Intelligent Transportation Systems:

Technology Paves the Way to Smart Traffic Management

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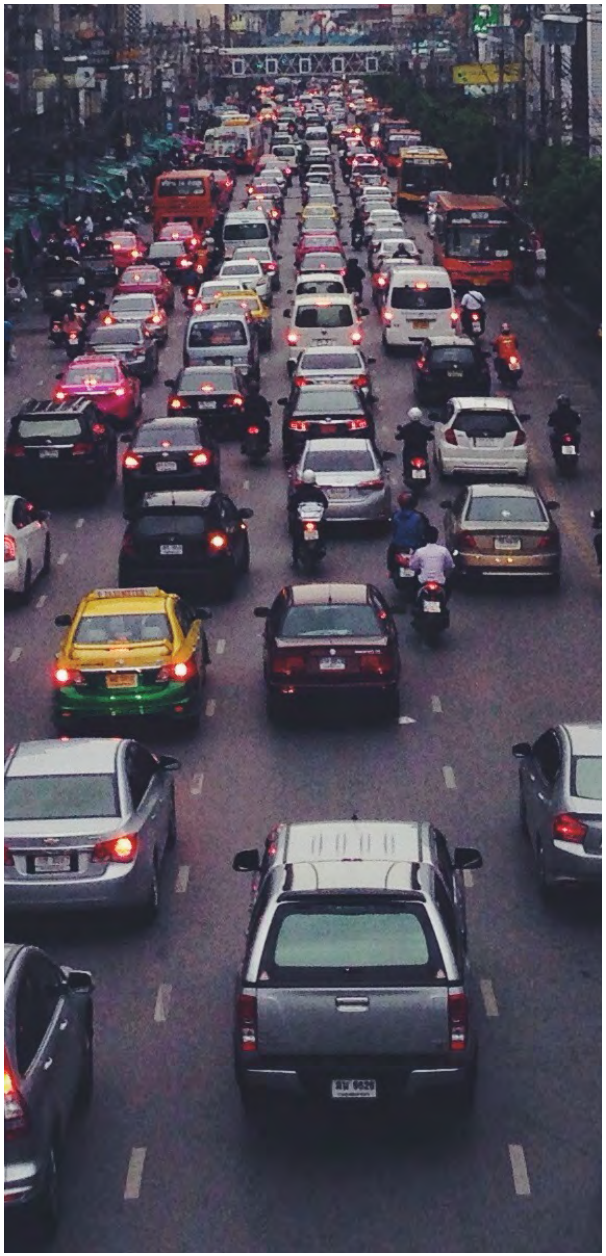

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Intelligent Transportation Systems: Technology Paves the Way to Smart Traffic Management

The ongoing challenge of traffic congestion in our nation's streets and highways is being tackled head-on by Intelligent Transportation Systems (ITS) contractors who are using smart technology to reduce congestion by up to 10% at a fraction of the price of building new roads.

The Texas Transportation Institute estimated that in a single year the nation wasted 4.2 billion hours stuck in traffic and burned 2.8 billion gallons of gas. Public agencies have two choices when facing this dilemma of unmet needs: add more pavement or look for smarter alternatives that use existing systems more efficiently. Joseph Rose wrote an article recently in oregonlive.com on intelligent solutions for freeways in the Portland area. Rose explained, "The region's highways have reached capacity. Money and room for major expansion is hard to come by." At the local level, Scott Kirby, Seattle's new transportation director, was recently quoted in a Seattle Times article saying, "We're not making any more streets, so we need to figure out how to use them more efficiently." ITS contractors and vendors are bridging this gap by offering public agencies proven mitigation solutions for street and highway congestion that government buyers are finding both compelling and affordable.

> *"The region's highways have reached capacity. Money and room for major expansion is hard to come by."*

ITS is a large, growing and diverse industry with an estimated "end use" market size of around $48 billion in the USA. Approximately 3,000 companies are involved, spanning 86 NAICS industry categories such as the following 12 examples:

- In-car collision avoidance and navigation systems
- Automated parking spot locator signs
- Automated toll collectors for bridges and HOT lanes
- "Weigh-in-motion" trucking load detectors replacing weigh stations
- Onramp freeway metering during peak times
- Real-time updates for smart phones
- Red light detection for traffic enforcement
- Adaptive traffic signals for efficient traffic flow
- Variable speed limit signs
- Estimated travel time signs
- Dynamic highway advisory signs
- Central traffic monitoring control systems

The results point to a **healthy market for proven solutions** aimed at reducing traffic congestion and returning real value for government clients.

