ITSA / NEMA Joint White Paper

Procurement Solutions for Modern Transportation Technologies

Executive Summary

Roadway infrastructure has evolved from physical assets constructed of primarily concrete and asphalt to complex digital and communication technologies that help make traffic run more efficiently and safely. There are several procurement challenges associated with these modern roadway systems that call for innovative solutions. Outcomes Based Contracting allows governments to achieve procurement goals of greater accountability and performance through adoption of improved procurement strategies and contract types that align with its goals.

This white paper describes the key characteristics of an Outcomes Based Contracting approach, tips for its implementation, and selected case studies that highlight its effectiveness. Finally, the white paper highlights the role and path forward of the federal government in advancing its adoption.

Challenges

The evolution of roadway infrastructure has significantly reshaped modern transportation networks, influencing how cities, states, and nations approach mobility and logistics. Historically, infrastructure comprised physical assets– roads, bridges, and tunnels–built to support growing populations and increased vehicle traffic. These were treated as largely static investments, designed to function reliably for decades with minimal updates.

Today, however, infrastructure extends well beyond concrete and steel. Modern roadway systems increasingly incorporate complex digital technologies, including sensors, data analytics, and automated control mechanisms. Technologies such as Intelligent transportation systems (ITS), real-time traffic monitoring, adaptive signaling, and connectivity-based solutions have revolutionized how roads operate– improving traffic flow, reducing congestion, and enhancing road safety, ultimately benefiting both commuters and the movement of goods. Yet, integrating these technologies introduces new challenges. Unlike traditional infrastructure, which often involved one-time capital expenditures, modern roadway systems require ongoing software updates, hardware replacements, cybersecurity safeguards, and technical support to remain functional. Planning must now anticipate continual adaptation rather than a one-time build-and-forget approach.

Despite these advances, the procurement process remains a persistent barrier to modernization. Traditional procurement frameworks were developed for large-scale construction and material acquisition, not rapidly

evolving technology. These legacy systems often delay project delivery, hinder innovation, and increase costs. Addressing these inefficiencies is crucial for ensuring that roadway infrastructure keeps pace with technological advancements, supporting safer, more efficient, and more resilient transportation systems in the digital age. Specifically, while procurement decisions are typically governed by state and local regulations, greater federal leadership is needed to ensure agencies have the tools, flexibility, and guidance to procure modern infrastructure solutions efficiently.

Workforce and Resource Limitations

State and local agencies often lack technical expertise and financial resources necessary to procure and manage advanced transportation technologies. Workforce challenges are exacerbated by the lack of uniform standards across different mission domains and regions, leading to inconsistent training, skill gaps, and unclear job expectations. Few agencies have access to testbeds or simulation environments to evaluate interoperability and technical performance before procurement. The absence of rapid testing environments during the procurement cycle further limits the ability to validate functionality in real-world conditions.

Complexity of Performance and Safety Requirements

Federal law requires governments to report on safety and performance metrics of their highway networks. These metrics can change by time of day (e.g., traffic congestion during rush hour) or throughout the year (e.g., snow removal during winter). This becomes increasingly problematic due to the complicated nature of these systems. For example, traffic signal systems are multifaceted. One intersection could have several individual sensors that often have an impact on the signal's operation. Governments also have an obligation to protect citizens within their jurisdiction. They must remain cognizant of potential liabilities and try to avoid them. For example, a traffic signal's operation has an inherent safety risk, and its associated liabilities need to be addressed.

Software as a Service (SaaS) and Cost Structures

ITS Software is increasingly delivered through Software as a Service (SaaS) models, which offer transportation-related functions–such as traffic management, navigation, and public transit information–through cloud-based platforms rather than locally installed and managed software. However, recurring charges associated with SaaS subscriptions may fall outside the scope of traditional procurement rules, particularly if not bundled into the initial contract. This mismatch can complicate budgeting, approval, and implementation.

Cybersecurity

Transportation systems are classified as one of the 16 critical infrastructure sectors. Critical Infrastructure are those assets systems, and networks that provide functions necessary to our way of life. Transportation systems, like all computer systems, are subject to risks that might harm the software, hardware, or data security of the transportation-related device. As these devices become increasingly connected to networks, security risks move beyond the system to intrusions across digital networks. Owners and operators of transportation systems critical infrastructure have a responsibility to implement security while still maintaining functionality and reliability of the systems themselves. There are also considerations of reducing dependencies of incorporating technologies manufactured in foreign countries into systems that reside in the United States.

