Leveraging environmental scanning methods to identify knowledge management activities in transportation

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Abstract

Purpose – *The purpose of this paper is to highlight the level of knowledge management (KM) activity underway in the transportation sector. The environmental scan highlighted common business drivers for KM across transportation agencies.*

Design/methodology/approach – *The project team used outreach methods, environmental scanning techniques, targeted interviews constructed around amplifying questions to identify stakeholders. A two-day workshop was sponsored, where stakeholders could discuss common business interests and exchange KM practices.*

Findings – *The environmental scan methodology was successful and will be carried over to two other economic sectors in the coming year. The identification and elaboration of business drivers through the amplification process was a valuable contribution. Sharing of KM practices was highly effective because the participants were working from a common set of business drivers.*

Research limitations/implications – *This activity has implications for other sectors. Well-designed environmental scans of KM programs and initiatives can identify stakeholders for intra-sector communities of practice. These communities of practice provide a support network for knowledge professionals working within organizations, provide the input for intra-sector KM research agendas, and a collaborative action plan for moving that agenda forward.*

Practical implications – *The workshop participants identified six action items to advance the practice of KM within their institutions.*

Social implications – *The environmental scan and the workshop resulted in the creation of a community of practice of knowledge professionals for the transportation sector. The community of practice will work to advance KM within the transportation sector.*

Originality/value – *The authors believe the scan approach provides a new and valuable approach to encouraging the practice of KM in the field of transportation. The authors also suggest that this approach may be used effectively in other sectors to promote the discipline.*

Keywords *Community of practice, Knowledge sharing, Research agenda, Business drivers, Environmental scanning, Transportation*

Paper type *Research paper*

Received 3 January 2015
Revised 16 January 2015
23 January 2015
Accepted 27 January 2015

The work described in this document was conducted as part of National Cooperative Highway Research Program (NCHRP) Project 20-68A, the US Domestic Scan program. This program was requested by the American Association of State Highway and Transportation Officials (AASHTO), with funding provided through the National Cooperative Highway Research Program (NCHRP).

Introduction

There are few reports in the peer-reviewed literature of efforts to assess or advance knowledge management (KM) practices at an economic sector level. The majority of the peer-reviewed literature focuses on KM practices and efforts at the organizational, the community or an individual level. This makes good sense because conventional wisdom suggests that the goal of KM is to create an organization whose collective value is greater than the simple sum of its parts (Bollinger and Smith, 2001). While it makes good sense to focus on the organization level when addressing KM practices, focusing on the sector level makes more sense for assessing the state of the practice of KM and for generally advancing the discipline. This paper describes a novel effort to advance KM at an economic sector level. This paper describes an effort begun by a broad-based community of practice among knowledge practitioners in transportation agencies.

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To date, discussions of KM in the transportation sector have tended to focus on knowledge technologies and the application of operations research and artificial intelligence methods to transportation problems (Boose and Bradshaw, 1987; Brady *et al.*, 2006; Chuang, 2004; Cuena and Molina, 2000; de Gooijer, 2000; de Laurentis, 2005; Fischer, 2001; Fugate *et al.*, 2009; Newell *et al.*, 2003; Yang *et al.*, 2009; Wu, 2001). Recently, though, there has been an increased recognition of a broader spectrum of KM activities across the field of transportation. Looking within the core KM journals and in transportation specific sources, we find references to a broader range of KM topics (Carrillo and Chinowsky, 2006; Cheung *et al.*, 2007; Greiner *et al.*, 2007; Sveiby and Simons, 2002). While there may be few reports of KM efforts in the field of transportation, significant opportunities exist. The challenge is how to raise awareness and mobilize KM professionals across the sector.

