Now in its third round, the Federal Highway Administration’s Every Day Counts initiative is sparking greater use of innovative technologies and processes within the transportation industry. In partnership with states and other stakeholders, the initiative seeks to create a broader culture of innovation—one that advances the transportation industry while improving the nation’s roads and bridges and benefiting motorists.

By Jay Landers

Since 2009, Every Day Counts (EDC), a partnership linking the Federal Highway Administration (FHWA) with state, local, and tribal governments, has sought to showcase many of these innovations and encourage their widespread adoption throughout the transportation industry. Now in its third two-year cycle, the EDC program appears to be achieving results.

For any organization, attempting to innovate can prove challenging. “Every time you try something new, there is a risk associated with that,” says Hari Kalla, P.E., M.ASCE, the director of the FHWA’s Office of Asset Management, Pavements, and Construction. This is particularly true of governmental entities funded by taxpayer dollars.

“‘When you work in the public sector, it’s harder sometimes to take a risk,’” Kalla says. “State and local governments face a variety of challenges when it comes to adopting innovations, says Ewa Flom, P.E., the program manager for the Accelerated Innovation Deployment Demonstration program in the FHWA’s Center for Accelerating Innovation. “There are a number of barriers to why something isn’t picked up right away,” Flom says. Finding the time to learn about and become familiar with new approaches can be difficult amid the constant pressure to meet project deadlines. “Our state partners are very busy in getting these projects moving and keeping up with the demands of what their infrastructure needs are,” she says.

Even when an innovation has been proved to work for one group, others seeking to adopt the same innovation must be able to view it in terms of their own context, says Jagannath Mallela, Ph.D., the director of the federal consulting practice for WSP/Parsons Brinckerhoff, the U.S. division of the global firm WSP Group, Inc. (Mallela has worked closely with the FHWA’s EDC leadership, innovation, and marketing teams as a contractor since the inception of the EDC initiative.) In deciding whether to adopt an innovation, “one of the biggest challenges” facing any organization, Mallela says, involves answering the question, “how does it apply to me?” Local organizational, political, economic, and legal circumstances can profoundly affect the ability of an organization to adopt a new process or technique. For example, local or state laws may preclude certain contracting procedures, he says, while in other cases an agency’s staff or the local contracting community may not possess the skills required for rapidly adopting a particular innovation. “The context of the innovation matters a lot,” Mallela says.

However, a “bigger issue” for many state governments hoping to make a change, Mallela says, is the need for key decision makers to understand the likely return on investment associated with the change. For innovation to succeed, support from an organization’s leaders is critical. But because the historical data needed to document the benefits of a given innovation frequently can be hard to come by, the management of an organization often must take a “leap of faith” and look for “quick wins” when deciding to adopt an innovation, Mallela says.

Ultimately, the purpose of the EDC initiative is to help transportation agencies and their partners address and overcome these challenges. Kalla says: “What we do with the Every Day Counts initiative is [to] provide the forum,” he says. By providing information and data about certain technologies and approaches, the FHWA seeks to help state and local governments and others gain the understanding they need to make informed decisions about adopting innovations. “We help them mitigate the risk,” Kalla says. “We give the exposure to the innovation, and we engage with state leadership so that they are also on board.”

Every two years, the FHWA selects the innovations that it plans to promote for the next EDC cycle. To this end, the agency assesses the highway and bridge marketplace to determine which “underutilized” technologies would be most likely to benefit the industry overall if they were adopted on a broader scale, Kalla says. In making these determinations, the agency also evaluates its own expertise regarding the potential innovations to be promoted as part of the program.

To ensure that its choices are supported by the transportation industry in general, the FHWA publishes a notice in the Federal Register seeking public input on its initial determinations and asking for suggestions regarding other innovations that could be included through EDC. Finally, the FHWA also discusses its plans with the dozen or so members of a transportation industry stakeholders group, which includes ASCE.

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“We want to make sure that we are picking the right innovations,” Kalla says. At the same time, the FHWA wants “to make sure that our partners are on board with the decisions that we make,” he notes.

After selecting the innovations for the next round of the EDC program, the FHWA forms deployment teams within its six innovation work groups. Before announcing the technologies to be highlighted during the next EDC cycle, the FHWA holds regional summits throughout the country to meet with transportation industry representatives to discuss the technologies in more detail and address any questions or concerns that people might have regarding those technologies. The summits also afford participants an opportunity to decide which innovations are most likely to help them achieve their program goals.

