Knowledge integration processes and dynamics within the context of cross-functional projects

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Abstract

This paper examines the dynamics of knowledge integration in the context of cross-functional project implementation within four large organizations. Specifically, the research focuses on exploring and conceptualizing the efficiency, scope and flexibility of knowledge integration [Organization Science, 7(4) (1996), 375] of which limited empirical evidence has been offered. Through the comparative study, the findings suggest that knowledge integration in the context of cross-functional project implementation is in essence a process of engaging organizational members through the promotion of project benefits and the management of social networks. Also, our findings reveal that an organization’s embedded practices, past integration experience and social capital plays a key role in shaping the level of coordination that in turn influences the efficiency and scope of integration. In particular, the development and nurturing of social capital within and beyond the project team is crucial, as is the promotion of project awareness through the creation of common knowledge.

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1. Introduction

A growing emphasis on the value and potential of organizational knowledge is reflected in the increasing amount of research output on this subject, as well as the growing number of firms that initiate and implement knowledge management programs as a way of systematically mobilizing and utilizing their knowledge assets. While one stream of research addresses the need to externalize tacit knowledge to ensure its accessibility (e.g. [26]), another stream characterizes the underlying activities through which knowledge is acquired [20], created [29], shared [4] and applied [3]. For convenience, we refer to the latter stream of research as knowledge-related activity research. Grant’s [15] theory of knowledge integration is an example of an attempt to synthesize these two streams of research. As noted by him, “the primary role of the firm, and the essence of organizational capability, is the integration of knowledge” (p. 375). There are two building blocks in Grant’s theory of knowledge integration—the need for specialization to achieve economies of scope, or differentiation in Lawrence and Lorsch’s [22] terms, and the linking mechanisms to streamline and coordinate the specialized workforce, integration in Lawrence and Lorsch’s terms. The importance and relevance of knowledge integration to a firm’s competitiveness is well-established. However, the question of how the theory can be applied to examine new organizational forms remains largely unanswered.

To address this issue, we focus in this paper on the dynamics and effectiveness of knowledge integration within cross-functional projects. For the purpose of clarity, we adopt the definition of knowledge integration as “an ongoing collective process of constructing, articulating and redefining shared beliefs through the social interaction of organizational members” ([18], p. 15). Exploring knowledge integration in cross-functional projects is important because firms are increasingly relying on this form of organization. This is primarily because such projects do not require a drastic modification of existing organizational structures, yet have proved to be helpful to firms in their attempts to manage complex organizational tasks [12,36]. However, although cross-functional project teams are often
formed on the premise that this will allow for the pooling of specialized expertise from different organizational units, our understanding of how knowledge is integrated within this specific context remains limited [19]. Exploring these processes of knowledge integration within cross-functional projects is therefore important. However, it is crucial to recognize that cross-functional knowledge integration within the context of a project team is not limited to a focus on the dynamics occurring within the team boundary. It is equally vital to understand the dynamics of knowledge integration beyond the team boundary, in particular in relation to knowledge integration with stakeholder groups. This is illustrated by the cases, which are discussed later in this paper.

2. Theoretical foundations

This section reviews and outlines prior research that we have drawn on to shape the theoretical foundations of this study. Two main areas included are the current debates about cross-functional project teams and various elements underlying the conceptualization of knowledge integration.

2.1. Cross-functional project and project teams

The popularity of employing cross-functional project teams is clear in many organizations today [36]. While the tasks performed by cross-functional project teams vary from one organization to another, three distinctive yet interrelated types of tasks can be identified. First, cross-functional teams are often used where the focus is on creativity and innovation. In other words, teams are formed to generate new ideas or solutions that did not previously exist in the organization. Cross-functional project teams formed for new product development [6] would be a typical example. Second, such teams are used to generate consensus through collective input, investigation and negotiation. For example, cross-functional teams are formed for strategic planning which needs to take into account the different interests of organizational units or divisions. Even though this type of task also often demands creativity, resolving internal politics to form an agreement characterizes the key focus [2]. Third, such teams are used for managing strategic change initiatives. For example, a strategy change initiative might include implementing new technological solutions, such as ERP [25] and GDSS [14], and process innovations, such as BPR [9] and knowledge management [16]. Due to the fact that strategic change initiatives often involve multiple stakeholder groups, such as project sponsors, users and external consultants (e.g. [23]), the project scale and degree of complexity can often outstrip the previous two types. In addition to the need for the continuous generation of new ideas and ongoing settlements over political battles, this type of project has relatively lower reoccurrence in the same organization. One of the issues related to this type of project is that organizations often fail to generate insightful lessons from their implementation experience, because they do not see the value of it, or they simply need to move on to different tasks [19]. Given the underlying difficulty, challenge and complexity of strategic change projects we chose this type of project to focus our investigation of knowledge integration.

