Photo: Michigan Department of Transportation

Developing a Knowledge Management Practice

One State's Experience

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One of the commercials in the "Pure Michigan" series begins with the words "handed down." Soothing music and enticing images accompany those words, and the ensemble brings to mind a time when life was simpler, maybe sweeter, and certainly slower paced.

But that is not the world on most days. The majority of transportation professionals today are working to address stagnant or falling revenues, aging infrastructure, increased transportation demand, workforce turnover, and technological change. These efforts cannot proceed at a slow pace.

Running Leaner

Stagnant or falling revenues, in particular, have prompted transportation officials to seek more economical solutions by partnering with the private sector or by reducing the size of the agency's workforce. Some state departments of transportation (DOTs) have been trimming their budgets for many years; others have only felt the pinch lately. But today most are running much leaner than before.

Michigan DOT has been running leaner for nearly two decades. The agency's workforce is half the size it was when highway construction was at its peak in the 1970s. Michigan DOT has weathered at least three waves of early retirements in the past two decades—in 1997, 2001, and most recently 2011—as well as three reorganizations. Michigan DOT has not hired a new employee under the old-style pension system since the spring of 1997. The workforce today is smaller and more "portable" than in the past.

(*Above:*) The Yankee Springs State Recreational Area in Barry County, a popular Michigan tourist destination—"pure Michigan."

Michigan DOT began outsourcing approximately half of its project design in the 1990s. Coupled with computer technology, outsourcing has allowed the agency to sustain a smaller workforce while still keeping up with a larger annual program. As a result of conscious efforts to encourage innovation and to communicate best practices across the department, staff continue to find ways to operate more efficiently and cost-effectively every day.

Although these cost-cutting measures clearly have contributed to efficiency, knowledge can be lost. To prevent losing the knowledge once handed down by longtime employees, Michigan DOT undertook an effort to capture that knowledge as an integral part of the programming and project development processes. Although the agency at the time did not call this knowledge management, it was—the steps taken align closely with the knowledge management practices applied today.

Photo: Michigan Department of Transportation

Highway construction in Michigan. Michigan DOT's workforce is half the size it was in the 1970s.

Data Management

The start of Michigan DOT's knowledge management efforts accompanied a new approach to data, relying on the management systems first required by the Intermodal Surface Transportation Efficiency Act of 1991. When the federal requirement expired, Michigan DOT chose to complete its data management systems, intending to collect one set of data, stored centrally, and to encourage staff throughout the department to use the single database.

This ended the development of silos of data controlled by an individual and shared only on a need-to-know basis. The departmentwide approach to data management has informed later decisions that have advanced the agency's knowledge management efforts.

Decentralized Expertise

The department reorganized in 1997, decentralizing to bring transportation expertise closer to all customers. The effort was not without challenges—the relocation of staff placed their experience and expertise at a remove from central management, raising concerns about consistency and alignment.

Effective decentralization clearly required improvements in communication and a conscious effort to manage knowledge. The department therefore established several teams to ensure alignment across the organization. At first, the teams met often and for long periods, establishing and incorporating good habits of communication, but as cross-region communication became ingrained, the teams found a rhythm.

The department's quarterly and somewhat unwieldy Management Team meetings gradually evolved into shorter monthly meetings of a smaller subset, called the Leadership Team. Monthly Operations Executive Staff meetings—involving a cross-section of region and central office engineering and planning managers—gradually became bimonthly meetings. The Region and Bureau Management Team—involving a broad set of engineering managers—continues to meet monthly. All the meetings follow a regular agenda, and the minutes are circulated widely throughout the department and are available on the intranet to keep interested staff informed.

A one-day annual Highway Operations Alignment Conference expanded in scope to include managers and staff-level "rising stars" from all parts of the department to share big-picture information on Michigan DOT's—and the state's—progress and direction and to showcase best practices and innovations. The updated version of the conference replaced a more costly, multiday leadership conference, which had provided many of the same knowledge management and leadership opportunities across the organization.