Last fall the FHWA held the regional summits for the current EDC round, which is the third (“EDC-3”). Formally launched in January, EDC-3 encompasses 11 innovations. Of these, 7 aim to shorten project development and delivery time, and 4 seek to increase safety, quality, and efficiency.

• Regional models of cooperation: This approach enables state departments of transportation, metropolitan planning organizations, and mass transit agencies to engage in planning that goes beyond normal boundaries, thereby improving collaboration and, ultimately, performance.
• Improving collaboration and the quality of environmental documentation: By following practices that have proved to be highly effective (“best practices”) and using specialized online tools, participants can decrease the time needed to comply with the requirements of the National Environmental Policy Act.
• Three-dimensional engineered models: Commonly used to design and construct transportation projects, 3-D engineered models can be expanded to incorporate construction schedule and cost information, address needs related to roadway inventory and asset management, and create accurate as-built drawings.
• Electronic records (“e-construction”): By adopting a paperless process for delivering construction administration documents, practitioners can save time and resources while improving the process of managing construction documents.
• Geosynthetic reinforced soil-integrated bridge systems: By identifying the construction process and using readily available equipment and materials, crews can construct or replace bridges in much less time, saving money and reducing traffic congestion.
• Stakeholder partnering: Increased collaboration with state and federal partners enables local public agencies to work more effectively within the framework of the Federal-Aid Highway Program.
• Improving transportation department and railroad coordination: Fuller communication between state departments of transportation and railroads improves safety, expedites project delivery, and reduces costs.
• Roadway reconfigurations (“road diets”): Redefining lanes along a stretch of roadway to facilitate left turns and accommodate all users can improve safety and mobility.
• Ultrahigh-performance concrete connections for prefabricated bridge elements: A cementitious-based material that is reinforced with steel fibers, ultrahigh-performance concrete is used to create stronger, more durable connections between precast-concrete bridge components.

As part of the EDC process, the FHWA also tracks the extent to which innovations are deployed within states. In this way, the agency is able to assess the performance of the overall initiative and monitor the pace of innovation at the state level. To track performance in this manner, the FHWA uses five categories to classify the stage of an innovation in a given state:
• Not implementing: The innovation is not being pursued.
• Development: Included here are such activities as defining guidelines, choosing effective practices, building stakeholder support, and elaborating an implementation process.
• Demonstration: The innovation is tested through a pilot program.
• Assessment: The process for carrying out the innovation is assessed, and preparations are made for full deployment.
• Institutionalized: The innovation has been adopted as a standard process or practice and is used on a regular basis.

Before rolling out EDC-3 this past January, the FHWA conducted a baseline assessment of the implementation stage of each innovation within the states. At the same time, the states established goals related to the implementation of some or all of the innovations during the two-year time frame of EDC-3. Armed with this information, the FHWA is able to support and track the performance of the states as they work to meet their goals.

The EDC-3 program is about more than simply tallying the number of projects that incorporate the selected innovations. Instead, the goal is to transform the nature of the transportation industry to make it more receptive to innovation in general, Kalla says. “The whole purpose is just to change the culture,” he notes.

Among the innovations included as part of EDC-3, the Michigan Department of Transportation (MDOT) has benefited greatly from the use of e-construction. Eliminating paper from its construction administration delivery process has helped the agency in numerous ways, among them by lowering costs and improving relations with contractors, says Mark VanPottfleet, MDOT’s chief operations officer and deputy director. “The desire to reduce the amount of staff time devoted to managing paperwork prompted the MDOT to begin implementing e-construction approximately two and a half years ago. "In construction, you have a lot of processes that require paper approval and take an exceptional period of time," VanPottfleet says. For example, payments to contractors cannot be made without first ensuring that all of the necessary paperwork is in order, a process that used to take a great deal of staff time. “The one thing that became clear is that if we had an automated method for processing papers through the process, we could save a lot of time,” he says.

To improve its process, the MDOT took such steps as equipping its field staff with mobile devices, implementing electronic processes for reviewing and approving documents, and transferring plans and contract specifications electronically. The benefits have been substantial, both for the MDOT and for its contractors, VanPottfleet says. The use of digitally encrypted electronic signatures and electronic methods for processing paperless payments has enabled the department to process contract modifications in days rather than weeks. “We made the payments ‘exponentially quicker,’” he says. “It’s just been a godsend, to be honest.” As for the contractors themselves, they quickly realized the benefits of the new approach. “Once we got this out there, none of [the contractors] ever wanted to go back,” he says.