The community of practice emerged from a concerted effort by the National Academy of Sciences Transportation Research Board to increase the recognition of the value and expand the practice of KM throughout the transportation sector (Casey *et al.*, 2012; Cronin *et al.*, 2013; Park, 2013). The National Research Council's Transportation Research Board (NAS TRB) established AB010T Task Force on Knowledge Management as part of TRB's Technical Activities Division (www.mytrb.org/CommitteeDetails.aspx?CMTID=3918). The NAS TRB Task Force on Knowledge Management is part of the Research Education, and Data and information Systems Section, under the Policy and Organization group. Over the past few years, the Task Force, under the leadership of Leni Oman, Knowledge Strategist and Director, Office of Research and Library Services, Washington State Department of Transportation, has supported several important KM outreach and research initiatives.

As part of this effort to grow awareness and adoption of KM practices, the National Cooperative Highway Research Program (NCHRP) (2013a, 2013b, 2013b) has funded several KM-focused research projects, including NCHRP 20-75 (completed), NCHRP 20-90 (completed), NCHRP 20-96; NCHRP 20-97; and NCHRP 20-98. The work described in this paper was conducted as part of the NCHRP Project 20-68A, the US Domestic Scan program (National Academy of Sciences Transport Research Board, 2014). This program was requested by the American Association of State Highway and Transportation Officials (AASHTO), with funding provided through the NCHRP. The NCHRP is supported by annual voluntary contributions from the state departments of transportation. Additional support for selected scans is provided by the US Federal Highway Administration and other agencies.

Community of practice for advancing KM in transportation

This paper describes several good practices designed and implemented by the community of practice. The good practices are anchored in an environmental scan of KM practices across the sector. Environmental scanning is an important business intelligence methodology which identifies internal and external factors that may influence an organization's position in its economic sector. In this case, an environmental scanning methodology was used to assess the state of KM practices in the field of transportation. The results of the environmental scan set the stage for a three-day workshop where participants level set their understanding of KM and shared their current practices. The environmental scan and the workshop were effectively designed around business drivers important to the

field of transportation. This alignment is a good practice design in itself. The workshop design and the facilitation of the community's core team produced highly effective knowledge sharing and relationship building. Additionally, because of the strong preparation and good focus, the community members identified a vision for their future work, and for advancing KM practices throughout the sector.

The authors share the scan methodology and outcomes with the intent of encouraging others in the transportation sector to join in the dialog. The authors also encourage KM professionals to organize similar sector-wide conversations. The full report of the environmental scan can be downloaded from the TRB website http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=1570

Good practice 1: environmental scan design and implementation

On November 18-19, 2013, the NCHRP hosted a workshop entitled, Advances In Transportation Agency KM (Project 20-68A, Scan 12-04) (National Academy of Sciences Transport Research Board, 2014). The two-day event in Baltimore, Maryland, was the culmination of an environmental scan of KM activities in the transportation sector. The purpose of the environmental scan was twofold:

1. to accelerate beneficial innovation by facilitating information sharing and technology exchange among the states and other transportation agencies; and
2. to identify actionable items of common interest.

As a sponsored event, the workshop was an important sign of the value KM brings to the field of transportation. As a KM activity, the workshop demonstrated the importance of cross-agency knowledge sharing and the building of communities and professional relationships. As a business intelligence strategy, the workshop surfaced a wealth of KM initiatives and methods. And, as a research project, the environmental scan demonstrated a methodology that may and, we advocate, should be taken up by other industries and economic sectors. Such environmental scans within sectors could have a significant impact on the visibility and value of KM.

A environmental scan team consisting of state Departments of Transportation (DOTs) and US Department of Transportation (USDOT) administration staff was formed to guide the environmental scan and develop findings, recommendations and implementation actions. The environmental scan team leads brought a wealth and diversity of KM implementation experience and an understanding of DOT management and workforce challenges to the table (National Academy of Sciences Transport Research Board, 2014). The team planned and delivered a three-day workshop in Baltimore, Maryland, from November 19-22, 2013. The workshop allowed organizations identified through the environmental scan to share their current KM practices. In all, participants reviewed KM activities in seven state DOTs (i.e. Alaska, Georgia, Kansas, Missouri, Virginia, Washington and Wisconsin); three USDOT administrations (Federal Aviation Administration [FAA], Federal Transit Administration [FTA] and Federal Highway Administration [FHWA]); two private sector organizations (Kraft Foods and Accenture); the National Aeronautics and Space Administration (NASA); and one international agency, the Alberta Transportation.

