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Organizing lessons learned practice for product–service innovation☆

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ABSTRACT

Many companies adopt lessons-learned practices to transform gained experiences into useful knowledge for future benefit. Researchers have examined lessons-learned practices in project-based organizations that primarily develop pure products or services in various disciplines and industrial sectors. However, little research exists on the lessons-learned practices in manufacturing companies offering integrated product–service combinations. Therefore, this study performs three case studies in two large manufacturing companies undergoing a servitization journey to becoming product–service providers. The study identifies ten requirements under three main categories—content, process, and technology—for better organized lessons-learned practice. Drawing from the requirements analysis, this study develops a method for representing lessons learned in product–service innovation contexts.

1. Introduction

In today's rapidly changing business environment, manufacturing companies are under pressure to bring product–service combinations into the market to create unique customer value. Product-centric manufacturing companies can move from the sale of additional product-related services, to the sale of the use of a product, to the sale of the availability of a product (Tukker & Tischner, 2006). Researchers discuss this emerging phenomenon using terms such as product–service systems or servitization (Baines & Lightfoot, 2013) and service innovation (Kindström, Kowalkowski, & Sandberg, 2013).

Researchers report that the product–service shift requires a fundamental review of companies' business strategies, organizational structures and culture, core processes and capabilities, and knowledge management approaches (Leoni, 2015; Martinez, Bastl, Kingston, & Evans, 2010; Oliva & Kallenberg, 2003). The inclusion of service aspects into product design elevates the need for a broad range of knowledge about the product lifecycle and applying such knowledge effectively in the development process (Chirumalla, 2013). Researchers argue that the lessons learned during the in-service period of a product significantly contribute to the subsequent development of product–service combinations (Goh & McMahon, 2009; Jagtap & Johnson, 2011). Thus, to consistently learn from experience, good knowledge management and lessons-learned (LL) practices (Milton, 2010) become vital for companies when compared to the traditional business situation of selling physical products (Igba, Alemzadeh, Gibbons, & Henningsen, 2015; Leoni, 2015).

The literature proposes different approaches to address this need. For instance, Vianello (2011) proposes a documentation model to reuse knowledge from the service phase of complex products. According to this study, designers require in-service information at a component level to improve the next generation of products through design. Studies like Abramovici and Lindner (2011) and Igba et al. (2015) develop solutions to capture, feedback, and reuse product use experiences in new designs. However, current research primarily draws from explicit field data (e.g., condition monitoring, operation, and service data) and statistical databases. Few studies focus on utilizing experiential learning that occurs through tacit knowledge and social interactions. In practice, companies face challenges in organizing this information and have difficulty in collecting and reusing learnings to improve future design activities (Goh & McMahon, 2009; Igba et al., 2015). Furthermore, LL literature emphasizes how companies struggle with the collection and dissemination of lessons from LL practices (Milton, 2010; Rhodes & Dawson, 2013; Williams, 2008). According to Milton (2010), the implementation of LL processes does not satisfy the 60% of 74 organizations under consideration because, even though the organizations identify and capture the lessons, they neither complete the process nor apply the lessons internally. One of the most common kinds of LL sessions is post-project review, whose effectiveness limits to leveraging tacit knowledge (Goffin & Koners, 2011; Tan et al., 2006; Williams, 2008).

In summary, although previous research acknowledges the importance of LL for product–service innovation, the literature includes limited methods for organizing LL practice. The existing literature examines LL practices in project-based organizations that primarily develop pure products or services in different disciplines and industrial sectors. Little research exists on the LL practices in manufacturing companies offering integrated product–service combinations. In addition, industrial practitioners need to understand how the servitization context affects LL

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practices, and how these practices need modification to develop a product–service provision successfully. Hence, the purpose of this study is to investigate the LL practices in product-centric manufacturing companies to identify potential barriers and requirements in the light of product–service provisions, and to identify alternative ways to improve the LL practice.

To fulfill this research gap, this study performs three case studies in two large manufacturing companies undergoing a servitization journey. The empirical analysis identifies 10 requirements that fall under three main categories—content, process, and technology—for better organizing lessons-learned practice. This study contributes to the theoretical development by suggesting a practice-based method for representing LL in the context of product–service innovation.

2. Lessons-learned practice

A lesson learned (LL) is knowledge or understanding resulting from either a positive or a negative experience (Weber, Aha, & Becerra-Fernandez, 2001). The literature reports various formats and capture techniques for LL (Williams, 2008). A few common techniques are LL sessions, after-action reviews, project debriefings, post-project reviews, and postmortems (Schindler & Eppler, 2003). The literature thoroughly documents the shortcomings of the existing LL practices across multiple industries (Tan et al., 2006; Weber et al., 2001; Williams, 2008). Tan et al. (2006) identify two major shortcomings with standard post-project reviews (PPRs). First, organizations do not share effectively the captured learning and no established way aids them to locate the learning in reports for reuse. Secondly, the current practice of summarizing the key learnings from PPR in points is too brief for understanding and efficiently sharing the resulting knowledge. In addition, Goffin and Koners (2011) reveal that PPR reports have limitations on capturing tacit knowledge and that these reports are likely to lose much of the tacit knowledge from PPR due to difficulties in articulating tasks performance and solving.