Despite its complexity, organizations continue to use this type of project team. There appear to be three key reasons for this. First, cross-functional project teams enable an organization to pool together a wide range of expertise from various units to accomplish complex tasks which cannot easily be dealt with by one unit [10]. The implication of this is that vital knowledge, which is often concealed by functional boundaries, can be effectively accessed [17]. Second, cross-functional project teams help to obtain sufficient support from the ‘stakeholders’ by having representatives from various units participate in the project [34]. Having organization-wide representation is crucial to gain sufficient support, because the collective sense of belongingness facilitates the reduction of cross-functional conflicts by ensuring political correctness. Such an argument is reflected in the study by Hutt et al. [21], who argue that political hurdles are often harder to conquer than technological ones in the context of strategic change. Third, cross-functional project teams can significantly enhance the quality of decision making by drawing on multiple perspectives which can often be missed out if the decision is made by one single division [2,17]. The earlier rationale suggests that cross-functional project teams are, in essence, groups which have members with highly differentiated knowledge and a mission that can only be fulfilled through integrating the differentiated knowledge both internally within the group and externally with the various stakeholder groups impacted by the group’s work. Yet, clearly, such a mission is not merely knowledge-intensive, but also politically hazardous. To ensure a clearer understanding, the following section explores the theory of knowledge integration and incorporates various perspectives that are useful in explaining the effectiveness of knowledge integration.

2.2. Knowledge integration

Stemming from the need for differentiation and integration [22], the theory of knowledge integration [15] emphasizes the economic value of specialization and the effectiveness of integration. In other words, competitiveness depends on the diversity and strategic value of specialized knowledge, as well as an organization’s capacity to integrate the knowledge in an effective
manner. An organization’s knowledge integration capacity is determined by two crucial mechanisms, which are direction\(^1\) and organizational routines \([15]\). The underlying assumption is that rather than having all specialists master all subject matters, direction enables the communication between specialists by codifying tacit knowledge into explicit rules \([13]\), and organizational routines reduce the need for communicating the explicit knowledge.

In addition to these two mechanisms, Grant \([15]\) argues that an organization’s competitiveness derived from knowledge integration is determined by three issues, notably the efficiency of integration, the scope of integration and the flexibility of integration. Based on his argument, the level of efficiency depends on the extent to which common knowledge exists between participants, the level of coordination and organizational structure. According to Demsetz \([13]\), common knowledge, or knowledge redundancy in Nonaka and Takeuchi’s \([29]\) terms, refers to the common understanding of a subject area shared by organizational members who engage in communication. For example, to facilitate the discussion of developing a trading system between a technologist and trader, it is crucial for the trader to have some basic understanding about the technology, and for the technologist to know something about the trading process. Undoubtedly, the lower the level of common knowledge that exists, the harder the integration between organizational members. Despite the importance of common knowledge, the level of coordination can only be improved through repetition. In other words, when common knowledge is created, different specialists need to continuously practice to enhance the quality of their coordination. This is reflected in the notion of collective mind \([37]\), which facilitates ‘seamless coordination’ between specialists, so ensuring the consistency of performance. Moreover, the level of efficiency depends on how the organizational structure aligns with the nature of the tasks performed by members. For instance, a bureaucratic structure reduces the need for communication and can maximize the efficiency of integration in a stable environment. By contrast, when the level of environmental change is high, an organic structure supports the increasing demands for communication and permits the improvement of integration efficiency \([38]\). The scope of integration refers to the level of complexity underlying the integration of differentiated knowledge. Referring to the discussion on integration efficiency, it is clear that the greater the scope of integration, the lower the level of integration efficiency that can be expected. This is because the need for a sufficient level of common knowledge may not be fulfilled when the scope of integration widens. Also, when the scope of integration expands, the need for a higher level of coordination is required. Hence, without prior experience in a large scale coordination project, organizations may potentially suffer from a low level of integration efficiency. Finally, according to Grant \([15]\), the degree of integration flexibility is determined by an organization’s capacity for reconfiguring existing knowledge as a means of promoting continuous innovation. The significance of integration flexibility is reflected in his statement that: “hypercompetitive conditions ultimately result in all positions of competitive advantage being eroded by imitative and innovative competition” \((p. 382)\).

