Knowledge Management to Support Systematic Innovation Capability

Marianne Gloet  
University of Melbourne  
marianne.gloet@unimelb.edu.au

Danny Samson  
University of Melbourne  
d.samson@unimelb.edu.au

Abstract

This qualitative research examined the links between knowledge management (KM) and innovation in 16 Australian manufacturing and service organizations that exhibited successful innovation and robust KM practices. A review of the literature indicated the contributions of KM to systematic innovation capability. Using a multiple cross-case analysis methodology and applying a framework of sustained innovation capability, in-depth interviews were held with managers of the case study organizations. The analysis of the data revealed the main contributions of KM to systematic and sustained innovation. Areas in which KM could contribute more to sustained innovation capability are also discussed.

1. Introduction

Today's advanced economies thrive on cutting-edge knowledge, which drives research and innovation in competitive environments. Competing primarily on a capacity to innovate, knowledge intensive industries constantly seek to reinforce sustainable links between forms of knowledge and modes of innovation. In this environment, the ability of managers to manage knowledge assets proactively is essential to achieve innovation capability and innovation performance [1] [2] [3]. However, because knowledge intensive organizations play a significant role in value creation through innovation [4] [5], the ways in which organizations approach knowledge management (KM) influences innovation and becomes a source of competitive advantage.

However, challenges emerge when organizations seek to develop innovation as a core competency [6] because of the complexity of the process, the diversity of knowledge assets and the variety of approaches to KM [7]. In addition, different markets place different values on knowledge assets. This complexity combined with the interdependence that characterizes global competition compels organizations to acquire and consume knowledge assets in ways that derive competitive advantage [8], [9]. Although KM should stand alongside the management of an organization's human, financial and physical resources, this is not always the case. Many senior managers fail to appreciate fully the value of KM as not only a discrete management function but also a unique skill [10]. The empirical literature also fails to articulate clearly the relationship between KM and innovation [11].

This exploratory study seeks to examine the ways in which KM is manifested across a range of organizations in both the manufacturing and service sectors, with a view to determining more clearly the relationship between KM and innovation. A further objective of this study is to investigate the extent to which KM can contribute to systematic and sustained forms of innovation within organizations. Current literature in the field is dominated by a focus on the role of innovation in the manufacturing sector as opposed to the service sector [12] [13] [4]. Given this imbalance, this research investigates the relationship between KM and innovation across both the manufacturing and service sectors and explores the likelihood that intangible assets contribute to innovation in different ways depending on the setting [14].

The study is significant because it highlights the role of knowledge in innovation. Without knowledge, there can be no innovation [15]. As such, the management of knowledge may hold the key to increasing systematic innovation capability in organizational contexts. People's knowledge, thinking and behavior influence the process of innovation in many different ways. Given that organizations are increasingly interested in understanding how to achieve innovation capability leading to business performance, exploring the management of knowledge that fuels innovation in business settings may yield new perspectives on the relationship between KM and innovation.

The results of this study may also shed light on the means by which to manage knowledge to achieve sustainable innovation, rather than aiming for haphazard forms of innovation that lack long-term benefits and which may not be easily replicated.
Sustainable innovation has human, social and management dimensions, and modern organizations face significant challenges on all these levels in order to gain and maintain competitive advantage. For managers, this involves exploring ways in which to develop new forms of knowledge, of embedding this new knowledge within an organization, as well as managing flows of information, knowledge and experience.

2. Literature Review

Multiple perspectives and a lack of rigorous research into the links between KM and innovation characterize the literature on KM. KM is a complex and subjective endeavor that is highly contextualized and therefore highly interpretative in nature. The literature on KM is classified as belonging to various broad paradigm orientations, each representing basic theoretical assumptions and biases that underpin KM practices [11]. Previous research has identified three main paradigm orientations that represent the basic theoretical assumptions and biases underpinning KM practices. The classification of these paradigms depend on whether KM is driven by IT, humanist or organizational culture elements [16] [42]. An IT orientation advances technology as the anchor for developing approaches to KM. A humanist orientation takes a more people-centric focus, whereas an organizational culture approach takes a resource based view where knowledge is regarded as a strategic resource. These three basic orientations occur in specific organizational contexts and because each orientation engenders very different approaches to KM, the tools and methods used to develop KM differ across and within organizations.