Kotnour (1999) argues that the culture and structure of the organization are key factors to collecting and disseminating lessons across organizations. Paranagamage, Carrillo, Ruikar, and Fuller (2012) suggest that company processes need built-in feedback loops to assess their effectiveness periodically and to ensure that the lessons are readily accessible to those who need them. Further, researchers argue that the context descriptions of lessons are crucial for their reuse (Chua, Lam, & Majid, 2006; Milton, 2010). Context refers to the circumstances (physical and social) in which an event occurs, including why, where, when, how, and by whom the knowledge is created. Milton (2010) states that industrial practitioners can summarize a simple lesson (i.e., a low-context lesson) in a few lines, express the lesson in a process flow sheet or diagram, and use a template to capture the outcome. In contrast, a more complex lesson (i.e., a high-context lesson) may be highly situation-specific, and is much more difficult to express in writing.

Weber et al. (2001) find that LL systems poorly serve their intended goal of promoting knowledge reuse and sharing; specifically, these authors find that these systems do not typically integrate into an organization's decision-making process and do not have a structural format to support knowledge collection, storage, dissemination, and reuse (Weber et al., 2001). Tan et al. (2006) propose a methodology for a "live" capturing and reusing of project knowledge using a template featuring background information on the project, an abstract, conditions for reuse, relevant details, and references. Similarly, Milton (2010) proposes an LL structure including context, description of the event, root cause of problems, lessons identified, and suggested action. Leoni (2015) argues that the learning method and content have to change drastically according to the servitization strategy. Further, Duffield and Whitty (2016) emphasize that the alignment of the people and system elements (learning, culture, social, technology, process, and infrastructure) can positively influence LL practice.

Several researchers assert that storytelling is an appropriate social method for capturing LL in relation to complex issues and skill-oriented tasks, especially those that relate to tacit, experiential knowledge (Goffin & Koners, 2011; Orr, 1996). Orr (1996) finds that Xerox's technicians employ storytelling for sharing problems and best practices from their day-to-day experiences. Milton (2010) acknowledges that a story can support a lesson by providing valuable background and context, and thus stories are easier to learn from and reuse when they carry a learning point that is a specific, actionable recommendation. However, Milton (2010) suggests that storytelling alone—with no analysis of the learning points—is not an efficient way to convey experience. Finally, the means of communication of a story are also a significant factor. If stories are powerful in verbal form, their effect improves using multimedia such as pictures and video clips (Swap, Leonard, Shields, & Abrams, 2001). In particular, videos can enhance stories' visual qualities (Panahi, Watson, & Partridge, 2013).

Wood, Rust, and Horne (2009) investigate the use of videos to elicit, record, and transmit the tacit nature of complex skilled practices. Videos enrich the description of knowledge with contextual cues due to their ability to scan the external environment and capture subtle, complex aspects of skill-oriented activities (Chua et al., 2006; Wood et al., 2009). Ylirisku and Buur (2007) assert that videos capture what happens in the field with detailed richness—that is, portraying people's personality and feelings—leaving extensive room for discussion, differently from text, photos, and audio recordings. Many researchers also show that video recordings can enhance the LL capturing practice. For instance, Sharif, Zakaria, Ching, and Fung (2005) view videos as a medium that is capable of providing richer lessons' details, is easy to understand and relate to new tasks, and thus their use improves the chances of reusing lessons (Weber et al., 2001).

The advent of social media (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011) has brought a new culture in the way of capturing videos. Through different formats, the sharing of videos happens easily and quickly online, almost instantly.

These technologies enable many social features, such as tagging, bookmarking, commenting, editing, and ranking (Kietzmann et al., 2011; McAfee, 2006), to increase the videos' searchability and network development. For instance, tagging functionalities allow users to classify and index captured videos in various categories to facilitate subsequent retrieval. However, Corbally (2005) finds that scriptwriting is the most important activity for producing purposeful videos.

3. Method

3.1. Research approach and case studies

This research investigates the LL practices of two large manufacturing companies using a qualitative case study approach (Yin, 2009). This study selects case studies by means of purposeful sampling, which provides a powerful, rational means to select information-rich cases for in-depth study (Patton, 2002). Three different case studies in two companies served as basis for the research. The companies constitute the main research context because of their rich experience and journey towards product–service provision.

The first case company, a process-technology supplier, provides both machining tool hardware and the application software. Study 1 identifies methods and tools that might be suitable for improving the "knowledge baseline" in the early stages of innovation projects, particularly how customers use the products or best practices in various application domains throughout the products' lifecycle phases.

The second company, an aircraft engine-component manufacturer, offers aero-engine components and additional maintenance services to aircraft-engine manufacturers and airlines. This collaboration with the original equipment manufacturers (OEMs) constitutes a risk-and-revenue sharing partnership, through which the partners share development costs, risks, and revenues throughout the engine program.

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