Synthesizing the discussion on cross-functional project teams with the discussion on the requirements to derive competitiveness from knowledge integration, it becomes clear that the expectations about what cross-functional project teams can achieve often tends to be over-ambitious. While prior studies have provided useful insights, it is also apparent that our understanding of how the efficiency, scope and flexibility of knowledge integration influence the implementation of cross-functional projects remains limited. To shed some light on this issue, a comparative study of four cases was conducted, in particular to address the two proposed research questions: (1) How are the efficiency, scope and flexibility of knowledge integration shaped in the context of cross-functional project teams? (2) What are the opposing forces that facilitate and inhibit the development of knowledge integration efficiency, scope and flexibility in cross-functional project teams? The following section outlines the methodological foundation of this study.

3. Methodological concerns and issues

Guided by the research focus of examining the efficiency, scope and flexibility of knowledge integration within the context of cross-functional project teams, a comparative study of four cases was conducted. The design was essentially a comparative case study \([39]\). This was considered appropriate for this research since it allowed us to address “why” and “how” research question(s). In particular, the aim of the research is to unravel the complexity of knowledge integration in cross-functional project teams. This would be difficult to address by testing the relationship between dependent and independent variables \([39]\). There were four criteria used to select the four case projects. First, to ensure similarity in the scope of integration, all selected projects required involvement of virtually all members of staff. In other words, all organizational members were stakeholders of the project, either as project sponsors,
end users, monitoring committee members and/or project members. Second, none of the selected case organizations had prior experience in implementing the specific innovation involved in the project. Third, all projects were cross-functional in nature. In other words, it is not only that a project team had members representing different organizational functions, but also that the scope of the project covered and affected multiple functions. Fourth, each of the projects was innovation-oriented so that there was a need for creating knowledge through integrating cross-functional knowledge.

3.1. Data collection

The periods of time spent collecting the data and the number of semi-structured interviews conducted are outlined in Table 1. Four sources of evidence collected from each case were on-site observation, semi-structured interviews, informal dialogues (including conversations with the researched via email, telephone, or conversation without any prior arrangement) and documentation to ensure the richness of the findings and for the purpose of triangulation [39]. Prior to interviewing, an average of two months on-site observation in each case organization was conducted by one of the authors for two purposes. First, it enabled the researchers to familiarize themselves with the social setting. Second, it fostered better understanding of the organizations’ background, including its structure, culture and sub-culture, technology and business processes. This facilitated the design of interview questions [39].

3.2. Data analysis

Prior to data analysis, preparatory research activities included transcribing interview tapes, typing and filing research notes, summarizing documents and clustering them into four groups, namely interview transcripts, research notes, photocopied documents and information downloaded from the case organization’s Intranet and databases. The idea of “concept cards” [30] was used to briefly summarize the content of each file and indicate potential linkages with different files. The data stored in the four groups were used as the foundation to proceed to the analysis. The analytic strategy [39] consisted of two main techniques, including “open coding” [35] and “conceptually clustered matrix” [27]. While the former was used to categorize the data into various categories and concepts in each case, the latter was used to generate cross-case comparison. Specifically, building upon the outcome of open coding, conceptually clustered matrices were developed to display key themes to represent the efficiency, scope and flexibility of integration [15], and cross-examine concepts generated from open coding to ensure the validity of the findings. Due to the constraint of space, the study only presents the outcomes from the cross-case analysis.

3.2.1. Case background

Restructured in 1997, Dynamic Investment Bank (DBank) provides a range of financial products, including foreign exchange, currency options and interest rate derivatives. Operating in major financial centers, including London and New York, a total of 1500 employees generated more than $2 billion gross profits in 2000. The overall structure of DBank is characterized by a hierarchy that consists of several parallel functions. The Technology and Business Divisions account for more than 65% of the total workforce. The rest of the employees are organized in various supporting functions, such as Administration, Accounting, and Legal. The Business and Technology Divisions were divided into various small teams that specialized in a specific range of financial products and supporting technology. Various Business and Technology teams were grouped, according to the nature of trading, into the front, middle and back offices.