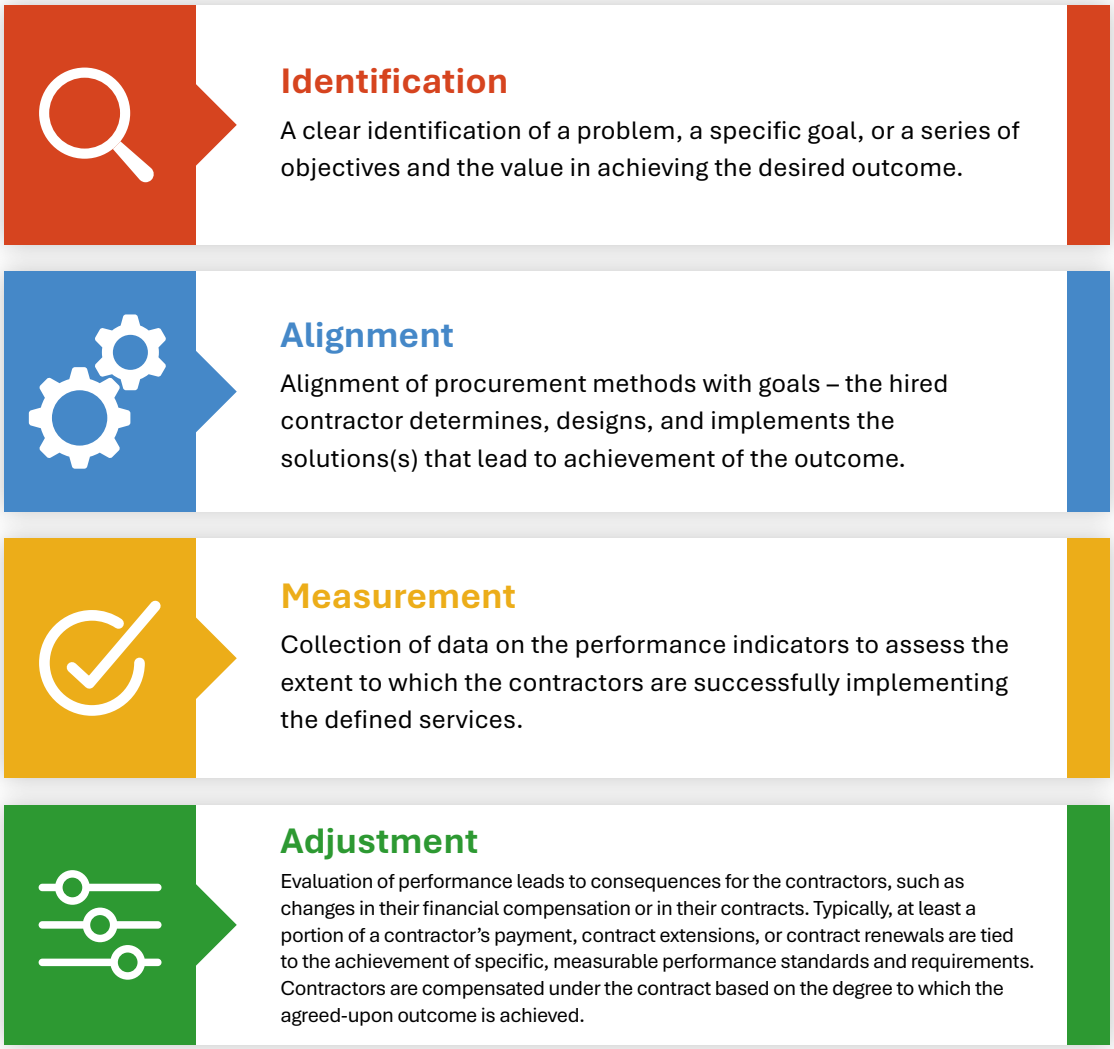
Additionally, transportation agencies seeking Service Organization Control 2 (SOC 2) compliance are aiming to demonstrate a high level of security and data protection practices for customer and operational data by adhering to the (SOC 2) framework. This is particularly relevant for companies handling sensitive information like passenger details, route schedules, and payment data, especially when using cloud-based systems; essentially assuring their clients that their data is managed securely.

