



## Chapter 25

# Tacit Knowledge Sharing for System Integration: A Case of Netherlands Railways in Industry 4.0


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## ABSTRACT

*Sharing of tacit knowledge is a key topic of research within the knowledge management community. Considering its embodied nature, organizations have always struggled with embedding it into their processes. Proper execution of complex processes such as system integration asks for an adequate sharing of tacit knowledge. Acknowledging the importance of lessons learned for system integration and their presence in tacit and explicit form, a case study was conducted within the Netherlands Railways. It was determined that non-sensitivity to the tacit dimension of lessons learned has resulted in their lack of utilization. Consequently, LEAF framework was developed, where LEAF stands for learnability, embraceability, applicability, and findability. The framework suggests that addressing these four features collectively can eventually lead to an adequate knowledge-sharing strategy for lessons learned. Lastly, the chapter presents an example from the Netherlands Railways to emphasize the key role technological solutions of Industry 4.0 can play in facilitating tacit knowledge sharing.*

DOI: 10.4018/978-1-7998-8548-1.ch025

## INTRODUCTION

The value of organizational knowledge has grown significantly over the past seven decades. Technological developments after the second world war and research conducted within the management sciences have brought the topic of knowledge management to the center stage. More recently, knowledge is being viewed as an organizational asset and as a source of competitive advantage (Kakabadse et al., 2001). Technology has played a key role in this transition and revolutionized the way in which organizations manage their knowledge. Meanwhile, these developments have also pointed out the limitations of human capability in articulating one's knowledge to explicit form. A deeper understanding of human capabilities and a closer look at human interactions with the technical systems are required to address these limitations adequately. Currently, the knowledge management community, by and large, acknowledges the conceptual distinction of knowledge into two main types namely tacit and explicit knowledge (Nonaka & von Krogh, 2009). The idea of the former knowledge type is mainly attributed to Polanyi when he famously stated "We know more than we can tell" (Polanyi, 1966), while the latter can be readily articulated, codified, stored and accessed (Hélie & Sun, 2010). Research within the management sciences has shown that not only is explicit knowledge an important resource for firms (Conner & Prahalad, 1996) but also that tacit knowledge is a source of competitive advantage for firms (Winter, 1987). This chapter builds upon the concept of tacit knowledge sharing and presents ways in which it can be enhanced within an organizational setting.

Knowledge sharing is a major field of research within the knowledge management community, with challenges on multiple fronts. It requires the transfer of knowledge from one entity to another (Argote & Ingram, 2000). Naturally, the transfer of explicit knowledge is easier and more straightforward. Moreover, technology has greatly assisted in optimizing explicit knowledge transfer. A common example, in this regard, is the use of various Information Technology (IT) based knowledge management systems by the organizations. On the other hand, tacit knowledge whose primary source is experience (Bratianu & Orzea, 2010), is rooted in a mix of "action, procedures, routines, commitment, ideals, values and emotions" (Nonaka, 1994), and generally difficult to share. Research has shown that the sharing of tacit knowledge is stimulated by intrinsic motivators (Chena et al., 2011) and facilitated by engaging environments (Muniz et al., 2013). Tacit knowledge management requires a shift towards practice-based approach and more sensitivity to workforce abilities and skills (Ribeiro, 2013). Furthermore, it also requires awareness of the nature of the system under consideration, as different knowledge management approaches are required for complex systems as well for complicated systems (Snowden, 2002). The difference between the complex and complicated system here is the intertwining and separation of the cause and effect relationships of the system respectively (Snowden, 2002). This chapter focuses on tacit knowledge sharing and looks primarily into the railway transportation system of the Netherlands.

Tacit knowledge sharing for a complex, safety-critical system such as railway is a strenuous task. The goal of the railway system as defined by CEN, (2017) is to "achieve a defined level of rail traffic at a given time, safely and within certain cost limits". For the system under consideration, system integration is a prominent process within the system life cycle phases (CEN, 2017). It is aimed at synthesizing the system elements into a realized system (ISO/IEC/IEEE 15288) and a key topic of research within the systems engineering community. Moreover, proper execution of system integration processes is of fundamental importance to key railway system stakeholders such as railway operators and infrastructure managers. Within this context, adequate sharing of relevant tacit knowledge can facilitate in the improvement of system integration processes both academically, managerially, and practically. The research topic

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