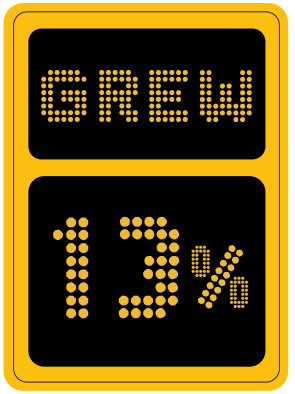
The "more with less" solutions have become increasingly popular as traffic managers in city and state agencies realize they are not going to make headway raising money for traditional approaches. Mary Keeling, a manager at the IBM Institute for Business Value, wrote a paper about the economic importance of using ITS, arguing these types of services "can become a differentiator for cities to attract and retain the talent necessary to drive growth, as they have a critical influence on the attractiveness and livability of a location." In other words, workers and employers who can no longer handle the travel delays in a given community can "vote with their feet" and find a more advantageous location.

Solutions aimed at reducing congestion represent a large opportunity for budget-constrained state and local agencies. For this paper, our goal was to examine the procurement dynamics of congestion-related projects to help transportation vendors, as well as public sector decisionmakers, gain more insight into the contracting landscape and understand what types of projects are being ordered. We first looked into contracting activity within ITS congestion solutions as a whole. We then examined two specific components – adaptive signal control technology for streets and variable sign technology for highways. The results point to a healthy market for proven solutions aimed at reducing traffic congestion and returning real value for government clients.

Industry Trends: Congestion Technology Solutions

photo by Andre Ruiz

In order to summarize recent growth within the congestion management part of the ITS industry, we looked in Onvia's Project Center at recent procurement trends since 2012. Searching for keywords related to adaptive signal technology and variable signs we found 571 project records of bids, RFPs and awards originating from 194 unique agencies. Considering the last two calendar years, the contracting volume of bids and RFPs in these areas has grown by 13% (2013 over 2012). Excluding smaller awards for individual components of a larger system or a single sign, these awards averaged nearly $1 million in size ($946,784) with a median or mid-point of $380,100. While the average was skewed by a smaller number of more expensive projects, the median reflects more typical contracts where a smaller or moderate sized system of $200K - $600K is initially installed and may be followed-up later as needed with much smaller replacement/ maintenance or incremental expansion purchases.



Growth in Adaptive Signal Technology and Dynamic Sign Contracting Activity 2012 vs. 2013

Top States for Congestion Technology Purchasing

State	Share of Projects	Share of U.S. Population	Index (1.0 = normal)
FL	8.4%	6.2%	1.36
TX	7.9%	8.4%	0.94
IL	7.9%	4.1%	1.94
CO	5.9%	1.7%	3.55
AZ	5.0%	2.1%	2.39
Subtotal	**35.1%**	**22.4%**	**1.57**

A review of the top five states for these projects revealed a relatively stronger commitment to using congestion technology than would be expected for their population sizes. Together these states make up 35% of all the congestion-related projects in our database yet they only account for 22% of the nation's population. The greatest example of this was Colorado, which had 6% of the projects but less than 2% of the national population.

Only about fifteen percent (14.7%) of all state and local government projects are procured with RFPs based on the data used to prepare Onvia's Q2 2014 State and Local Procurement report. This varies by sector, with architects and engineers as high as 70.9%, IT/ Telecom at 12.3%, and road construction down at a minimal 1.3%. Against this backdrop, ITS congestion projects are more likely than average (20.3%) to require an RFP. The remaining ITS projects that are put out for bid speak to the fact that these solutions are not experimental but have been tested and proven over a number of years, making detailed bid specifications possible.

Reflecting a slight tilt toward highway projects, over half (53.9%) were advertised at the state government level rather than local or regional government. Of all bids and RFPs, around 8% were identified as "set asides" where the procurement specifications called for women-owned, minority-owned or small business contractors. This figure comes up well short of the overall goal of 23% for set aside contracts awarded to contractors at the federal level but is much higher than the 2.4% average for all state and local government, based on Onvia's database of state & local procurement documents.