Solution

Unprecedented challenges demand innovative solutions. Traditional steel and concrete infrastructure quandaries are giving way to dilemmas associated with ITS, such as those associated with the application of computer, electronics, and communications technologies. With roadway infrastructure facing both existing and emerging problems, Outcomes Based Contracting (OBC) can offer government agencies an efficient solution to manage transportation repair, enhancement, and expansion issues.

OBC allows governments to achieve procurement goals of greater accountability and performance. In OBC the hired contractor devises the most effective and efficient way to perform the contracted work. These types of agreements tie compensation to a contractor's ability to meet or exceed defined program outcomes in a meaningful and measurable way. When the focus is on results and outcomes, procurement officers and agency leaders can better design contracts that drive innovative, cost-effective services, reasonable risk-sharing, and measurable results.

OBC is comprised of four discrete characteristics: Identification, Alignment, Measurement, and Adjustment.



The demand for public funding of transportation infrastructure projects greatly outstrips the constrained amount of public funds available. Under traditional contracting methods, a government purchases assets (such as asphalt, signage and signaling) which are then deployed and maintained over time. With an outcomes-based model, an agency develops clear goals for the efficient management of their transportation system and their physical infrastructure. This shift in approach incentivizes contractors in the private sector to find the most efficient and cost-effective methods and technologies to meet the government's goals, without prescribing rigid specifications that may often be unworkable or inhibit fair competition among potential vendors. Additionally, OBC allows governments to address specific challenges associated with technology and data-centric products that need periodic software updates and other upgrades that may change some of the product's specifications.

To support effective implementation of Outcomes-Based Contracting (OBC), agencies should incorporate structured safeguards that prevent uncontrolled scope expansion and cost overruns. By defining clear outcome thresholds, pre-set change order triggers, cost caps, dispute resolution mechanisms, and governance oversight, agencies can preserve the flexibility and innovation benefits of OBC while maintaining fiscal discipline and accountability. These controls help ensure that performance-based contracts deliver measurable results without compromising transparency or budget integrity.

This concept is not unique to surface transportation. Energy Performance Contracts (EPCs) also known as Energy Savings Performance Contracts (ESPCs) are financing mechanisms where an Energy Service Company (ESCO) installs energy-efficient equipment and guarantees savings, with the customer paying for the upgrades over time. A more detailed description is provided below.

- The ESCO conducts an energy audit, identifies energy savings opportunities, and designs a project to implement those improvements.
- The ESCO arranges financing and installs the energy-efficient equipment.
- The ESCO guarantees a certain level of energy savings, and the customer pays for the project through a portion of those savings over a set period.
- The ESCO often takes responsibility for maintaining the equipment and monitoring its performance.

At the end of the contract, the customer owns the improvements and continues to receive all the savings. OBC can assist governments in delivering desired performance through adoption of improved procurement strategies and contract types that align with its goals.

Case Studies

Alpharetta City Council Traffic Preemption System[1]

In most growing cities throughout America, with the City of Alpharetta included, emergency response times are increasing as traffic worsens. Emergency vehicle drivers are finding it more difficult to navigate roadways safely and arrive at emergency scenes within prescribed times.

[1] https://www.appenmedia.com/alpharetta_roswell/alpharetta-contracts-to-upgrade-preemptive-traffic-signal-system/article_29480124-a844-11e9-b5ab-c3002e908f5d.html

Identification - Alpharetta's current system is more than 20 years old, operates at only 40 of the city's 129 signalized intersections and uses antiquated line-of-sight communication technology.

Alignment - To address this challenge Alpharetta embarked on a citywide upgrade to its traffic signal system with a goal of improving response times for fire emergencies. The City Council approved an OBC contract for the installation of a traffic preemption system that allows emergency fire vehicles to override traffic signals and turn lights to green when responding to a call. The contract approach sought qualified, experienced, and licensed firms to provide a GPS Emergency Traffic Preemption System that would be installed on fire equipment vehicles under this contract. The proposed system needed to be compatible with existing traffic signal control equipment, onboard technologies, communication systems, and centralized management systems.