The Australian KM Standard [17] offers managers a functional definition of KM as a cross-disciplinary construct, which involves “the design, implementation and review of social and technological activities and processes to improve the creating, sharing, and applying or using of knowledge”. In this light, KM links to “innovation and sharing behaviors” and “managing complexity and ambiguity through knowledge networks and connections”. Investigating smart processes and implementing “people-centric technologies” are part of an environment where the central role of knowledge in securing and maintaining competitive advantage emerges as a constant theme [18] [19], [20] [21]. This underscores the need for effective and strategic KM in organizations.

Definitions of innovation also abound in the literature [22], although common threads emerge. Drucker [23], for example, views innovation as a process that exploits change through specific and learned practices. Myers [24] describes innovation at two levels – at one level, people execute a "set of processes carried out at the micro-level" against "a set of macro-structural conditions" that ideally “stimulate, facilitate and enhance innovation” at the micro-level. Despite differences in how organizations focus on innovation, the concept implies improved performance and enhanced problem-solving capabilities. Thus, innovation per se is predominantly about change, sometimes radical, other times slow but more often than not, incremental. Nevertheless, external environmental factors also come into play and despite its promise, innovation does not necessarily equate with business success [15].

Carneiro [25] investigates the relationship between KM, levels of innovation and levels of competitiveness in organizations and highlights the strategic nature of knowledge development. He suggests that KM positively influences innovation and competitiveness. Since innovation involves the mobilization of knowledge, some types of innovation are more tangible than other types, although the literature reveals that successful KM approaches in innovation have common factors. For example, for Darroch, successful KM acts as a coordinating mechanism to enhance both innovation and organizational performance [26], whereas Liao and Wu's research has found that by using organizational learning as a mediator, KM can improve organizational innovation [27]. The Lengnick-Halls postulate that the development of organizational, team-based and individual capabilities to support KM and innovation rests within the realm of HRM [28].

Other successful approaches include a strong IT infrastructure within the organization [29] and embedding understandings about innovation deeply within an organization's culture [30]. Researchers also emphasize the pivotal role of KM in engendering internal work environments that support creativity and foster innovation [31]. Other successful approaches require organizations to hone continuously their technological, organizational and managerial processes to secure positive strategic positions that support innovation [32]. The above approaches signal the importance of KM in mediating and monitoring the contextual aspects of the innovation process.

Following Du Plessis [33], innovation is highly dependent on managing knowledge in ways that align knowledge to the innovation process. Du Plessis flags three important drivers of KM in innovation. These drivers include (i) the need to create and sustain competitive advantage through the utilization of
knowledge and collaboration processes; (ii) the capacity of an organization to reduce complexity in the innovation process by managing knowledge as a strategic resource; and (iii) making knowledge for innovation more accessible through the integration of internal and external knowledge sources.

Kandampully [6] suggests that innovation is the core competency of a service organization. While manufacturing and service sector organizations actively seek innovation, Lyons et al. [34] emphasize that each sector requires a different approach - in services, innovation efforts must traverse the structure and culture of the organization in a conspicuous manner to be successful. Service organizations also require less formalized approaches to innovation for successful outcomes compared to manufacturing settings [14]. In manufacturing, innovation is often a more structured, rigid and formalized process [35].

The new focus on KM and innovation in the service sector in the mid-2000s revealed the uniqueness of the sector, which required different notions about innovation than those previously applied to the manufacturing sector [36]. In this light, innovation in business settings presents specific challenges, which include "conceptualizing and defining innovation" and furthermore, identifying where innovation occurs within a business setting. A subsequent challenge is determining the economic contributions of these innovative processes.