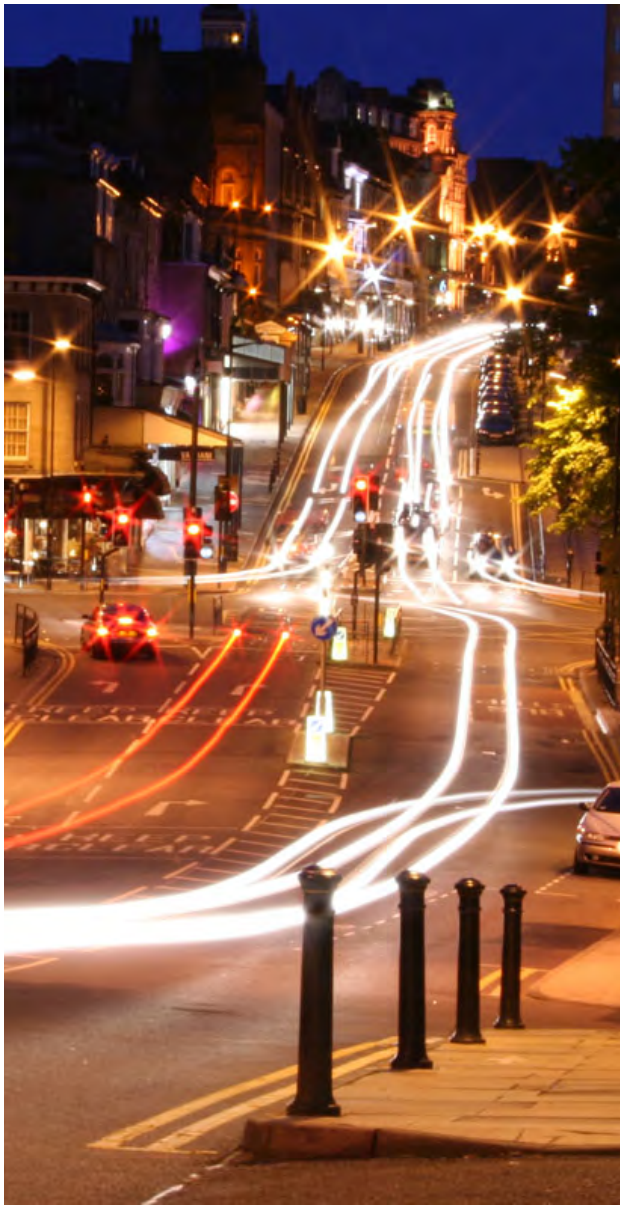


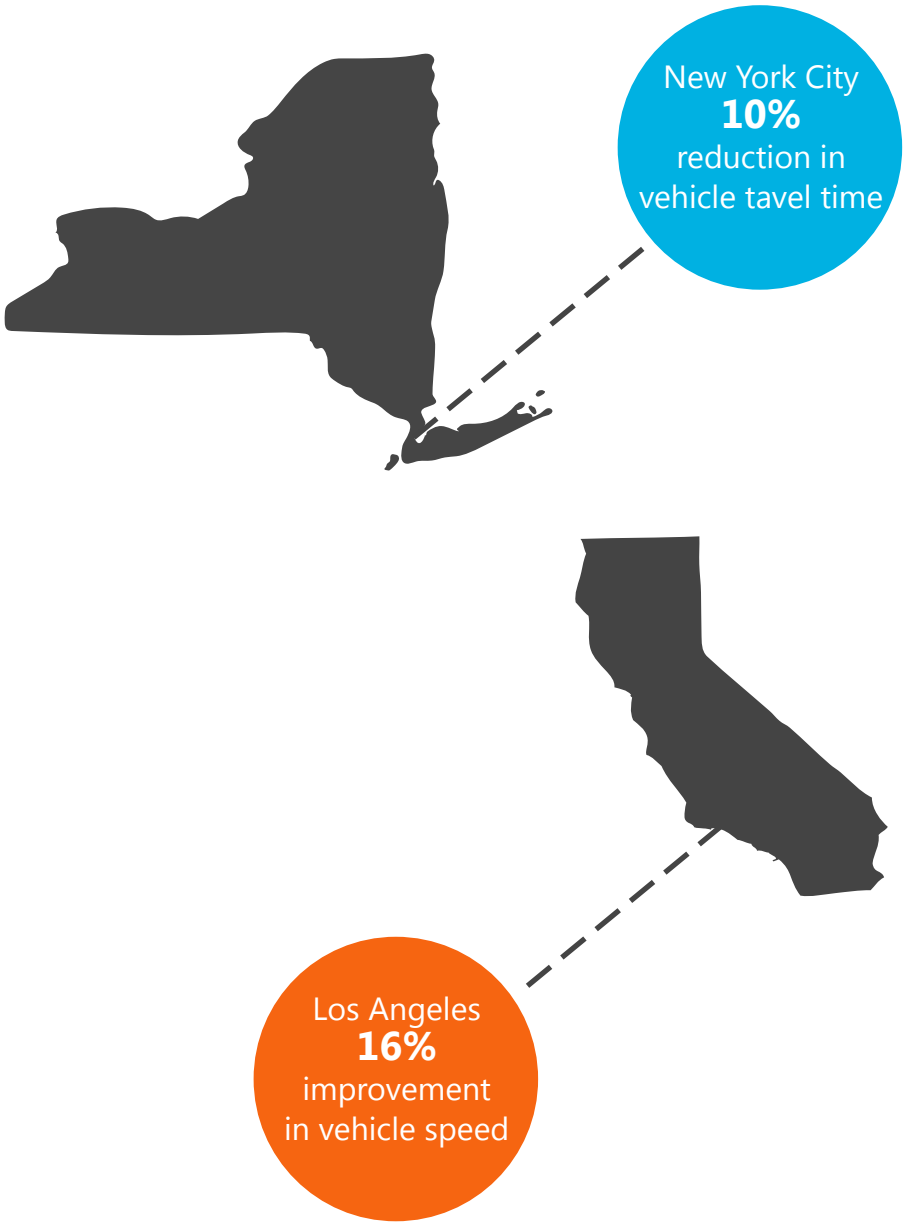
photo by Ptr Kratochvil

Local Congestion Technologies: Adaptive Signal Control

Adaptive Signal Control Technology (ASCT), connecting a series of "smart" traffic signals using fiber optic connections, real-time sensors, centralized control and sophisticated software, is a powerful tool for improving traffic congestion within local communities -- and has had well-documented success. According to the Federal Highway Administration, adaptive traffic lights on average improve travel time "by more than 10 percent. In areas with particularly outdated signal timing, improvements can be 50 percent or more."

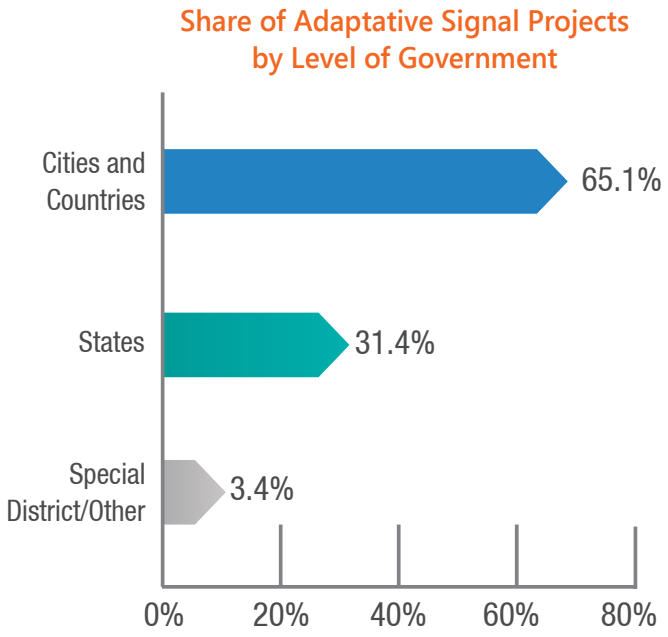
While adaptive signal control typically creates an incremental benefit, even small changes in congestion can have a significant positive economic impact. In a New York Post article, Jennifer Fermino reported that traffic congestion in New York City has been responsible for an estimated $13 billion per year in lost business revenues. At the same time the city's new ASCT system in its first phase reported an estimated 10% improvement in travel times, which could mean a potential for saving as much as $1 billion dollars per year for the entire system of intersections. When one mid-sized U.S. city (Bellevue, Washington) made the decision to move ahead with an initial 31-intersection project of adaptive traffic lights, the city council estimated it would save the public $1.5 million annually from "reduced travel delay costs," according to an article in the Bellevue Reporter. The article adds that results from other cities adopting similar systems "indicate travel times could improve by five percent or more," which in this context can presumably still result in meaningful improvement.

