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EXPERTISE MANAGEMENT: A PROMISING APPROACH FOR SUCCESSION PLANNING

SUMMARY

The railroad industry is facing a significant loss of expertise that succession planning programs alone cannot adequately mitigate, largely due to shifting demographics and an aging employee population (see Figure 1; Stewart, 2020). In 2022, FRA's Office of Research, Development, and Technology's Human Factors Division sponsored TrueSafety Evaluation to demonstrate an innovative Expertise Management (EM) Framework to identify, capture, and transfer critical areas of expertise for safety leadership positions in the U.S. railroad industry.

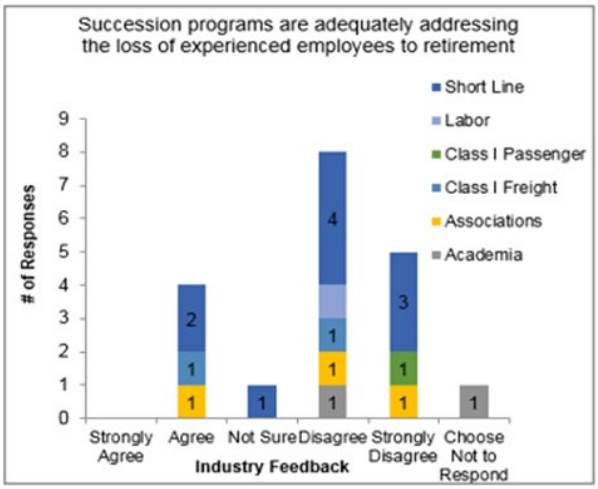

Figure 1. Succession-planning program success in the railroad industry

The EM Framework is a set of processes and methods for managing expertise, scaffolded by the collective experience of experts in the organization applied in specific organizational contexts. This work builds upon previous, FRA-sponsored Cognitive Task Analysis (CTA) initiatives (Roth et. al., 2001, 2007, 2013, 2020).

The project applies the EM Framework to the domain of safety-critical rail operations to strengthen highly skilled areas of technical expertise, such as train-track interactions, and Key Impact Skills[SM] within the railroad industry. Key Impact Skills are the foundational, non-technical skills, abilities, and competencies, such as emotional intelligence, team building, listening, communicating, and conflict resolution, that are essential for building strong organizational impacts.

This report presents the EM Framework and the preliminary outcomes from the railroad industry EM demonstration project.

BACKGROUND

The term *Expertise Management* (EM) is used to emphasize the importance of focusing knowledge-management efforts on the most critical knowledge within an organization: expertise.

The EM Framework presented in this project is built on CTA methodology, which comprises a set of techniques for eliciting, analyzing, and representing cognitive work inherent in domain tasks (Hoffman & Millitello, 2008; Crandall, Klein & Hoffman, 2006). The EM Framework encompasses three core process elements: (1) knowledge identification, (2) knowledge capture, and (3) knowledge transfer (Moon, Baxter & Klein, 2015).

Knowledge identification is the systematic process of identifying and prioritizing at-risk categories of tacit knowledge domains of safety leaders that are crucial to safety-critical planning and decision making but largely undocumented in any written format. *Knowledge capture* is the

CTA-based interviewing process in which experienced "knowledge elicitors" work one-on-one with identified experts for capturing knowledge. The interviews help experts articulate their internalized mental models, critical decision paths, and core information sources used by the identified experts when making safety-critical decisions. Finally, *knowledge transfer* covers those activities that are intended to facilitate the acceleration of expertise in others, to include sharing the articulated expertise through products such as decision games, job aids, stories, and expert content.

OBJECTIVES

This project aimed to (1) capture the core knowledge, skills, and abilities (technical and non-technical) of identified safety-critical experts, (2) develop a suite of railroad-specific EM Products, and (3) demonstrate the EM Products at railroads to identify the potential uses and applications of the EM Products.

METHODS

The methods used for this project were in-depth interviewing, based on CTA, combined with an internal formative evaluation. The evaluation documented the potential uses and impacts of the EM Products to guide this project and inform its broad scale roll-out strategies. The interviews were conducted with 15 safety leaders identified by the project partners, Amtrak and the American Short Line and Regional Railroad Association (ASLRRA). Thirty interview sessions across a variety of employee positions in both passenger and freight operations were conducted virtually and in-person, totaling nearly 80 hours of interview time, as summarized in Figure 2.

The purpose of the interviews was threefold: to (1) identify the expertise most critical and most at risk of loss for that position, (2) articulate aspects of that expertise (in particular, safety-related decision making, sensemaking, problem detection, and managing uncertainty), and (3) convert their experience and mental models into usable products for railroad industry trainers to use for knowledge-transfer purposes.

Organization	Position	# of Interviewees	# of Interviews	Total Hours
Amtrak	· AVP · Deputy Chief, Engineering · Mechanical Technician · Locomotive Technician	4	10	24.0
ASLRRA	· President · Vice President · Chief Mech. Officer · Superintendent, Ops & Mech. · Director of Safety · Director Env. Health & Safety · Roadmaster (2) · Rail Training & Consulting · Safety & Compliance Officer · Equipment & Ops. Manager	11	28	55.5
	Total	**15**	**38**	**79.5**

Figure 2. Expertise Management interviews conducted

The EM project team reviewed, organized, and synthesized the experts' knowledge to develop a suite of knowledge-transfer products. These included decision games, which are self-guided or facilitator-led training tools based on the lived experience of the expert. Similar to simulation-based training, decision games place the learner in a guided, real-life scenario that actively engages them to think like an expert, adding a powerful augmentation to traditional training. The team also developed exemplar job aids, which provide a cognitive guide for challenging tasks that can be used by novices and advanced professionals. The team also organized stories and expert content to illustrate and describe the skills required for proficient performance, which can enable smarter planning for selection and succession.

After developing the products, the project team conducted 14 introduction and/or demonstration meetings of the EM Products with key stakeholders to (1) assess the level of interest/ need for the products, (2) understand the potential utility of the different types of knowledge transfer products, and (3) identify opportunities to demonstrate a sample of the products in ongoing training programs. These meetings allowed for stakeholder engagement and feedback to inform the development of the EM Products.

RESULTS

Analysis of the EM interviews informed the focus on the four types of knowledge-transfer products developed for this project: decision games, job aids, stories, and expert content. The EM Products have been customized for targeted applications within Amtrak and ASLRRA-member railroads and show promise for broad application in similar positions across the railroad industry.

During the introductory and demonstration meetings conducted with stakeholders, the feedback was discussed, specifically the potential use of the EM Products in their railroad's training programs, as 84 percent (n=19) of the stakeholder participants considered "trainer" to be part of their railroad position. Most (85 percent, n=20) affirmed that succession or loss of expertise is an issue of concern at their railroads. Based on their demonstration experience, 70 percent (n=17) indicated they would recommend the EM approach/products to other railroads.

CONCLUSIONS

Through working with partners and key stakeholders to understand the potential value and uses of the EM Products, the preliminary indication is that EM, both the Framework and its Products, are promising innovations in the railroad industry.

FUTURE ACTION

As the demonstration nears its end, the project will continue to explore opportunities and processes to introduce EM Products within the railroad industry.

Upcoming demonstrations will be delivered during training sessions (for both technical and leadership impact skills) at Amtrak and at an ASLRRA-member railroad, Transportation Review Board conference presentations, and workshops for the railroad industry. These events will provide additional feedback and the lessons learned will be presented in the forthcoming final technical report and another research results report anticipated in spring 2024.

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