Van Riel, Lemmink and Ouwersloot [37] highlight the role of inputs in decision-making in ways that systematically reduce the uncertainty often associated with "organizational information gathering, diffusion and processing activities". Their study of 251 innovation projects found that innovation success related "positively and directly" to the knowledge assets that resided in the organization's human capital, especially the senior managers. The study also accentuated the role of people; "information sharing" mediated very positive effects from intelligence gathering about customers and technology. In the light of the discussion above, the potential of studies that investigate the relationship between KM and innovation across both manufacturing and service sector organizations is considerable.

Systematic innovation capability framework

Samson's [38] framework on systematic innovation capability identifies the processes and relationships used by successful organizations to generate a series of innovations that "deliver business value". The building blocks of the model are ranging but include aspects of strategy, resources, measurement, human resource management and development, leadership and approaches to KM.

![Systematic Innovation Capability Framework](image_url)

**Figure 1. Samson's framework**

In the snapshot of Samson's framework above, KM cuts across the various attributes of innovation. Samson [38] encapsulates the various factors associated with successful systematic innovation at the enterprise level. For Samson, systematic innovation capability requires a holistic and integrated approach to innovation across the following attributes:

- Strategy
- Leadership
- Customer Focus
- Resources for innovation
- Change focus
- Risk appetite
- Balance between large and small scale innovation
- Values and culture to support innovation
- Learning culture
- External partners and open innovation
- Quality processes and philosophy
- Rewards and recognition for innovation contributions
- Measuring innovation activities
Systematic innovation capability is best achieved when all of the above 'building blocks' are present. Samson [38] views innovation from a value creation perspective, where systematic innovation capability leads to a continuous stream of innovation, rather than haphazard or unplanned innovation. While recognizing that significant challenges accompany innovation, the framework assumes that those organizations with a robust and systematic innovation capability have higher probabilities of success with either large scale or incremental innovation.

3. Methodology

The study used data derived from 16 Australian organizations to investigate the relationship between KM, systematic innovation and innovation effectiveness. The following research questions indicate the scope and depth of the research:

RQ1. What is the nature of the relationship between KM and innovation?
RQ2. What is the extent of the contribution of KM to systematic innovation capability?
RQ3. Does the contribution of KM to systematic innovation capability vary significantly between manufacturing and service sector organizations?

RQ 1 pertains to the ways in which KM is manifested in the organizations studied. RQ2 seeks to apply Samson's framework [38] to the organizations in question to determine the extent of KM's contributions to systematic innovation capability. Since the case study organizations represented both manufacturing and service sectors, RQ3 seeks to determine whether there is any significant variation in the way KM supports systematic innovation capability.

Case study approaches, common in the social sciences, suit research environments dominated by multiple overlapping scenarios and approaches [39], [40], as is the case with KM and innovation. Importantly, case studies require the scientific application of case study principles and practices in addition to the careful selection of appropriate cases. However, while the analysis of a single case design results in a uniform logic, in this study, replication logic braces the multiple case designs, where the case selection adheres to replication logic rather than logic based solely on statistics [39]. The use of a "cross-case analysis" increases construct validity, reliability and generalizability of the findings [41].

A purposive sampling methodology also enhanced reliability of the cases selected [39]. Previous research suggested the cases used would exhibit KM as a planned and embedded initiative [42] because these organizations invested significant resources to support their KM activities. The sample also offered the researchers variance across company size, ownership type and industry sector and included foreign-owned and local organizations. The organizations consisted of seven manufacturing organizations (M1-7), seven in the services sector (S1-7) and two with a product/services mix (P1-2). It was anticipated that this range of organizations would yield insights into differences across sectors, business types and organizational size. Table 1 displays the business type of each organization.