Innovation Engineering Limited (IEngineering) is a major league multinational player in the engineering industry, designing and manufacturing standard and custom-built products and providing consulting services for corporate clients from over 70 countries world-wide. More than 60,000 employees across the globe generated sales turnover in excess of $8 billion during 2000 alone. IEngineering’s employees are based in four main product divisions, namely Power Generation, Transport, Infrastructure, and Gas and Oil, each organized on a global basis. In addition to the centralized head office functions, each product division has its own support functions, such as finance, accounting and human resources that report directly to Head Office.

Trustworthy Retailing Limited (TRetailing) is one of the largest retailers in the UK, and has more than 1350 stores throughout the UK and the Republic of Ireland’s high streets and out-of-town shopping centers. New stores in Continental Europe and Southeast Asia were being added as the initial step of its global operation strategy. With a total workforce of just under 60,000, TRetailing has yielded more than £3.5 billion of sales in 2000. In addition to the central supporting functions, such as Marketing, Human Resources and IT, the Head Quarters is organized based on three main product

<table>
<thead>
<tr>
<th></th>
<th>Data collection period</th>
<th>Number of interviews</th>
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<tbody>
<tr>
<td>DBank</td>
<td>April 1999–March 2001</td>
<td>39</td>
</tr>
<tr>
<td>IEngineering</td>
<td>March 1998–November 1999</td>
<td>37</td>
</tr>
<tr>
<td>TRetailing</td>
<td>March 1999–February 2001</td>
<td>26</td>
</tr>
<tr>
<td>GOil</td>
<td>September 1998–January 1999</td>
<td>14</td>
</tr>
</tbody>
</table>
categories, notably healthcare, beauty and leisure. All stores in the UK are grouped into 13 different regions, and report directly to the designated regional office.

Global Oil Company (GOil) is one of the largest companies in the world, and has continuously undergone numerous mergers and acquisitions during the past decade. One hundred thousand employees worldwide have contributed to the revenue of about £100 billion in 2001. Specialized in exploration, refinery, chemicals and retailing, GOil is perceived as one of the strongest players in its fields. In contrast to the above three case organizations, GOil had a flat structure that consisted of more than 100 business units worldwide. Strong emphasis on technology and innovation had helped GOil to cut down its operational cost by more than a quarter during the past decade.

3.2.2. Case findings

Within this section, we outline the findings generated from the cross-case comparison. Table 2 summarizes some of the key features of the projects. The four projects differed in terms of the degree to which they relied on external knowledge for the project implementation. Two projects—Iengineering and DBank—relied more on external knowledge, and we refer to these as externally driven innovation projects. The other two projects relied less on external knowledge, and we refer to these as internally driven innovation projects. This distinction does not imply that internally driven innovation projects do not have any influence from an organization’s external environment, or vice versa. Rather, the purpose is to indicate that externally driven innovation requires external knowledge, which can only be acquired through “grafting” [20]. For example, IEngineering had an IT consulting firm to facilitate the ERP implementation, while DBank had recruited more than a hundred new staff to fill the vacuum of Component-Based Development (CBD) knowledge. By contrast, while internally driven innovation can be initiated through grafting, such organizational innovation can also be achieved through utilizing the organization’s existing knowledge. In other words, compared to externally driven innovation, an organization is less dependent on external knowledge for internally driven innovation. For example, TRetailing appointed a management consultant team to conduct the initial process analysis. When the process analysis was completed, an internal team took over the implementation of the BPR program. Likewise, GOil had its members carry out all activities related to the implementation of its knowledge management program.

All project teams had an average of 12–14 core members who were selected from a variety of organizational units to ensure organization-wide representativeness. Ensuring organization-wide representation means that

<table>
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<th>DBank</th>
<th>IEngineering</th>
<th>TRetailing</th>
<th>GOil</th>
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<tbody>
<tr>
<td>Project</td>
<td>Component-based development</td>
<td>Enterprise resource planning</td>
<td>Business process redesign</td>
<td>Knowledge management</td>
</tr>
<tr>
<td>Project nature</td>
<td>Technology-led process innovation</td>
<td>Technology-led process innovation</td>
<td>Process Innovation</td>
<td>Process innovation</td>
</tr>
<tr>
<td>Project duration</td>
<td>Ongoing</td>
<td>3 years</td>
<td>2 years</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Project objectives</td>
<td>To enhance technology leadership by revolutionizing software development</td>
<td>To enable information sharing across all units</td>
<td>To embed continuous change into work practice</td>
<td>To improve HQ’s support to all regions and stores</td>
</tr>
<tr>
<td>Involvement of external consultants</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Business users and technologists</td>
<td>All divisions</td>
<td>All divisions</td>
<td>All business units</td>
</tr>
<tr>
<td>Steering group</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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2 According to Huber [20] grafting refers to a learning process by which organizations acquire knowledge from recruitment or hiring external consultants.