The planning team's approach to developing the environmental scan is considered a good practice from a business and competitive intelligence perspective. The planning team collaboratively developed a draft set of amplifying questions. These questions were key to

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establishing a well-defined scope. The team next conducted a broad call to identify transportation agencies with documented KM initiatives. The broad call helped to identify pertinent literature, and consisted of searches of the Transportation Research International Documentation, the integrated database that combines the records from TRB's Transportation Research Information Services Database and the Organization for Economic Co-operation and Development's Joint Transportation Research Centre's International Transport Research Documentation (JRD) Databases. These searches were supplemented by searches of resources on selected KM and transportation research Web sites. From this review, the team compiled a list of agencies and sent follow-up e-mails to agency representatives, requesting further information on the status of their efforts. Because there is not yet a commonly understood definition of KM among transportation agencies, the e-mail messages included an outline of the topics covered by the amplifying questions to communicate the scan's scope. The scope description helped transportation agencies identify KM initiatives and efforts. The scope was defined by the amplifying questions suggested by team, and placed in a broader context by Kent State University's KM graduate program (National Academy of Sciences Transport Research Board, 2014).

Dr Maureen Hammer, a member of the planning team and director of the KM program at Virginia DOT (VDOT), helped the team identify additional agencies by providing a list of individuals who had requested information about VDOT's KM program over the past several years. The team made follow-up phone calls with selected transportation agency representative (National Academy of Sciences Transport Research Board, 2014).

While the focus of the environmental scan was on transportation agencies, the team also identified a limited set of non-transportation public agencies and private organizations with KM programs. Based on the information gathered, the team developed a prioritized list of agencies that merited further investigation, highlighting practices of interest.

The planning team held a day-long organizational meeting on July 31, 2013 to review the desk scan's results, refine the amplifying questions and select organizations to include in the scan. Following this meeting, the team invited the selected organizations to participate and asked them to provide written responses to the amplifying questions in advance of the scan meeting. The knowledge sharing that took place at the November workshop was designed around the amplifying questions. From the context of a community of practice, the planning team's environmental scan also served to help define the community's domain and boundaries (National Academy of Sciences Transport Research Board, 2014).

Good practice 2: aligning KM with agency-level transportation business drivers

The amplifying questions not only helped to define the scope of current KM practice in the sector, they also helped to define the six most important business drivers for KM in the field of transportation. The six drivers were aligned with a faceted description of the field of KM (Bedford, 2012). The six facets included:

1. intellectual capital management and the impacts of the emerging knowledge economy;
2. the use of knowledge in key business processes;
3. the increased need to manage information assets;

4. the importance of team work, collaboration and communities of practice to knowledge retention, transfer and innovation;
5. a focus on organizational learning and strategic talent management; and
6. the importance of leadership and strategy to effective KM programs.

The nature and implications of these business drivers for state transportation agencies are discussed in detail below.

In the context of an emerging community of practice, these six business drivers equate to areas of common practice. The planning team 's identification of common business drivers was a wise action. Experience has shown that KM effort shave a higher probability of succeeding where they are aligned with business goals and where they target pain points the business is experiencing.

Business driver 1: intellectual capital and knowledge economy. Intellectual capital is defined as capability to manage an organization's intellectual capital, including its human capital, structural capital and relational capital. Human capital management includes understanding the theory of knowledge and expertise, the economic view of knowledge and knowledge assets, managing and investing in knowledge workers, talent and competencies, the skills required to manage a global workforce, a virtual workforce and international workforces. State agencies highlighted four general intellectual capital and knowledge economy business drivers.