<table>
<thead>
<tr>
<th>Code</th>
<th>Business Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Bakery products</td>
</tr>
<tr>
<td>M2</td>
<td>Differentiated supply chain solutions/product design</td>
</tr>
<tr>
<td>M3</td>
<td>Technology, mining and related products</td>
</tr>
<tr>
<td>M4</td>
<td>Design and production of specialty fabrics</td>
</tr>
<tr>
<td>M5</td>
<td>Textile inserts – product manufacturing</td>
</tr>
<tr>
<td>M6</td>
<td>Production of high performance textiles</td>
</tr>
<tr>
<td>M7</td>
<td>Automobile production</td>
</tr>
<tr>
<td>P51</td>
<td>Mobile phone products and services</td>
</tr>
<tr>
<td>P52</td>
<td>Travel support products and services</td>
</tr>
<tr>
<td>S1</td>
<td>Customized IT solutions and product development</td>
</tr>
<tr>
<td>S2</td>
<td>Ambulance services/community support</td>
</tr>
<tr>
<td>S3</td>
<td>Real estate services</td>
</tr>
<tr>
<td>S4</td>
<td>Environmental monitoring</td>
</tr>
<tr>
<td>S5</td>
<td>Revenue collection</td>
</tr>
<tr>
<td>S6</td>
<td>Legal services</td>
</tr>
<tr>
<td>S7</td>
<td>City council services and support</td>
</tr>
</tbody>
</table>

Table 1. Business type across case study organizations

Construct validity in multiple case studies is essential [39]. The constructs employed here are similar to validated constructs in previous research [38] [38]. Moreover, making generalizations based on statistical analysis is not the goal of this study - in fact, "probabilistic sampling is not necessary or even justifiable" in research of the type undertaken here [44].

The study followed the case study protocols (CSP) recommended by Yin [40], which included using stem questions to guide participant discussion during the interviews and align the discussion to the research questions. Stem questions established the basis for systematic innovation and KM in the case organizations. Responses gave clues to organizations'
approaches to both systematic innovation and KM. The stem questions are set out below:

- How is KM manifested in your organization?
- How is the relationship between KM and innovation viewed?
- What was the basis for introducing KM into your organization?
- How did your organization implement KM?
- How does KM contribute to innovation in your organization?
- What difficulties were encountered and how were these addressed?
- What type of lessons have been learned to date?
- What types of benefits have been achieved?
- What would you like to see in future iterations of KM to support innovation?

In each case study organization, between two and six managers were interviewed, depending on the size and scope of the organization. The multiple perspectives gleaned from the respondents essentially revealed the organization’s dominant orientation to KM, as well as insights into various KM practices. A method of textual analysis common to studies in both semiotics and structural anthropology [45] was applied to interpret the data gathered during the in-depth interviews. A coding system allowed the researcher to place data in one or more predetermined categories. The data was grouped according to emerging common patterns or themes. The researchers also noted when a participant departed from the dominant pattern of responses and sought clarifications. The influence of the organizational environment helped explain divergent responses. A more comprehensive rationalization of discrepancies occurred when patterns confounded previous research.

In each case, various documentation supported the analysis, including Annual Reports, Business Reports, performance data, project proposals and progress reports. Material available in the public domain, including the organizations’ websites or via domains maintained by state and/or federal government departments also enriched the study.

4. Major Findings

Organizations invested considerable thought and significant resources to support KM. As such, KM was neither arbitrary nor haphazard, although each organization faced different challenges in implementing KM to support innovation. Organizations tended to identify more strongly with IT-based forms of KM in supporting innovation, while simultaneously acknowledging the necessity for a strong people orientation to KM. All managers recognized the importance of organizational contexts in supporting KM initiatives, such as a strategic thrust and leadership support for KM. So too, the significant challenges associated with people-focused approaches to KM were clearly highlighted by the same managers.

While no agreed guidelines or formulas exist to create the innovation-driven organization, the role of KM is integral to the innovation process. Hence, the participants, all of whom held management positions, reported practical understandings about how KM contributed to innovation. KM also emerged as a main driver of innovation that supports sustained competitive advantage. This goal manifested itself in the following activities:

- Systematically gathering, managing and disseminating information
- Strongly supporting business processes
- A focus on quality initiatives
- Widely distributed learning and organizational development initiatives
- Clear communication processes
- A collaborative work environment

All managers, whether in organizations with a manufacturing, services or a product/services mix, demonstrated a very strong customer focus. Managers also identified the major enablers of KM to support innovation to be:

- Formal and informal KM practices within their organization
- A solid IT infrastructure
- Centralized access to information across the organization including repositories and intranets
- A variety of channels and means by which to share knowledge
- The use of teams and group structures to communicate and collaborate
- Effective learning programs to support KM
- Recognition and rewards for contributions to KM and innovation

The scope and nature of KM and innovation within the case study organizations is revealed using Samson’s [38] framework that outlines the main attributes of systematic innovation capability. Table 2 indicates areas where managers reported that KM strongly supports systematic innovation capability.

