection, ODOT would have had to submit the CMS under a separate construction bid contract, and it would have been the only location where ODOT would have installed a CMS.

Coordination and Cooperation

The key to any coordination is a good working relationship among project partners. All project partners indicated that they believed the project team worked extremely well together. There were not any significant issues in terms of communication between project team members, and cooperation between the City and ODOT was easily achieved.

Project partners noted three primary reasons for successful communication and cooperation. One reason was that the City and ODOT have had a long history of working together on ITS projects. Past experiences working together and good relations between the City and ODOT staff members helped make the project a success.

Another reason noted was that roles and responsibilities between the agencies were very clearly defined. Project tasks were specifically assigned so that ODOT would be responsible for work on their systems and the City of Portland would be responsible for work on their own systems. Project funding was also similarly divided so that each agency would be allotted a certain amount of money that they could spend to perform their tasks.

A third reason noted by all partners was the effective regional planning that exists in the Portland/Vancouver Metropolitan area. In this region, a regional committee (TransPort) was formed over six years ago that meets regularly on ITS issues, funding, and project coordination. Significant effort has been made to plan and coordinate projects in the Portland/Vancouver Metropolitan area. The project was originally initiated through Transport. As part of the Transport team, the City had submitted the project as one of a number of potential projects that could help benefit the Region. The TransPort team reviewed all of the potential projects and the I-5/Barbur project was selected as one of the projects identified to be most beneficial for the Region. It was then included as part of the grant application and came to fruition when the grant was awarded. Going through this regional review process helped in the creation of a shared vision between ODOT and the City, and with all the regional jurisdictions involved in Transport. It allowed for a shared vision that was focused on creating benefits for not only on the sections of the roadway where the project was being installed, but for the Region as a whole.

Legal/Proprietary Issues

Often on ITS projects different partners come together with conflicting ideas and proprietary issues such as how the partners would share control of the systems and infrastructure deployed with project implementation. With the I-5/Barbur project there were not any conflicts concerning proprietary issues.

In terms of whether there were any legal agreements or memorandums of understanding (MOU) developed between the City and ODOT, there were not any developed specifically for the project that identified control and infrastructure sharing rights. It was noted that this project was one of several listed in the Model Deployment Grant submitted by the Region and all regional partners did sign a general MOU that indicated that they were committed to the project in general but did not go into specifics concerning proprietary issues. There is also an existing MOU between several regional partners (including the City and ODOT) on the sharing of the fiber communication between agencies.

ODOT had indicated that though they might potentially follow up with a MOU between the agencies, it is not needed. ODOT and the City have a history of working well together and both agencies have a good understanding of the responsibilities and rights of each agency.

Financial Issues

Money is always a major consideration on projects. With the I-5/Barbur project, the City noted that they ended up not having enough funding to install all of the cameras and signs as originally hoped. ODOT, however, did not note any funding issues except that the operations plan cost approximately \$10,000 more than originally expected. ODOT was able to redistribute the project budget in order to provide the additional money required for the plan.

The project partners employed some innovative financing techniques to help finance and/or minimize project costs. Reusing existing cameras and poles salvaged from a previous ODOT project and the City's stockpile helped minimize project costs. A minor disadvantage in using the salvaged cameras was that the cameras available were not of the dome type, which the City prefers for their more efficient viewing capabilities.

ODOT noted that what helped minimize project costs the most was effective regional planning. Through TransPort, significant effort has been made to plan and coordinate projects. Much of the equipment used on this project had been funded/installed through past projects. Conversely, future planned projects will build upon infrastructure and incident management concepts developed through this project.

Schedule

Schedule delays may be a sign of issues that caused problems during project implementation. Because of this, the project partners were asked whether the project had been completed on schedule and if not, what were the causes.

The City noted that their part of the project did experience some delay. The main issue that caused the delay was inadequate staffing to proceed with the project design and specifications. The City had another large project underway at the same time and a staff person that had been working on that project retired. It was noted, however, that the City's delay did not affect the ODOT project, nor consultant work effort, but had delayed the project in terms of being able to test the incident management plan.

ODOT indicated that there were some delays but not any that were substantial.

Staffing

Whether there is adequate staffing, and having the right people working on a project can significantly affect the success of a project. As mentioned earlier, the City had difficulties acquiring the staffing needed to develop their project designs and specifications as there had been another large project underway at the same time and the staff person working on that project had retired. As a result, there were some delays with the project; however, overall quality was not affected.

In terms of identifying staff to operate and maintain the new incident management system, staffing is always an issue for the City as they do not staff the traffic operations center on a consistent basis. This is a key reason why the City has continually worked with ODOT Region 1 staff to have an open system that can be monitored and operated at both the City's traffic operations center and ODOT's traffic management operations center. Because of these past coordination efforts, it was fairly easy to determine the staffing for the new system. There are not any TMOC operators working at the City during the evenings and weekends, so having ODOT operate the system during those times was an easy decision. It was decided that during the weekdays, ODOT would call the City and the City would implement signal timing changes to their intersections.