A critical intellectual capital business driver is the loss of expert knowledge due to attrition, retirement, workforce reductions and the tendency of younger workers to change jobs frequently. In some agencies, up to 30 per cent of the workforce is eligible for retirement within the next five years. While transportation is a field for which there is formal education, it is the interpretation and application of that knowledge over time that has built the country's transportation system. There is a significant need to mitigate the impact of retirements on institutional knowledge, particularly for key staff and core business operations. Knowledge loss and attrition are not limited to retirements, though. In addition, younger and mid-career employees are changing jobs more frequently, transitioning both within the organization and across organizations. Workforce transitions are creating both challenges and opportunities for DOTs, as they seek to improve the delivery of transportation projects and services with increasingly limited resources. Workshop participants indicated that KM methods and techniques might be valuable tools to meeting these challenges.

Another important intellectual capital business driver is the need to foster innovation in areas including transportation finance, construction and operations. Traditional approaches need to be rethought. A new approach to innovation is needed, one that is adaptable to a wide scope of challenges, and is inclusive and integrative. State agencies are challenged to create working environments which support innovation and knowledge sharing.

Finally, like many other public sector organizations, state transportation agencies are grappling with a lost generation of leaders, resulting from staff cutbacks in the 1990s. This means looking for innovative ways to develop leadership skills in new and existing staff. Whereas in the past, these skills could evolve over time, targeted interventions are now needed. Coincident with this driver is the need to support faster on-boarding, development and integration of new employees.

Business driver 2: organizational learning. Organizational learning includes capabilities that support a learning organization, including group learning, individual learning, situational learning, lifelong learning, learning in virtual environments, instructional design and problem-solving methodologies. Intellectual capital and innovation are fueled by organizational learning. State agencies realize the value of organizational learning and employee development. They face challenges in designing and delivering cost effective

learning opportunities, though, in financially constrained environments. Organizational learning strategies for state transportation agencies must address a broad scope of subject matter-specific proficiencies as well as core behavioral competencies.

Business driver 3: communities of practice and team collaboration. Collaboration and communities has both hard and soft competencies. The soft aspects include fostering inter- and intra-organizational, as well as intro-unit, collaboration, encouragement of professional, knowledge and social networking and development of facilitation and resolutionary skills among team members. The hard aspects include designing and implementing environments and technologies that foster collaboration – whether in physical or virtual spaces. Mission complexity and the diverse nature of project teams highlight the importance of using communities of practice and collaboration to ensure effective teamwork. In some agencies, 90 per cent of the work is being done by industry partners, and, in some of those cases, partners are international. Shifts from an emphasis on construction to an expanded focus on maintenance and system operations call for greater internal and external collaboration.

Collaborative environments and virtual communities of practice can help foster relationships among geographically dispersed team, particularly those that include individuals working in remote locations. Leveraging communities of practice and extended project teams can also reduce the risk and inefficiencies that result from relying on a few experts. Lack of knowledge distribution can create vulnerabilities for organizations. There is also a recognition among agencies that past failures may be attributable to a lack of effective collaboration and a failure to recognize diverse perspectives. In general, state agencies recognize that collaboration leads to success for stakeholders and creates a strategic advantage.

Business driver 4: access to and discovery of knowledge and information assets. Knowledge asset management includes capabilities related to knowledge retention and loss, mapping, diffusion and mobilization, transfer, knowledge organization systems, information governance, quality, disclosure, policy, content and records management and preservation. State agencies indicated that the global and diverse nature of business mandates that project teams and stakeholders have quick access to content, approaches and methods needed to deliver solutions. All organizations have large amounts of information and know-how. The shift from paper to digital environments has enabled creation, capture, encoding and availability of information and knowledge. It has also introduced challenges in terms of effective and efficient access. In addition, the field of transportation rests on a very broad topology of information. The kinds of information assets that are important to state agencies and their stakeholders go beyond the traditional information management guidelines. Given the focus on efficiency noted earlier, KM interventions may allow staff to reuse and repurpose rather than reinvent.

DOTs are seeing exponential increases in the amount and variety of available information – from both internal and external sources. There is growing recognition of the importance of having an organization-wide information management strategy so that information can be found when it is needed. Without a coordinated strategy, multiple efforts for information storage and management are initiated within organizational silos, resulting in duplication and inefficiency.