Adaptive Traffic Lights will save the city of Bellevue, WA (population 133,992) an estimated **$1.5 million** annually from "reduced travel delay costs"



Case Studies: Big City Implementations in NYC and LA

Known for having some of the oldest neighborhoods in the U.S., New York City has been hard at work centralizing, standardizing and upgrading its formerly aging and low-tech intersections to be remotely operated and intelligent. All of the 12,500 traffic signals were reported to be completed by the end of 2013 with the entire system linked and operational. During the first phase test, covering the initial 110 blocks, the software, vehicle detection sensors, video cameras and E-ZPass (electronic toll) readers installed provided real-time data and decision-making that enabled an average reduction in vehicle travel time of 10%. Recently after decades of experimentation and partial implementations dating back to the early 80's, Los Angeles reached the 100% mark, where each of their 4,400 traffic signals are now remotely operated and linked to their underground central command facility. Inductive loop sensors in the roadway measure vehicle traffic volumes and 400 CCTV cameras provide visual feedback for operators. The data is analyzed in the control room and signal timing is automated with the option of manual intervention. Preliminary testing showed a 16% improvement in vehicle speed.



Insights from the Contracting Database

Onvia's Project Center database of state and local government contracting activity suggests a strong overall interest in adaptive signal projects, with more than 250 project mentions representing 128 unique agencies with at least one bid, RFP or award for this technology since 2012. This doesn't include "below threshold" projects that were less expensive than the minimum amounts required for a competitive bid situation. Adaptive signal projects averaged around $418,000 each excluding smaller piecemeal purchases, with a median or typical size of $200,000. Given these projects are normally intersection-oriented, two out of three (65.1%) are purchased by local governments (cities or counties) and 31.4% are procured by a state transportation agency.

While nearly seventy percent (69.3%) of the time these project were purchased through a standardized bid process, RFPs were used more often here (30.7%) than for ITS congestion projects as a whole (21.0%). There was a 6% incidence of being a set aside contract for disadvantaged businesses, which is well above the 2.4% average for all state and local government contracting in Q2 2014.

Adaptive Signal Technology in Mid-Sized Cities

Signal Coordinate Project	Traffic Adaptive Signal Control System
Purchasing Agency: City of Anaheim	**Purchasing Agency:** City of Bellevue
Location: Anaheim, CA and Orange, CA	**Location:** Bellevue, WA
Vendor: Iteris	**Vendor:**TransCore ITS, LLC
Budget: $974,000	**Budget:** $503,000
Project Description: Agency requests vendor to install ITS signal control system in 46 intersections to reduce travel times along Lincoln Avenue and Nohl Ranch Road	**Project Description:** Agency requests vendor to install the SCATS traffic adaptive signal control system on key corridors in the Downtown and Factoria areas

> *This signal coordination project is intended to improve the safety of these intersections, while providing a better travel experience through reduced travel times, stops and delays.*
>
> Abbas Mohaddes
> President and CEO of ITERIS

Two examples of mid-sized cities are profiled from Onvia's procurement database. The City of Anaheim in California awarded Iteris a contract to install adaptive signal technology along two streets in 46 intersections with a budget of up to $974,000. As reported by Jacy Danque in an OC Metro article, Abbas Mohaddes, president and CEO of Iteris said, "This signal coordination project is intended to improve the safety of these intersections, while providing a better travel experience through reduced travel times, stops and delays." As a second example, the City of Bellevue in Washington hired firm TransCore ITS, LLC to install the SCATS ITS signal control technology in 31 intersections within two major traffic corridors for a contract worth $503,000.