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Leadership</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Customer Focus</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Resources for</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
innovation capability did not rate highly include:

By way of contrast, areas where systematic formal processes and approaches to innovation organizations.

innovation capability compared to service sector rated more strongly across the attributes of systematic innovation capability compared to service sector organizations.

Managers suggested nine areas where their organizations rated highly concerning systematic innovation capability. The highest rankings came from the following areas:

- Strategy
- Leadership
- Change Focus
- Customer Focus
- Values and culture to support innovation
- External partners/open innovation
- Quality processes and philosophy
- Learning
- HR orientation to innovation, rewards and recognition

By way of contrast, areas where systematic innovation capability did not rate highly include:

- Developing an appetite for risk
- Balancing small scale and large scale innovation activities
- Resources committed for innovation
- Measurement of innovation

Overall, organizations in the manufacturing sector rated more strongly across the attributes of systematic innovation capability compared to service sector organizations.

The service sector organizations failed to exhibit the same levels of organizational embeddedness for KM and innovation across the 'building blocks' of innovation. These organizations appeared to use less formal processes and approaches to innovation compared to the more formal innovation processes.
observed in the manufacturing sector. Smaller organizations also tended to use more fluid and agile KM processes as opposed to the more structured and formalized processes used in larger organizations. Interestingly, this study did not yield any significant relationship between organizational size and systematic innovation capability.

5. Discussion

The literature concerning the relationship between KM and innovation highlights the multidimensional nature of both areas, multiple perspectives regarding KM and differing views about what constitutes innovation. The managers in all organizations reflected these multiple views. Some organizations engaged in KM practices dominated by IT while others took a people-oriented approach. Concerning innovation, some organizations were oriented toward research and development or developing new technologies and services. In contrast, others regarded innovation as a series of incremental improvements. While managers generally recognized the potential of KM to contribute to innovation, most managers found it difficult to articulate the precise nature of this link. The organizations appeared to lack common definitions concerning KM, which extended to a lack of common articulations about innovation. The contextual nature of both innovation and KM might explain this gap.

Managers generally agreed that people and organizational culture aspects of KM are more important when managing tacit forms of knowledge. However, the same managers remained ambiguous about tacit knowledge because they consistently reported feelings of confidence and success when they worked with technology-based KM initiatives. While managers were emphatic that the people and organizational culture aspects of KM are paramount, IT thinking subtly held sway in the discussions.

Managers also identified a number of areas where KM supports innovation, including strategy, leadership, HRM, learning, IT and organizational culture. Embedding KM and innovation at the strategic level, which reinforces the pivotal role of leadership and management to support innovation, is a strong theme in the literature [29] [46] [47]. Managers supported the need for tying KM and systematic innovation to the overall business strategy by linking KM and innovation with their organization’s mission and business objectives. This linkage demonstrates a strong organizational commitment to both KM and innovation initiatives. In this coupling, KM and innovation did not become another passing fad. While a KM strategy provides direction and support for KM activities, the managers suggested that a KM strategy alone is unable to achieve significant inroads into sustained innovation.

While managers implicitly favored IT approaches to KM and innovation, the same managers saw that developing links between KM and HRM helped address the challenges posed by people-based approaches to KM and innovation. Such linkages involve the development of performance management systems that reward knowledge work leading to innovation and the implementation of sophisticated HRD programs designed to increase employee engagement, develop skills and enhance capabilities that add value to an organization [48], [42]. Managers in the manufacturing organizations reported that KM supported a strong customer focus, based on open innovation and adopting lead user strategies, thereby facilitating communication and collaboration with customers [49].