Younger generations of workers have different communication styles and expectations about information access. They are most comfortable with electronic means of communication and are less likely than their predecessors to pick up the phone. They expect online access to the information they need to perform their jobs. This creates an impetus for more disciplined efforts to capture, codify and post mission-critical information. Such efforts would provide persistent access to a consistent information base and decrease employee dependence on an increasingly weakening "grapevine" for information. On the other hand, even the best information or knowledge repository cannot

substitute for person-to-person communication, so there is also an impetus for more proactive efforts to support networking within the organization.

Business driver 5: knowledge leadership and strategy. Leadership and strategy focuses on the capability to:

- develop and promote a knowledge vision;
- develop a strategy to realize that vision;
- communicate the organization's commitment to the vision and strategy, leading by example; and
- identify opportunities for knowledge interventions, acting as a transformation agent in shifting the organization's thinking from industrial and financial capital to intellectual capital and knowledge and intellectual policy guidance and formulation.

State transportation agencies are committed to organizational performance excellence. This means being able to deliver on established agency values of excellence, teamwork, safety and integrity. In many cases, this requires an increase in operational efficiency. Cost efficiencies and lean processes may lead to improvements. Such improvements, though, may come at the cost of developing and managing intellectual capital and encouraging innovation, so careful balance is required between shorter- and longer-term perspectives. Some organizations have linked KM to initiatives such as Baldrige Performance Excellence Performance Management (Baldrige Performance Excellence Program, www.nist.gov/baldrige/) and Lean Six Sigma (www.motorolasolutions.com/USA-EN/Training+Home/Lean+Six+Sigma).

Business driver 6: knowledge-embedded operations. Knowledge operations also has both soft and hard competencies. The soft competencies include ensuring that knowledge processing is aligned with the organizations business goals and objectives, and is integrated into the organization's everyday business and work. It also includes decisions sciences and systems, business architecture and workflow management. The hard competencies include elicitation and representation of human capital (tacit knowledge and skills) as structural knowledge (business rules, business process applications), business process optimization, operations compliance and business analytics. State agencies also see a need to ensure that knowledge is leveraged within operational processes. Improved use of knowledge may lead to increased organizational performance including productivity, agility and better decisions.

Good practice 3: knowledge sharing and exchange of practices

The environmental scan provided a boundary for the community's domain, and identified the key areas of practice. As a result, the community that came together in November to share practices was able to dive directly into productive discussions. As a starting point for growing knowledge practices, each participating organization shared its current efforts. Each participating organization described the characteristics of their organization to provide a context for understanding their KM focus and strategy. Participants included seven state DOTs, including Alaska (www.dot.state.ak.us), Georgia (www.dot.ga.gov/Pages/default.aspx), Kansas (www.ksdot.org), Missouri (www.modot.org), Virginia (www.virginiadot.org), Washington (www.wsdot.wa.gov) and Wisconsin (www.dot.state.wi.us); three USDOT administrations, including FAA (www.faa.gov), FTA (www.ftwa.dot.gov) and FHWA www.fhwa.dot.gov); two private sector organizations, including Kraft Foods (www.kraftfoodsgroup.com/home/index.aspx) and Accenture (www.accenture.com/us-en/pages/index.aspx), the National Aeronautics and Space Administration (NASA) (www.nasa.gov) and the Alberta Transportation www.transportation.alberta.ca). The strategies and practices shared are described below in relation to the amplifying questions.

Shared intellectual capital management and knowledge economy practices. Successful practices shared by participants included organizational function and key personnel

briefing books. Briefing books provide an overview of business capabilities and subject matter experts in each capability. These books can be important networking tools for new employee integration and orientation. Briefing books are particularly important for on-boarding of new middle- and corporate-level managers.

Another successful practice involved the tracking of learning activities and competencies acquired as employees progress through their careers. Learning management systems may be effective tools for tracking formal learning activities. Employee profiles may highlight other important intellectual capital assets. This would help an organization to make the best use of available talent, and to identify internal talent for targeted development.