Smaller Scale Signal Projects

Traffic Adaptive Signal Control System
Purchasing Agency: City of Aurora
Location: Aurora, CO
Vendor: Intermountain Traffic, LLC
Budget: $58,500
Project Description: Agency requests vendor to provide Adaptive Signal Control Technology (ASCT) for two key intersections where new commuter rail traffic threatens to complicate the existing traffic signal operation. The ASCT systems "will have the ability to adapt their timing on a real-time basis to account for the impacts of the rail... and to recover more effectively. This ability will preserve some semblance of arterial progression and will restore a portion of the existing base-level functionality that the East Rail Line project is removing."

In addition to these major corridor or city-wide sample projects, there were also examples in Onvia's database of smaller scale projects. For example, in the case of the City of Aurora in Colorado, only two intersections were chosen to be retrofitted with the new technology because they would otherwise be negatively impacted by a new commuter rail line crossing. For this limited project scope, the award amount was $58,500.

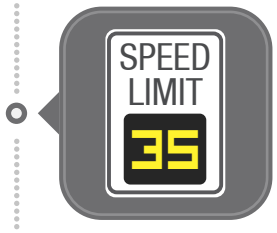
Adaptive signal control technology has the potential to make a significant difference in the battle to reduce traffic congestion within our nation's busiest urban streets and intersections. Even small incremental improvements of 5-10% in commute times can have a positive impact at a modest price compared to the higher cost of road construction. While some of the largest cities like New York and Los Angeles – with the greatest scale of problems to tackle - have been early adopters, a large number of mid-sized cities stand to benefit from this solution. The average midsize city appears to be spending anywhere from $100,000 to $500,000 for a corridor project or larger system.

Highway Congestion Technologies: Variable Traffic Signs

Three Examples of Variable Sign Technology

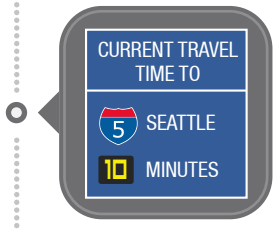
VARIABLE SPEED LIMIT SIGNS

Cause drivers to slow just before they reach a section of dangerously slow traffic. As Matt Beaulieu, a Washington State Department of Transportation engineer explained to Joseph Rose in the oregonlive.com article, "these are for the people coming up to slow traffic. They're intended to get them to pay attention, to avoid panic braking and erratic last-minute lane changing."



ESTIMATED TRAVEL TIME SIGNS

Continuously update drivers on drive times from that sign to leading destination points. These travel time updates can potentially improve traffic flow by helping drivers make the best choices that will lead to reduced overall time for their trip. In the same article, Dennis Mitchell, ODOT's chief traffic engineer for the Portland region said, "People will have better tools to help them decide if they really want to look for an alternate route…People often think a traffic jam is going to take longer than it will actually take."