Performance Management

Employee performance management plans are becoming a more integral part of the agency's knowledge management efforts. With these plans, every full-time employee has a set of specific performance factors and receives an annual assessment of performance with regard to those factors; afterwards, a new plan is developed for the following year.

The assessment replaces a cumbersome paperwork exercise that was hard to track and therefore easily avoided or overlooked. The performance plans are part of a computerized template that is readily com-

Photo: Michigan Department of Transportation

Incorporating new project management technologies and improvements, Michigan DOT's ProjectWise document workflow facilitates efficient collaboration in highway construction program administration.

pleted and visible for employees and for managers all the way up the management chain. The department recently made the completion of employee performance management plans a performance criterion for managers and supervisors and is tracking the number of plans completed at the deadlines.

Michigan DOT's strategic plan provides the context for developing employee performance measures.[1] As on a sports team without extensive bench strength, all employees need to stay engaged, be productive, and keep working toward specific goals—communication and the sharing of knowledge are critical.

Foundational Curriculum

With today's more mobile workforce, Michigan DOT is working to ensure that new employees have access to a standard body of knowledge as quickly as possible. The agency has instituted a Workforce Development Program Foundational Curriculum, to be completed by all employees within one year.

[1] www.michigan.gov/documents/mdot/MDOT_mission_vision_and_goals_2_375168_7.pdf.

The course's content ranges from the basic—for example, Michigan DOT culture, file management, and time sheet completion—to legally required training, such as preventing discriminatory harassment or wearing personal protection equipment. Also included is qualitative instruction in ethics, integrity, conflict resolution, and team building.

The program addresses 14 categories of knowledge, most of which are presented in a variety of course options and in a variety of formats, from classroom-style to videos or interactive electronic instruction accessible from an employee's desk. Veteran employees were able to review their course histories and to claim credit for similar courses completed in many of the more basic categories. All employees, however, had to complete the legally required courses.

A shorter, follow-up curriculum was developed for supervisors and managers, to cultivate understanding and consistency in labor relations and supervisory responsibilities. In all, the Michigan DOT curriculum provides a variety of ways for all employees to gain the information they need to be effective in a new job or a new location.

E-Construction

Much of the knowledge once captured in paper documents and archived and accessed in libraries and file rooms is now generated, stored, and accessed digitally. Michigan DOT therefore initiated the e-construction process, a paperless approach to the administration of design and construction.[2]

After the success of four pilot projects in 2013, the department quickly mandated the procedure for all construction projects. Many hurdles arose in digitizing the process and in sharing document management software with private-sector partners at no cost—such as legal concerns, technology upgrades,

[2] https://www.youtube.com/watch?v=HAbYgqgnyB8.

Photo: Michigan Department of Transportation

The Latson Road project in Livingston County is one of Michigan DOT's paperless projects, which use electronic signatures for construction documents.

and Federal Highway Administration approval—but all were resolved.

E-construction relies on mobile devices in the field to access electronic construction plans and proposals, manuals and guides, filing systems, document submittals, fillable forms, and automated document workflows.[3] The process enables digital payroll transmittals, relies on digital design plans, and requires digital signatures. New users receive training online via a Wiki site, and construction manuals have been converted to e-books to be more accessible for all employees; in addition, updates to the manuals are more timely and cost-effective.

The e-construction process saves money for Michigan DOT and for its contractors but also offers benefits from a knowledge management perspective. The open and transparent document management system allows users to access project documentation on a desktop, laptop, or mobile device. Michigan DOT is able to capture and retain information from all parties involved in a project, from design through construction, in the field or in the central office, in a single data repository that everyone can access from any location.

Process Documentation

Michigan DOT applies knowledge management to more than construction. The Bureau of Transportation Planning has undertaken a thorough effort to encourage staff to document their processes. Large-scale efforts, such as the development of the State Long-Range Plan or Michigan DOT's Five-Year Program, require lengthy step-by-step documentation, but even smaller efforts—such as planning for carpool parking lot improvements—are documented in some way.