Integrating KM competencies into employee performance evaluations was encouraged by all participants. To achieve this strategy, it is important to work closely with human resource management professionals and business managers.

Mentor–mentee or buddy systems were also suggested to ensure that new employees were well integrated in their roles and into the culture of the organization. Participants stressed the importance of organizational culture as a key enabler of innovation and knowledge sharing within an organization. A highly siloed organization with a "every-person-for-themselves" culture will not be conducive to adaptation, growth or innovation.

Shared knowledge asset capture and management practices. An important practice, and one that might be adopted by other industries and sectors, is the development of peer-review processes (before a project or initiative), action reviews (during a project or initiative) and retrospective reviews (after a project or initiative) to ensure that available knowledge is applied, teams learn from experience and key lessons are captured for future use.

Knowledge capture goes beyond explicit information management. Stories and perspectives of technical experts and leaders within and outside the organization can be captured by inviting these individuals to speak and creating podcasts or videos that can be shared across the organization.

Critical business knowledge can be identified by examining significant events in an agency's history. A dialog can be constructed around these events, examining and discussing what precipitated the events, how they were handled, and capturing this information for extended and future learning.

Agencies produce and acquire vast quantities of information and continuously create new knowledge. It is neither possible nor effective to devote resources to capture everything. Workshop participants shared techniques for identifying business critical knowledge that have business and operational value.

Because of the complex working environment of state transportation agencies, it is important that contractors and other working partners work from a common playbook for capturing and preserving information and knowledge assets.

Shared knowledge and information architecture practices. Scan participants discussed the importance of blueprinting an enterprise information architecture that integrates multiple sources, supports access to multiple content types and is adaptable to different views and perspectives. Transportation is a complex information environment, with a broad spectrum of structured, semi-structured and unstructured data sources. The environments in which these sources are created and retrieved are also complex. Good enterprise information architecture always includes consultation with stakeholders and analysis of their needs. In transportation, though, this is a tall order given the variety and diversity of stakeholders. The stakeholders include anyone who use the transportation system, designs it, builds it, funds it or manages it. Managing terminology to enable common points of access is also a significant challenge. The field

of transportation provides a robust set of test case for any knowledge organization system or service.

Shared knowledge strategy and leadership practices. Scan participants made it clear that KM is fundamentally a strategic endeavor that seeks to maximize value from the organization's human capital. As such, a Cxx-level position for the KM lead or a close working relationship between the KM lead and the leadership team is important. To realize and sustain benefits from KM, agencies must ensure that the KM function is strong and sustainable. This involves selection of an effective KM lead with the political savvy, business and customer service orientation. It also means treating KM as a strategic function that reports to the leadership team. Each KM initiative should be aligned with and measured against core business objectives and goals.

While top-level support is important, though, bottom–up support is critical to sustainability during times of management turnovers, leadership changes and changes in business priorities.

Examples of strong leadership development programs and deliberate management efforts were provided, illustrating how organizations can not only articulate values that support teamwork and innovation but also make sure they are actually "walking the walk".

Leadership is also critical to building a culture of trust throughout the organization. Leadership and high-level management buy-in is critical to the success of any KM initiative, and is necessary for building a culture of trust throughout the organization. One tactical method to consider for gaining top management buy-in is a briefing from a recognized external KM expert or from a peer agency with an established KM program.

Participants agreed that KM is a discipline which must be practiced and monitored. Engagement and commitment to a core set of KM principles will contribute to the development of a knowledge-friendly culture.

A winning KM strategy is one where KM goals and metrics are clearly tied to and aligned with critical business capabilities and outcomes. Agency performance management functions should include KM metrics, and KM metrics should be aligned with the organization's overall performance.

One of the most effective ways to help senior and middle managers to become knowledge practitioners is to integrate organizational learning, collaboration and information sharing values into leadership training.