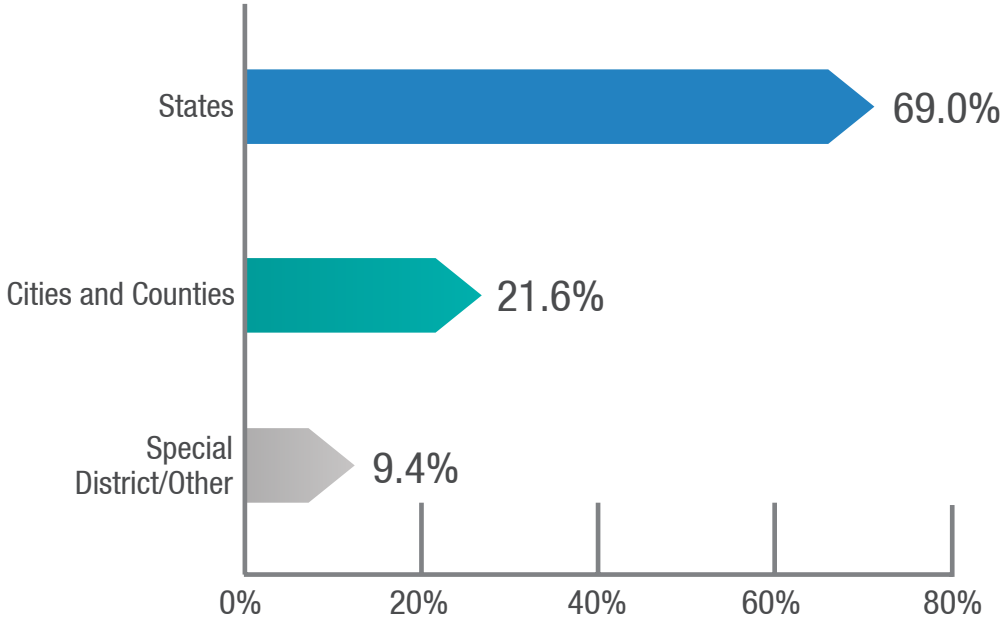
DYNAMIC TRAFFIC ADVISORY SIGNS

Are often used together with variable speed limit signs to update drivers about accidents, slick roads or closures. This approach normally relies on CCTV video cameras stationed along the most congested corridors of highway along with, in many cases, weather sensors to track road temperature and moisture levels.

Traditional highway signs are dependable but fail to communicate real-time traffic information in a way that helps reduce congestion. For drivers living in a growing number of progressive cities nationwide, special digital highway signs are being placed into regular use featuring variable readings or messages. Looking into our data set, we found three key applications of variable traffic signs in highway projects across the country: variable speed limit signs, estimated travel time signs, and dynamic traffic advisory signs. Two independent studies in different states have found that using variable traffic signs can reduce accidents between 5-8%, which would have a noticeable impact on congestion and could make our roads safer for drivers. We wanted to look into the purchasing trends for these three types of variable signs and understand how these technologies are being used, what they cost and where they are being deployed.

We looked at project mentions of "variable" or "dynamic" signs in Onvia's database and found over 300 bids, RFPs and awards issued since 2012, representing 109 unique agencies nationally. The ratio of set asides for bidding was 9%, which is slightly higher than the corresponding level for adaptive traffic signals. Compared to all congestion ITS projects, variable sign projects were less likely to be purchased using an RFP process (13.4% vs. 20.3%). Because these projects deal with highway and freeway travel, nearly seventy percent (69.0%) are procured by a state department of transportation agency. In twenty-two percent of the projects, the highway traffic solution is ordered at the local government level because many state highways will transition into local streets as they run through the downtown corridors of towns. Contracts with special districts can include toll bridge authorities, concerned with managing traffic congestion around and through these major bridges.

Share of Variable Highway Signs by Level of Government



Looking in Onvia's database at variable sign awards made since 2012, we noticed they averaged $1.42 million in size with a median (mid-point) size of $601,000. A scan of upcoming projects using Onvia's Spending Forecast Center revealed evidence that this scale of projects should continue or increase over the next 3-5 years.

The following $5 million example from the Oregon Department of Transportation is scheduled to begin in 2015:

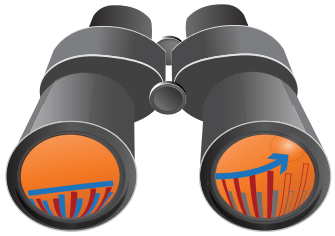
US26 & OR 35 Intelligent Transportation Systems Project
Purchasing Agency: Oregon Dept. of Transportation
Location: US26 and Oregon Route 35
Est. Start Date: begin 2015
Est. Budget: $4,937,000
Project Description: Agency requests vendor to install variable speed limit and variable message signs along US26 and Oregon Route 35. Design work is budgeted at $868,000 with $3.97M budgeted for construction and $100,000 for other expenses.

An example of providing travel time estimates electronically in real-time to motorists is a recent project procured by the State of Michigan. This $1.4 million award blended variable travel time signs with video camera monitoring and dynamic road condition advisory signs.

$1.4 million award

- variable travel time signs
- video camera monitoring
- advisory signs

Dynamic Message and Travel Time Signs
Purchasing Agency: Michigan Dept. of Transportation
Location: US26 and Oregon Route 35
Est. Start Date: March, 2012
Est. Budget: $1,410,302
Project Description: Agency requests vendor to install 10 closed circuit television cameras, dynamic message signs, and 3 travel time signs at various locations along I-75.



In order to profile upcoming variable sign projects in Onvia's Spending Forecast Center, we used search terms related to "variable" or "dynamic" traffic signs and found 155 instances where an agency mentioned this wording somewhere in a planning or budget document. Within this universe of total mentions, we pulled four sample projects to profile in more depth, with budget ranging from $200K to $10M. These projects often involve packages of spending with more than one type of intelligent transportation technology.