Measurement - Additionally, the offerer was required to provide a turn-key solution for the City's Traffic Preemption System, including, but not limited to the following: all equipment, design for any required integration, interfacing, training, testing, optional hardware/software installation, warranties, and project management.

Adjustment - The $300,000 contract called for the installation of preemptive systems in traffic cabinets at (100) of the city's (129) signaled intersections. The triggering devices were installed on all fire service vehicles and others in the town's Department of Public Safety hierarchy. Alpharetta firefighters on average save 10 seconds per traffic light by utilizing the Traffic Preemption System.

Virginia Department of Transportation Hardened Security Traffic Cabinets[2]

Identification - The Virginia Department of Transportation (VDOT) maintains thousands of traffic cabinets across the state that house sophisticated electronics which are critical to controlling traffic signals and also communicate over the state's network infrastructure. Via a security assessment that focused on cyber security, risk compliance, and network resilience it was determined that the state's transportation network was vulnerable. Nearly all VDOT cabinets were secured using only a standard mechanical lock and common key.

Alignment - To address this challenge, VDOT set a goal of strengthening both physical and cybersecurity measures by quickly and easily retrofitting existing cabinets with new security technology. State officials created a list of tasks to undertake in determining the best solution that not only alleviated the condition but fit with their infrastructure, their traffic operations and the ongoing maintenance and support of the state's traffic systems. They concluded that an intelligent key system with electronic cabinet locks were a simple drop-in replacement for current locks.

Measurement - Partnering with a consulting and project management services firm and the chosen vendor, VDOT completed a proof of concept and evaluation of the technology. A stringent compliance review was then completed.

Adjustment - Once product shipping began VDOT was able to successfully deploy all across the state, and in less than one year, updating and hardening security on more than 6,000 traffic cabinets.

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[2] https://www.medeco.com/en/resources/blog/blog-post.aehdynamic-virginia-department-of-transportation-vdot-deploys-medeco-xt-traffic-cabinet-locks-statewide-642c4383c0a148003d96c01f_medeco

Artificial Intelligence Crash Response Management - Southern Nevada[3]

The Southern Nevada Traffic Management Center (TMC) is the hub of traffic communications for the Southern Nevada region. The TMC houses four distinct agencies which cooperatively oversee freeway and arterial operations. These agencies include: the Nevada Department of Transportation (NDOT), which operates the Freeway Service Patrol (FSP) and Las Vegas ROADS, (the freeway maintenance and FSP dispatch); the Nevada Highway Patrol (NHP); the Nevada Department of Public Safety (DPS-NHP dispatch); and FAST (a division of the Regional Transportation Commission of Southern Nevada), which operates Southern Nevada traffic signals and ITS devices.

Identification - Although housed in the same facility and the same operations theater, there was never a collective platform on which all agencies shared real-time incident data. As a result, valuable information was often kept from traffic managers, impacting their ability to respond to changing scene safety immediately.

Alignment - In September 2017, an experimental pilot was launched using a digital platform to share and analyze data between these agencies. This platform operates a cloud-based system that leverages in-vehicle data and artificial intelligence (AI) to help manage traffic and prevent crashes. The system aggregates real-time and historical traffic incident information, based on data from social media feeds, crowdsourcing applications, and in-vehicle telematics, indicating possible traffic incidents and areas of concern. The platform was developed through a series of in-depth immersion sessions of platform developers working with TMC technicians, FSP drivers, dispatchers, and law enforcement to understand the existing processes, incident responsibilities and flow of information, both internally and externally between the four agencies.

Measurement - Upon implementation, the incident records contained a precise GPS location of verified incidents, type of incident, lanes impacted, injury status and vehicle type (truck, car, number of vehicles, etc.). A real-time GPS GIS-based visual of congestion, queues, incident, and safety events enable operators to have a better view of the state of traffic in Southern Nevada. Contextual driving behavior and hazard reports are directly sent to personnel on the road enabling a faster incident response. NHP troopers are able to login to the web-based platform from their vehicle's computers and see the active and pending incidents, along with their precise GPS locations and incident details, which reduces radio chatter.