Having a documented set of processes is now a requirement for the processing of any staff reallocation or promotion. The bureau stores the documented processes digitally on a network drive available to any planning staffer who needs to understand the steps in a given planning process. The step-by-step information about current processes can aid in developing new processes as the need arises.

New Efforts

Most recently, Michigan DOT has begun to develop and share knowledge related to real estate acquisition. For transportation agencies, real estate acquisition requires a specialized body of knowledge—expertise not easily found at a career fair, but cultivated within the organization.

A departmental reorganization in 2011 reassigned and relocated some real estate professionals among the central office and the seven region offices. The changes also shifted or privatized important process responsibilities to mitigate the effects of the workforce reductions. In the years following, inconsistencies surfaced from region to region; improvements were needed in documentation and communication.

A presentation on knowledge management at a Transportation Research Board Annual Meeting inspired an experiment in the agency's real estate business area. Guided by the information in National Cooperative Highway Research Program Report 813, *A Guide to Agency-Wide Knowledge Management for State Departments of Transportation*,[4] the initiative seeks to develop a knowledge management strategy and implementation plan. The step-by-step approach involves working directly with the department's real estate professionals and has included an employee survey. The goal is to reinforce knowledge management principles to create a sustainable organizational culture.

Conscious Steps

Handed down—in the past, knowledge that was handed down, or across, relied on time, tradition, and a paper trail to build a gradual understanding over years of experience and activity. The rapid pace of modern life undercuts that tradition in ways that can be devastating without planning and preparation.

The technological tools to ease that transition are available, but technology alone will not suffice. Taking conscious steps to capture and manage knowledge and to share it widely has helped Michigan DOT survive and thrive despite budget cuts, downsizing, and rapid employee turnover. In Michigan, ever since Henry Ford's moving assembly line, adoption of the latest technology to expand the ability to move the world is a long-standing tradition, handed down for generations. That is pure Michigan.

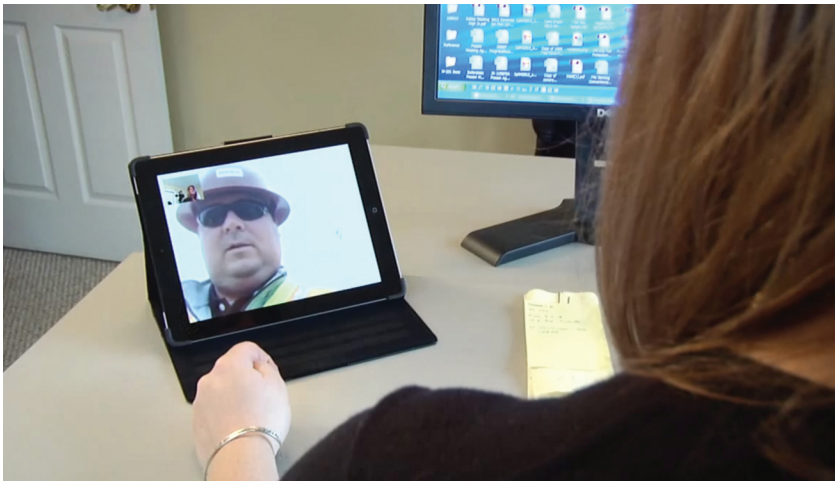
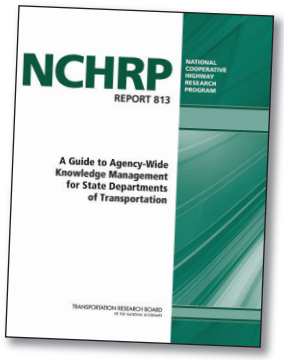


Photo: Michigan Department of Transportation

Mobile devices connect Michigan DOT employees in the field with those in the agency's offices.



For more information on NCHRP Report 813, *A Guide to Agency-Wide Knowledge Management for State Departments of Transportation*, see www.trb.org/Publications/Blurbs/173082.aspx.

[3] https://www.youtube.com/watch?v=y_9XCy2IQ2w.

[4] www.trb.org/Main/Blurbs/173082.aspx.