Technical Issues

There are often many technical issues encountered while integrating ITS components. Technical issues identified during the project are discussed below.

Standards and Protocols

Compliance to standards and protocols can help to ensure that ITS components being integrated are compatible with each other and can function together. With this project, it was stipulated in the contract specifications that the VMS would need to comply with NTCIP Standards and that the vendor would supply the MIB. ODOT and the Washington State Department of Transportation had already done full tests on the VMS signs used so compliance with standards was not really in question.

The CMS proposed on Barbur Boulevard did not comply with ODOT standards. As a compromise, it was agreed that it would be acceptable for the City to install the non-ODOT compliant CMSs along Barbur Boulevard, provided that the City would be responsible for maintaining the signs.

Systems Integration

Project partners indicated that not many issues occurred while integrating the new equipment with existing legacy systems, or while integrating ODOT's freeway systems with the City's arterial control system. A VMS sign system NTCIP driver needs to be installed in ODOT's "Navigator" operations system so that they can have adequate access to the VMS system.

Equipment Problems

Minimum equipment problems were noted by the project partners. The City noted that it seemed to take a long time to turn the CMSs on and off. The City is currently reviewing the sign system to see if this issue can be fixed.

Only one failure of a section (module) in one of the CMS sign faces has occurred. The sign was under warranty and the failed module was replaced.

Although the contract was bid using the City's typical low bid process, the contractor that was hired was one that had previously done a considerable amount of work for the City on other projects. Their qualifications helped to make the construction process go smoothly and minimize equipment malfunctions.

Efforts that most likely helped to minimize equipment problems included learning more about the CMS signs by visiting the factory where the signs are assembled and requiring the sign manufacturer to initially make one CMS sign and send it to the City for inspection and approval prior to building the remaining five signs.

General Comments

Overall, all partners considered the project a success. When asked what worked well and what would they have done differently, the City indicated that one of the things that helped make the project a success was the way the roles, responsibilities, and project funding was divided between the two partner agencies. ODOT and the City would each be responsible and provided separate funds for implementing improvements on their own systems. In this manner, no funds were passed between the agencies.

ODOT agreed that the way the roles and responsibilities were divided helped make the project simple and easy to deploy; however, ODOT did experience one minor disadvantage. ODOT believed that it might have been beneficial to take a more regional look at where to install equipment. One other location where it may have been beneficial to install a CMS was further south on 99W near the OR 217 intersection. However, this intersection would have been the only location where equipment would have been installed outside city limits. Because of the way the project responsibilities were split, it would not have been easy to install equipment at the 99W/OR 217 intersection. The City cannot construct outside the city limits, so if equipment had been installed at that intersection, ODOT would have had to submit the CMS under a separate construction bid contract, and it would have been the only location where ODOT would have installed a CMS.

CONCLUSIONS

The primary goal of this lessons learned report is to allow others to learn from the experiences gained through the project so that they can complete future projects with even greater success. In summary, the interview results suggest the following may help contribute to the success of a project:

- **Participate in a Regional ITS Planning Committee.** Having and participating in a regional ITS planning committee can contribute to a project's success. This committee can help plan projects so one project can build upon infrastructure and concepts established from prior projects, thereby reducing overall project costs. Effective regional planning can help form a shared vision of the project between the project partners and with all other agencies in the Region that participate in the Regional ITS planning committee. Effective regional planning can also help partners develop projects so that they not only create benefits for the project area, but for the entire region as a whole.

- **Divide project roles, responsibilities, and funding in as simple a manner as possible.** The City and ODOT divided the project so that the City would be responsible for work on their systems, ODOT would be responsible for work on theirs, and funding was split between the two agencies accordingly. This simple format allows the partners to easily understand and perform their responsibilities with the project.
- **Research new equipment prior to procurement.** Researching new equipment prior to implementing them can help to ensure standards compliance and compatibility of the equipment with the existing legacy systems. Ways to learn more about the equipment include visiting the factory in which the equipment is made, speaking with other agencies that have already implemented the same equipment, and testing one device prior to implementing many.
- **Good working relations between partners is key to project success.** Having staff members who have successfully worked together on other projects continue to work together can make a project run more smoothly. Participating in a Regional ITS planning committee can potentially help to establish good relations with other agencies participating in the committee.
- **Share resources and operation responsibilities among agencies.** The City's Traffic Operations Center is understaffed and had ODOT not volunteered their own staff to help operate the system, there would not have been adequate staffing to keep the system in operation. The project would not have been possible if the City and ODOT did not both willingly contribute their own staff, equipment, and other resources to the project.

APPENDIX A