Change orders are another key aspect of the construction process that are now handled much faster through e-construction. “There has been at least a 10-fold reduction in the processing time for doing construction change orders,” VanPottfleet says. By using mobile electronic devices, MDOT staff members can approve change orders anytime, even in the field, rather than having to conduct such activities in the office. Because staff members no longer have to return to the office at the end of the day to finalize paperwork, they have been freed to work on other activities at the jobsite. Having a process that works in a timely manner and can be handled from anywhere is the “real benefit” of e-construction, VanPottfleet says.

Its construction administration efforts once required an “astronomical” level of paperwork, but the MDOT has reduced this amount “to almost nothing,” VanPottfleet says. By using electronic documentation, the agency has reduced its paper consumption by an estimated 6 million pieces of paper per year and decreased its average time for processing contract modifications from 30 days to just 3. “We’ve been able to speed up the process and free up a great deal of staff time,” VanPottfleet says. By decreasing paperwork, the agency has reduced its paper consumption by an estimated 6 million pieces of paper per year and decreased its average time for processing contract modifications from 30 days to just 3.
Deficient Bridges Using New Technology,” on Civil Engineering online.)

A GR-S-IBS project comprises three main elements: a foundation of reinforced, ungrouted, and an integrated approach. For the foundation, layers of compacted granular fill and geosynthetic reinforcement are alternated, creating a highly stable composite material that performs predictably. The span is placed directly on the substructure, creating a smooth transition between the roadway and the bridge and eliminating the “bump” that commonly occurs at locations. The technique also obviates the need to use deep joints, deep approach slabs, or cast-in-place concrete, according to a summary of the approach provided by the FHWA.

Because it requires only commonly available materials and equipment and can be implemented by means of standard earthwork methods and practices, a GR-S-IBS structure “can be designed and built at substantially less cost than for conventional methods,” according to the FHWA summary.

One champion of the GR-S-IBS approach is Warren Schlatter, P.E., P.S., the county engineer for Defiance County, in northwestern Ohio. In 2005 Defiance County began using the technique to build culverts and eventually extended it to bridge construction. It has constructed more than 30 bridges by means of the GR-S-IBS approach, Schlatter says. All two-lane structures, the bridges have ranged in size from a 10 ft long span approximately 5 ft above the underlying water to a 130 ft long span roughly 25 ft high.

After gaining experience with the GR-S-IBS approach, Defiance County has become proficient in the “very rapid construction” of two-lane bridges, Schlatter says. “We’ve found so far that the cost advantage is more than a built with 30 bridges by means of the GR-S-IBS approach, Schlatter says. All two-lane structures, the bridges have ranged in size from a 10 ft long span approximately 5 ft above the underlying water to a 130 ft long span roughly 25 ft high.

After gaining experience with the GR-S-IBS approach, Defiance County has become proficient in the “very rapid construction” of two-lane bridges, Schlatter says. “We’ve found so far that the cost advantage is more than four times that of a bridge built with the conventional approach,” according to a summary.

In the past, county crews constructing a culvert or a bridge would have to dig one abutment and basically keep that hole dry for the entire construction. In some cases, it has even been possible to construct bridges during periods of high water. In New York, for example, the drive to complete construction projects faster is spurred by innovation that cuts costs and improves performance. For bridge projects, the use of prefabricated components facilitates construction and ensures higher quality than would be obtained with traditional cast-in-place processes. Greater use of prefabricated bridge elements prompted a search for a better way to connect these elements in the field. For the New York State Department of Transportation (NYSDOT), the solution has involved ultra-high-performance concrete (UHPC), one of the innovations fostered by EDC-3.

UHPC is used between prefabricated concrete components to form a simple, strong, and durable connection. Thanks to its properties, a GR-S-IBS bridge can be constructed in a single day, says Daniel D’Angelo, P.E., M.ASCE, the agency’s deputy chief engineer. The technique “simplifies making the connections” and “improves the quality of those connections significantly,” D’Angelo says. “It helps tremendously with accelerated construction techniques.”