Shared collaboration and culture practices. Participants reported that reviewing and updating hiring practices and position descriptions can support an organization's values with respect to collaboration and information sharing. KM professionals should expect to work with human resource managers, hiring managers and selection panels to ensure a clear understanding of the qualities the organization seeks.

Rewards and recognitions are important visual markers of an organizational culture that promotes collaboration. Scan participants provided examples of initiatives that established awards for employees and teams that model exemplary collaborative behavior. Organizational values for sharing and collaboration may be supported by formal programs that highlight exemplary behaviors.

Shared network and community practices. Directories are critical access points for an agency's intellectual capital. Easily searchable directories of expertise are critical elements of an agency's knowledge environment.

Communities of Practice, in which groups of employees with similar or intersecting responsibilities meet periodically to share knowledge and discuss challenges, are one of the particularly effective, yet simple-to-implement KM strategies. Defining and managing common terminology is another important KM strategy that supports knowledge sharing and collaboration across organizational silos. Communities of Practice also are important

tools for integrating new employees into the agency's knowledge base. To ensure success, agencies need to encourage and reward employee participation in communities of practice.

Knowledge flows through formal and informal organizational networks. Organizational network analyses are important KM tools. They can help to identify important sources of knowledge, vulnerabilities, bottlenecks and connection gaps.

Agencies can also develop policies for incorporating employees into networks based on their primary discipline.

Advancing the KM agenda in transportation

On the final day of the meeting, community members discussed what they had learned, synthesized their findings and identified strategies and actions for moving forward. The results suggest that there are patterns and threads of issues across all agencies. The community produced six high-level action items related to advancing KM practices in the field of transportation. We believe that as the community moves forward on these action items, it will have a profound impact on the transportation factor. The impact will be far greater than any single agency might have accomplished working independently. A sector-wide impact will also have significant value to the field of KM.

Action 1: establish a central and formal KM function. There was considerable variation across scan participants in their approaches to KM implementation. A handful of the participants reported that their organizations had established centralized and formal KM functions; others had implemented KM practices in a more limited and decentralized fashion (National Academy of Sciences Transport Research Board, 2014).

The existence of wide variations across organizations with respect to how they define, refer to and apply KM was noted as an important finding. It implies that future education and outreach activities to advance the state of the practice of KM in transportation need to be explicit about definitions and components of KM. Some agencies may already be undertaking activities that are not recognized as KM, so Departments of Transportation need to understand that they can start by identifying and recognizing existing activities, and then introduce additional advances (National Academy of Sciences Transport Research Board, 2014).

After hearing the presentations, the community members concluded that a formal KM function with a designated lead and staff resources is a strategy that should be considered to effect meaningful and sustained change. However, the team also acknowledged that organizations that cannot establish a central KM office can still derive value through implementation of KM techniques within individual business units (National Academy of Sciences Transport Research Board, 2014).

Action 2: building executive buy-in and align KM with business goals. The community members concluded that there is no single right way to implement KM; however, getting management buy-in requires connecting any KM initiative to business outcomes. KM will get executive attention and support if it addresses critical pain points or serves the needs of major projects or initiatives. Once they are implemented, it is important that KM programs produce metrics showing how these programs are adding value.

Action 3: increase understanding of KM across the transportation community. The workshop was successful in increasing the participants understanding of the field of KM. Distributing the materials developed for the workshop through multiple and broad channels can ensure that they are leveraged across Departments of Transportation.

A list of KM experts and peers would be useful when there are opportunities to speak about KM to different Department of Transportation audiences. The list might cover all areas of specialization to align with business drivers.

Open and public webinars on KM topics of interest to state agencies would also be an effective, convenient and low cost way to continue the conversation and to increase the community dialog. Similarly, the community could develop a resource base of written and/or videotaped KM case studies, drawing upon the scan materials.

Another action identified was to establish a cross Department of Transportation Community of Practice focused on the implementation of KM ideas.

