Introduction and Background

Traffic monitoring is a key function for traffic management centers (TMCs), which are generally responsible for high-order facilities such as freeways and limited access facilities. The cost of existing surveillance technology is extremely high because of the extensive infrastructure needs involved. These devices are effective when they are operational, but studies suggest high rates of failing sensors for large state-wide networks. Additionally, the geographic coverage of these systems is limited to those infrastructure requirements.

A new wave of probe-based technologies have been shown to be effective in identifying travel speed and, in some cases, origin-destination pairs. No traffic volume or density parameters have been observed in the existing literature for probe-based surveillance systems. In addition, state departments of transportation are unlikely to have the in-house staff or leverage over major mobile-device providers to build these projects in house. As equipment ages and necessitates replacement or overhauls, TMCs are faced with the option of purchasing this broad-coverage speed data from third-party vendors. This research project attempts to identify what technological or organizational barriers exist in the deployment of these systems.

Organizational Barriers

The existing organization of most TMCs is predicated on their role as a central manager for the hardware and data of infrastructure-based traffic monitoring. Inductive loops, video cameras and other devices are all connected to communication and power networks that carry data to a TMC where it is translated into information for TMC operators who can then manage traffic with that information. With third-party data, DOTs will control far less of the traffic monitoring system. What are the risks involved and how might TMCs mitigate these risks when there are third-parties are increasingly responsible for critical elements of traffic monitoring?

Technical Barriers

Traditional traffic monitoring equipment has been developed to report speed, counts and occupancy for use by TMCs. Not all activities in planning, traveler information and operations, however, require that much data. GPS units are only able to report vehicle speed when there are sufficient probes available on a facility. Will TMC operators be able to perform their tasks without either vehicle count or occupancy data? Does traffic management itself require all the data that has been generated from devices or is some of the data redundant or unnecessary?

Methodology

Literature Review: GPS-based traffic monitoring began to show up regularly in literature within the past decade; this will be used to identify the technical capabilities and limitations of modern devices and systems.

Semi Structured Interviews and Survey Development: A survey of TMC operators will be the primary data collection instrument for this study. To ensure a broad understanding of survey questions and format, a series of extended semi-structured interviews with 3-5 TMC-operators will assist in the development of the survey.

Survey Deployment: The TMC Pooled-Fund Study, organized through the US Department of Transportation, is a group of active TMC operators that collaborate on research tasks. The survey will be distributed to this group of approximately 40 operators.

Analysis: The results from this survey and the literature review will be compiled and analyzed in the context of the original research questions.

Survey Question Highlights

Understanding impediments to the use of third-party data

- What are the existing technologies employed by the agencies who are answering?
- Are there critical elements of existing ITS systems that agencies do not manage or control?
- Do agencies make use of all data from their existing systems?
- Are certain technologies more or less acceptable than others when operated by a third party?

Technical Barriers

- Traditional traffic monitoring equipment has been developed to report speed, counts and occupancy for use by TMCs.
- GPS units are only able to report vehicle speed when there are sufficient probes available on a facility.
- Will TMC operators be able to perform their tasks without either vehicle count or occupancy data?
- Does traffic management itself require all the data that has been generated from devices or is some of the data redundant or unnecessary?

Survey Question Highlights

- Are certain physical elements of existing ITS systems vulnerable to outages?
- Are there critical elements of existing ITS systems that agencies do not manage or control?
- Will third-party vendors be held to different standards than internal system data?
- What are the long-term cost implications on the TMC business model?

Survey Question Highlights

- Are there critical elements of existing ITS systems that agencies do not manage or control?

Survey Question Highlights

Using third-party data

- Are certain technologies more or less acceptable than others when operated by a third party?
- Do public agencies trust third-party data vendors?
- Will third-party vendors be held to different standards than internal system data?
- What are the long-term cost implications on the TMC business model?

Preliminary Results

- Initial findings suggest that TMC operators are currently reluctant to trust third-parties with the responsibility of providing traffic monitoring data, largely because of the non-transparent nature of the data. The use of historic data to fill in what live data is unavailable is potentially useful for drivers but TMC operators find this practice misleading and un-useful for their purposes.
- There are many sources of uncertainty and risk that will affect TMC operators’ likelihood to endorse a third-party GPS-based system including lack of documentation, limited understanding of technology, third-party operation and others that will emerge from ongoing study.
- TMC operators may be willing to accept technologies that produce speed measurements without traffic flow or volume data. The need for volume and flow information is largely related to performance measurement such as the Highway Performance Monitoring System. This is an important task but is not central to the function of TMCs, which focus on operations.
- TMC operators recognize the trade-off between accuracy and the cost of a system; they may be willing to accept a decrease in accuracy if the system costs are substantially less than the cost for maintaining or rehabilitating existing systems. This will be most apparent when a low sample of vehicles is available for speed calculation, decreasing confidence in the values.

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