3 ERP systems have been defined as enterprise-wide packages that tightly integrate business functions into a single system with a shared database [23].

4 CBD refers to a software engineering approach that allows adopting firms to effectively develop new systems based on assembling existing software components (codes) that have embedded reusability when the components were developed. Comprehensive reviews about CBD can be found in the special issue of Communications of the ACM [8].
organizational members are more likely to accept the innovation, because each group will have a project team member who represents their interests [34]. This is particularly vital for organization-wide projects where there is a need to obtain acceptance across the organization.

Two of the case organizations utilized a steering group as a control mechanism to monitor the project progress. In the IEngineering case, the steering group continuously provided help and support to the ERP team facilitating the removal of obstacles and the obtaining of sufficient resources. However, in the TRetailing case, the steering group provided virtually no help to rescue the struggling BPR team. While both steering groups were composed of senior managers, the focus and interests of the members varied across the two cases. In particular, in the TRetailing case, the steering group members were more concerned with their own departmental interests than the broader interest of the organization.

We now link our findings to the theoretical framework of knowledge integration [15], and summarize our findings based on the relationship between integration efficiency, scope and flexibility and the promoting and opposing forces that affect this integration. Fig. 1 provides a summary of these relationships.

3.2.2.1. Efficiency of integration. While common knowledge was found to be essential across all cases, the analysis revealed some interesting similarities and differences in how the required level of common knowledge was created. In terms of similarities, common knowledge was primarily created within the project team, before being diffused throughout the organization. However, differences were found in how the project teams created common knowledge through building project awareness and how stakeholders shared such knowledge within and beyond their divisions. Even though all teams had organized workshops and training courses to promote their projects and educate the users, the results suggested that it was individuals’ attitudes towards learning the knowledge that most strongly influenced the effectiveness of creating common knowledge. For example, in the IEngineering case, a large number of users had attended various ERP-related workshops and seminars prior to the implementation decision. A collective demand was created across various divisions to ensure that ERP would be adopted. In contrast to the proactive learning in IEngineering, business users in DBank refused to attend any training, because the need to understand technology was perceived as part of the technologist’s job.

Furthermore, it was found that the effectiveness of building common knowledge was strongly associated with the availability of objective measures. For example, in the GOil case, the team had faced difficulties in convincing some users about the value of knowledge management, because there was no measurement available for calculating its costs and benefits. As one member from the Knowledge Management Team noted, “you can’t measure how much a nut contributes to a washing machine, can you?” Similar problems were faced by the BPR team in the TRetailing case. As some interviewees noted, why should users change something which they were familiar with and which allowed them to achieve their targets to something which they were not familiar with? By comparison, the level of effectiveness was relatively higher in the technology-led process innovation cases at IEngineering and DBank for two reasons. First, because users did not need to understand the design of a technology to use it. Second, because the creation of common knowledge could be underpinned by tangible benefits, such as better support from the new technology [11]. In particular, in the IEngineering case, the cost savings achieved from the ERP implementation was in turn reflected in an increase in the year-end bonus. It is clear that common knowledge is vital for communication [13], yet the perceived value of this common knowledge appears to be the driving force behind its creation. Where those involved see little value in gaining common knowledge, they are unlikely to attempt to learn this knowledge.