Action 4: development of transportation-focused KM tools and resources. The community members discussed potential development of a KM inventory and assessment tool that could be used by Departments of Transportation to identify and track the development and use of knowledge and information assets. Similarly, having a transportation agency-relevant KM maturity framework and assessment methodology would have value to all state agencies.

Participants suggested that a standard set of job descriptions and responsibilities would be useful for establishing KM practices. This would also increase the recognition of the role of KM to the field of transportation.

Understanding where KM functions currently live within transportation agencies would also be valuable information. While practices may vary, there will be commonalities in the functions that agencies perform. This might be accomplished through an open survey of state agencies.

A guide and roadmap to the successful implementation and sustainability of KM initiatives would also be a valuable tool.

The presentation by Kraft Foods on the use of knowledge books and the MASK Methodology to capture and access institutional knowledge was very well received. This methodology should be packaged and made available as a workshop which could be made available to all state agencies.

The workshop provided a valuable forum for exchange of ideas and information and the launch of an emerging community of practice. To further the community's work, members suggested that state agencies consider writing case studies, white papers and publications that could be shared across the community. These actions serve to advance the value of KM throughout the sector. They also increase awareness of the extent of the current practices within the field.

Action 5: promotion and outreach to foster KM. The workshop produced a wealth of ideas on promotion and outreach. Conference participation and presentations are important promotional channels for KM. Routine participation in broad agency and discipline-specific conferences such as the NAS TRB Annual Meeting, the AASHTO Annual Meeting and Regional AASHTO meetings can enhance visibility and provide opportunities for engagement with key individuals. Participation on and collaboration with important association committees can produce network effects that carry the message to others in the professional network. Engagement will build a network of supporters and increase the impact of an agency's efforts.

Informal outreach at the agency level can also be effective. The team agreed to consider identifying opportunities for informal outreach within their own departments, organizations and the broader community.

Articles on KM in trade journals can increase awareness and understanding. Peer-reviewed case studies and articles can enhance recognition of the work of transportation agencies in the broader KM community.

Video presentations on a broad range of topics can make learning about KM affordable and easy. A repertoire of speakers and thought leaders in the field of transportation could also be developed.

Action 6: support formal KM research projects. The community members discussed ideas for future research efforts focused on risk and lost productivity associated with lack of information sharing. Longer-term research needs discussed included:

- the development of a transportation agency-specific KM maturity model; and
- development of a road map to sustainable KM.

Research results and observations

There is a sense in some spheres that KM is no longer an important discipline, and that it has fallen off in popularity as a methodology. In contrast, the environmental scan conducted in the transportation sector suggests that KM practice is alive and well in many organizations. The knowledge exchange during the three-day workshop demonstrated the extent of KM activities and initiatives within a single industry. It also demonstrated the value of using business and competitive intelligence methodologies to promote and better position the field.

The use of business drivers to frame the conversations was particularly effective. The framework allowed participants to identify their KM practices, which, in turn, highlighted how much is actually happening across the state agencies. The business drivers also aligned well with the broad facets of the discipline (Bedford, 2012). This provides a common framework for moving forward.

The success of this effort suggests that future environmental scans should focus – at least initially – on economic sectors. While our broad-based KM conferences offer professional level value and increase understanding among those who are new to the profession, sector-focused conferences might be more productive for advancing and promoting the practice. The project demonstrated how rich knowledge sharing and exchange may be when focused on a common business domain.

Another critical success factor was the fact that the motivation for and participation in the event came from practitioners within the economic sector. There was a business motivation at the heart of the activity. The fact that transportation practitioners participated in the planning and design of the effort was a key success factor. Likewise, the motivation to leverage the results and move forward to implement the observations tat came from transportation agency-practitioners.

In addition to accomplishing their stated goals, the community members designed and delivered a reusable methodology which other communities, industries and economic sectors may leverage. If the model is adopted and adapted by other industries and sectors, we believe it will increase the visibility of KM practices around the globe.

The project also produced important outcomes for the discipline of transportation. While there is much yet to accomplish at the organizational level and in the discipline more generally, this project demonstrated that significant progress is being made.

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Further reading

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