Since 2009, NYSDOT has used UHPC as part of 31 bridge projects. The technique has helped the agency shorten project time frames, save money, improve quality, and benefit the traveling public. For example, accelerated construction and the use of UHPC result in shorter road closures and fewer detours, D’Angelo says.

Because it improves the connections between prefabricated components, UHPC also confers long-term benefits. “The concrete connections [made with UHPC] last longer, and it results in the bridge lasting longer,” says Jennifer Post, a NYSDOT spokesperson. "Because with those joints lasting longer, we don’t have the leakage that causes the steel members to deteriorate," Post says. Ultimately, NYSDOT expects to spend less on maintenance for bridges made with UHPC.

“Like a tradition that’s dying out,” Post says.

Whereas some states select a few innovations to adopt as part of each EDC round, NYSDOT addresses them all. For each EDC round, the agency prepares a plan detailing the extent to which it plans to incorporate a particular process or technology and how it intends to do it. During the year, NYSDOT tracks performance to determine whether the objectives are attained. The initiatives are aimed at improving “all aspects” of the agency’s processes and project delivery mechanisms, Post says. As a result of implementing these innovations, she notes, NYSDOT is benefiting from “better, more effective planning; enhanced traffic safety; efficiencies and savings in terms of contract delivery; and smoother, faster, more innovative processes that save the agency money and minimizes the impact on the traveling public.”

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By integrating multiple innovations promoted during the EDC program, NYSDOT is reaping significant benefits as it replaces the Kosciuszko Bridge. Opened in 1939, the structure carries the Gowanus Expressway (Interstate 288) over Newton Creek and links the New York City boroughs of Queens and Brooklyn. The $355-million effort to replace the bridge is one of the largest projects ever undertaken by NYSDOT. In developing the project, the agency used innovative planning methods included in earlier EDC rounds to develop a clear project schedule and highly detailed cost estimates, Post says. By selecting a design/build approach, the department expects completion four years earlier than would be the case with conventional construction. UHPC will be used in most project as well. As a result of using various EDC innovations on the project, NYSDOT expects to enjoy “significant cost savings” while causing “less inconvenience” to motorists, Post says.

Through the EDC initiative, the FHWA aims to help more state and local governments, tribal governments, and other public agencies deliver transportation projects the type of benefits enjoyed by NYSDOT, Defiance County, and the MDOT. Through technical outreach and support, the EDC initiative “has provided benefit and value” for participants, Mallela says. As an example, he points to the so-called peer exchanges, where transportation professionals who have experience with a particular innovation meet with others who wish to learn about that technology or practice. The peer-to-peer contact that occurs during such meetings is the “biggest benefit” offered by EDC, Mallela contends.

By “shining a sustained spotlight” on specific processes and technologies, the EDC initiative has “really sharpened the focus on innovation” within the transportation industry, Mallela says. To its credit, the FHWA leadership and innovation teams have worked diligently to involve the states as partners in the efforts, he says, producing a partnership that continues to improve over time. “States have a huge role to play in that,” he notes, particularly through the development of bodies referred to as state transportation innovation councils. Thus far, 47 states have established such councils, each of which brings together transportation professionals who work in concert to foster innovation within the state. The councils are a “legacy” of the EDC initiative, Mallela says, and they are expected to continue to deliver innovation within the transportation industry for some time.

From ASCE’s perspective, the EDC initiative “dovetails with our own focus on highlighting solutions for maintaining and modernizing our nation’s infrastructure,” says Emily Freenesta, the Society’s director of infrastructure initiatives. “We both share the goal of promoting the innovations that are state of the art and allow us to maximize limited investment dollars for transportation,” Freenesta says. “Over the past year or so, ASCE has gotten more involved in the EDC initiative and in working with FHWA to identify innovative engineering practices and programs as part of the industry stakeholders group.”

Ultimately, the FHWA’s goal for EDC transcends simple recommending the adoption of various technologies by transportation interests. Rather, the initiative aims to develop a “self-sustaining system” within the states themselves that fosters greater awareness of innovation and a fuller understanding of its potential, Kalla says. “I think we are getting there,” he says, citing the growing number and influence of state transportation innovation councils. “More and more, states are getting excited. I think we are making a difference in terms of creating a culture of innovation,” he says. “That’s the bottom line.”

Jay Landers is a contributing editor to Civil Engineering.

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