All managers alluded to the importance of communicating clearly about KM and innovation, developing a culture underpinned by common values, goals and objectives through a shared language[50], [51] [52]. Managers also reported that learning was a fundamental component in maintaining competitive advantage. By focusing on learning as a core value, KM facilitates the processes of knowledge generation, sharing and dissemination, all of which are fundamental to innovation, particularly when dealing with tacit knowledge.

While the case studies provided some insights into the role of KM in supporting innovation generally, the link between KM and systematic innovation capability is far more tenuous. The case studies revealed lack of KM support for particular innovation activities, including the development of innovation resources, balancing large scale and incremental forms of innovation, developing an appetite for risk and measuring innovation. One of the main challenges faced by the organizations is the lack of resourcing for both KM and innovation. The literature indicates that investment in these areas is essential for sustained innovation performance and overall business success [14].

In all the case study organizations, a robust technological infrastructure and significant investment in IT supported KM. However, investments in other attributes of KM and systematic innovation capability were not apparent. Another major challenge involved the development of an appetite for risk by recognizing that successful innovation efforts often depend on risk-taking in order to come to fruition [53]. In three of the cases, managers saw that KM mitigated risk rather than encouraging a risk appetite. The measurement of both
KM and innovation was also shown to be a major shortcoming among the case study organizations, mirroring a general deficiency alluded to in the literature [36].

There were more instances where innovation focused on incremental and small-scale improvement rather than on large-scale radical transformation. This is not surprising given that all organizations were committed to pursuing quality initiatives within a strong culture of continuous improvement, which permeated each organization's unique culture. Moreover, two of the service sector case studies were in the government sector, where the main drivers of KM were continuous improvement and business excellence rather than seeking competitive advantage.

Differences were noted between service and manufacturing sector organizations. Overall, the manufacturing organizations seemed to be outperforming the service sector organizations on systematic innovation capability. Two of the service sector case studies were government organizations, although this factor does not fully account for the differences. Processes and approaches supporting innovation tended to be more formal in the manufacturing sector. Moreover, manufacturing companies tended toward a disciplined approach to innovation compared to service sector organizations, perhaps due to the tangible outcomes of manufacturing. Hence, manufacturing organizations displayed a more disciplined style of innovation. Service sector organizations favored organic approaches to the innovation process.

Although organizational size was not a significant differentiator, the researchers noted some differences between large and small organizations. Smaller organizations lacked maturity in systematic innovation because the process often relied on one person or a small group, thereby concentrating the risk elements attached to the process. In comparison, larger organizations are more deeply resourced and systematized, less vulnerable to a change, with the risk spread across many people and teams, thereby reducing the risks associated with innovation.

6. Conclusion

The findings suggest a strong link between KM and innovation. However, the ways in which KM contributes to systematic innovation capability is less than clear. So too are differences that might be attributed to organizational size, industry sector and business type. It may be prudent to consider whether KM and innovation have different meanings in the service sector compared to those in the manufacturing sector. In particular, further research on the nature of the relationship between KM and systematic innovation capability is required.

This research was exploratory in nature and limited to the Australian context – future research should broaden the selection of organizations; thus, a larger sample would generate results that are more generalizable. As the links between KM, innovation in general and systematic innovation capability in particular represent complex relationships, the authors suggest that a combination of qualitative, quantitative and longitudinal studies will enhance the literature in the field.

The potential of KM to influence innovation and achieve competitive advantage increases significantly with effective KM approaches. Moreover, the implementation process for KM makes all the difference. The cases demonstrated sound KM practices across some but not all of the various building blocks of innovation. In order to contribute to systematic innovation capability, KM practices should address as many attributes of innovation as possible.

The greater the extent to which KM supports the various attributes and activities of systematic innovation, the more likely it is that KM performs an integrated and holistic function within an organization. Organizations that embed KM practices across a range of innovation activities create a boundary spanning culture, which links various organizational domains. These links are vital to the process of increasing KM’s contributions to systematic innovation capability. This exploratory research confirms the complexity of the relationship between KM and innovation process, and how people's knowledge, thinking and behavior influence the process of innovation in different ways.

6. References