Adjustment - The platform benefits included demonstrating an average 12-minute reduction in incident response times, a substantial reduction in secondary crashes via real-time travel information sharing so the public can make other route choices and relieve stress on impacted facilities, and a seamless, real-time sharing of incident information across multi-agencies, multi-discipline responders and to the public.

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[3] https://www.rekor.ai/case-studies/nevada-highway-patrol

Federal Role and Path Forward

The digital transformation of the transportation sector has ushered in a new era of infrastructure—one that is dynamic, data-driven, and continuously evolving. However, traditional procurement models are not well-equipped to keep pace with the lifecycle needs of modern, technology-centric systems. These systems require flexible funding mechanisms, ongoing maintenance, and sustained collaboration between the public and private sectors.

To modernize roadway infrastructure and ensure that projects keep pace with technological advancements, federal transportation programs must lead in adopting and encouraging outcomes-based procurement approaches. This strategy allows vendors to propose innovative solutions that meet clearly defined objectives, such as improving safety, reducing travel times, enhancing efficiency, and increasing the durability of transportation systems. By shifting the focus from rigid specifications to measurable results, outcomes-based procurement can drive more effective technology deployment across transportation networks.

The U.S. Department of Transportation (USDOT) should play a central role in advancing this shift. By expanding initiatives like the Federal Highway Administration's (FHWA) Every Day Counts program, FHWA's Special Experimental Projects (SEP) Program, and the Departments Advanced Research Projects Agency-Infrastructure (ARPA-I)., the Department can help accelerate innovation, promote best practices, and scale successful models across agencies. Providing technical assistance, case studies, and standardized procurement guidance would help agencies navigate complex technology deployments.

Management Information Bases (MIBs) are a prime example of how federal support can enable greater vendor interoperability. These standardized data sets allow transportation agencies to procure connected devices based on open, non-proprietary standards. MIBs are already advancing in areas like traffic signals, V2X equipment, sensor systems, and other ITS assets. Federal support for MIBs could include collaboration with industry on best practices for their sharing, conformance testing, and widespread use promotion.

Additionally, procurement processes must be refined to encourage greater efficiency and collaboration. USDOT should actively share best practices and case studies of successful technology procurements to help public agencies navigate the complexities of acquiring and deploying advanced infrastructure solutions. Congress and USDOT should also foster robust partnerships between private sector technology suppliers and public transportation agencies throughout the entire project lifecycle, from conceptualization to completion. Strengthening collaboration between public and private entities will ensure that projects benefit from cutting-edge innovations while remaining adaptable to future advancements. To further support these efforts, USDOT should issue clear and standardized guidance on procurement-related terminology, ensuring a uniform understanding of procurement requirements across federal transportation programs. This clarity will help agencies make informed decisions and streamline the procurement process for technology-driven solutions.

As Build-America, Buy America (BABA) provisions continue to reshape the domestic manufacturing landscape, procurement frameworks must be pragmatic and forward-looking. While the ITS and transportation industry supports the previous and current administration's goal of strengthening U.S. manufacturing, agencies need flexibility and an implementation runway to adjust. The federal government should recognize and amplify private-sector-led solutions[4] that help identify BABA-compliant products and facilities, avoiding unnecessary disruption in project delivery and deployment timelines.

[4] https://www.makeitelectric.org/nema-programs/make-it-american/

Finally, procurement frameworks should be updated to address the unique challenges associated with technology-based infrastructure investments. Project funding criteria should allow for subscription- and license-based procurements, providing flexibility and ensuring that agencies can allocate resources toward the continuous maintenance and evolution of critical infrastructure technologies. By modernizing procurement policies and embracing flexible funding structures, transportation agencies can better support the integration of smart technologies, ultimately leading to more efficient, resilient, and future-ready roadway systems.

Conclusions

By embracing outcomes-based procurement, fostering public-private collaboration, supporting interoperability standards like MIBs, and modernizing funding mechanisms, USDOT can position the nation's transportation infrastructure to be smarter, more resilient, and future ready. Strategic federal leadership will empower state and local agencies to integrate digital infrastructure at scale-driving better safety outcomes, system performance, and long-term value for the traveling public.