Agency Name	Description	Start Year	End Year	Total Budget
New Jersey Department of Transportation	Improve traffic flow and traveler information through separate ITS projects or added to other road projects. Equipment can include dynamic message signs to provide real-time traffic conditions.	2014	2018	$10,000,000
Alaska Department of Transportation and Public Facilities	Deploy ITS systems, which may include dynamic message boards, temperature data probes, weather cameras, sensors, etc. Upgrade communications along the corridor to support ITS applications.	2014	2015	$204,682
Florida Department of Transportation	Implement dynamic message signs and a highway advisory radio traffic management center.	2014	2017	$9,518,466
Ada County Highway District (Idaho)	Install 4 arterial dynamic message signs on major I-84 freeway detour routes to alert drivers of conditions.	2015	2015	$300,000

Maryland Transportation Authority

spending over $115 million on a broad range of ITS technology, communications and support services

We also pulled an example of a much larger project: The Maryland Transportation Authority has a remaining budget of $115 million to spend on a broad range of ITS technology, communications and support services by 2019. This project's comprehensive nature goes well beyond the typical scope of projects that include variable sign solutions. Previously, the agency spent a total of $293 million in these areas. In scope, it does help paint a picture of the size that ITS projects can potentially reach when most everything is included and it is deployed over a very large share of the highways, including arterials in this case. The project description contains the following specifics:

> Install advanced traffic management system (ATMS) and advanced traffic information system (ATIS) technologies on Interstate highways and arterials statewide. Technologies include cameras, traffic detectors, weather sensors, dynamic message signs, highway advisory radios, web sites and telecommunication networks. CHART is comprised of five major components: 1) Traffic and Roadway Monitoring; 2) Incident Management; 3) ""511"" - Traveler's Information; 4) System Integration and Communication; 5) Traffic Management.

Annual Budget for Maryland Transportation Authority ITS Project

Year	Total Project
2014	$20,000,000
2015	$23,000,000
2016	$18,200,000
2017	$18,800,000
2018	$17,600,000
2019	$17,400,000
TOTAL	**$115,300,000**

Source: Onvia's Spending Forecast Center database

These amounts can be viewed as "total budget" figures that include design or engineering work as well as purchase and installation costs. The project will be implemented over a six-year period from 2014 through 2019, as the table demonstrates:

While the Maryland project is particularly large in its scope, these types of bundled ITS highway projects often involve significant capital outlays for the purchasing agency. Vendors who specialize in intelligent transportation solutions for highways can utilize available information about agency budgets and capital improvement plans to learn about these projects 1-3 years before they come up for bid.

Conclusion

photo by superfamous

For cities, intelligent signal technology presents an opportunity to improve traffic conditions without the enormous expense of wider streets. Some leading cities like New York and Los Angeles have already invested heavily in this framework, reaching or approaching 100% coverage. Because they started earlier, large cities are more likely to be making incremental upgrades or maintenance purchases that complement existing systems - although the value of these types of contracts may be sizable. On the other hand, the smallest cities lack both available infrastructure funds and the demonstrated need for ITS given their population and lower congestion levels. That leaves the mid-sized cities that may offer the best future market for comprehensive new projects: particularly those communities with forward-thinking leaders and heavy downtown congestion.

Variable highway signs are making an impact within the state highways and interstates of this nation. Compared to city intersection projects, highway sign projects tend to be larger in size and are more often federally funded. Given the scale of traditional road construction and engineering work along with possible right-of-way purchases needed to build new freeway lanes, these modest intelligent solutions appear quite reasonable as public expenditures. Preliminary estimates are showing reductions in the rate of crashes for variable speed limit signs, which translates into improved overall travel times. Commute time estimate signs promise to have a positive impact on the flow of traffic by helping motorists make better, more efficient, decisions about routes to take. Dynamic advisory message signs about weather and incidents are expected to provide additional safety and traffic flow benefits.

Traffic congestion is a modern problem that affects most every citizen and commuter at some level. Since the option of building our way out with new infrastructure is generally not a viable one for urban areas, tools and strategies that help make the existing system more efficient will increasingly be in demand by agency decisionmakers. As an industry segment, intelligent transportation systems or “ITS” procurement has been growing at a much faster rate than overall public agency procurement, highlighting it as an area of particular strength in the government contracting market.

ABOUT ONVIA

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