Two themes which were found to shape the level of coordination were the case organizations’ past experience in cross-functional collaboration and the organizations’ embedded practice that permitted or inhibited the building, nurturing and maintaining of social capital [28]. In each of the four cases, the creation of common knowledge was primarily built upon the perceived value of and benefits derived from being involved in the project. This is reflected in the notion of intellectual buy-in suggested by Huang et al. [19]. However, the creation of common knowledge alone did not necessarily lead to the level of “emotional attachment” [24], which was required to overcome resistance. For example, in the

![Fig. 1. The model of knowledge integration—efficiency, scope and flexibility—in the context of cross-functional project teams.](image-url)
TRetailing case, one project manager stated that “if you come along and show them the facts and figures, and tell them that actually the world is changing like this, then intellectually they can see that. But in their hearts, they are feeling ‘that is fine, but I still don’t want to do it’. So you actually need to persuade them on the emotional level as well”. The need to influence stakeholder groups at the emotional level was found to be strongly related to the organization’s past experience in implementing cross-functional projects. Thus, DBank and TRetailing had limited experience in carrying out large scale cross-functional projects. These two cases had much more difficulty in achieving emotional attachment with the stakeholders compared to the other two cases. As noted by Robey et al. [31], collaboration requires practice.

The emotional dimension of collaboration explains only part of the importance of social capital as it affects cross-functional project work. As illustrated by Nahapiet and Ghoshal [28], social capital, in addition to its relational dimension, also has structural and cognitive dimensions. The structural dimension refers to the network ties and configuration between various organizational groups. Where an organization’s practice does not require frequent cross-functional collaboration, this substantially undermines the need for and development of network ties. This was particularly evident in the DBank case. Referring to the scale of the project and the organization’s size, in the Goil, TRetailing and IEngineering cases, it is clear that only limited strong ties can be developed purely by the project team members. Yet, through a process of referral [5] the strong ties had been extended, allowing the teams to expand their social networks to a broader network. This was seen to be crucial for implementing this type of project, where organization-wide representation was vital.

In relation to the cognitive dimension, the findings suggest that social capital, specifically the development of shared narratives and codes, requires a facilitating organizational structure. This is because various different tasks performed by different organizational units have led to the development of group-specific subcultures [32]. Shared narratives and codes across these different groups are not developed, unless frequent cross-functional communication and collaboration are encouraged. Compared to Grant’s [15] view that efficiency of knowledge integration lies in a structure which minimizes the need for communication, our findings have shown the opposite. The reason for this difference is likely to be because we have here focused on cross-functional projects, which are tasked with performing a series of non-routine tasks. Grant [15], on the other hand, was focusing on routine organizational operations. Rather than deriving integration efficiency from routinization and minimizing the need for communication, it seems that the level of efficiency in the context of cross-functional project work depends on how common knowledge is created, how social capital is managed and how an organization’s structure facilitates the development of social capital.

3.2.2.2. Scope of integration. As suggested by Grant ([15], p. 381), “the greater the scope of knowledge integrated, the harder it is for competitors to replicate the integration capability”. Referring to cross-functional implementation projects, it is evident that there were differences in such capability across the cases. For example, in the IEngineering and IEngineering cases, implementation was found to be relatively effective compared to the TRetailing and DBank cases. However, their differential integration capability was not determined solely by the scope of knowledge being integrated, because the scope was similar across the cases. In other words, all projects required the integration of knowledge across virtually all organizational units. In the cross-functional project context, our findings suggest that an organization’s past experience in integrating knowledge that is wide in scope, for example, experience gained from implementing previous organization-wide projects, is an important influence. Compared with TRetailing and DBank which had limited experience in large scope integration, GOil and IEngineering had gained substantial experience from past projects. For example, in GOil, prior to the knowledge management program, various corporate-wide initiatives, such as creating a common operating environment and a virtual teamwork project, were successfully implemented. Similarly, in the IEngineering case, experience was gained from projects, such as TQM and a common IT platform project.

Clearly, the examination of integration scope cannot be isolated from the understanding of integration efficiency. In particular, the four cases demonstrated that an organization’s capacity to integrate functionally specific knowledge with a broad scope, is influenced by its past experience as well as the structure through which cross-functional collaboration is encouraged and rewarded. Specifically, where social capital had been developed through previous cross-functional collaboration it was found to be easier to integrate knowledge with a broad scope. However, knowledge integration cannot be perceived as merely an intellectual activity [19], so that the understanding of how an organization copes with wide-scope knowledge integration should not be understood simply by considering an organization’s past experience. Rather, it is equally important to take into account how the development of social capital is promoted and managed in the organization and facilitated by the organizational structure and practice. For example, cross-functional projects of various scales had been previously undertaken in IEngineering and these previous experiences had benefited the organization by laying a strong foundation in comprehensive
social networks. In contrast, the overemphasis on specialization in DBank had reduced the opportunity for its workforce to develop the required social capital to facilitate CBD implementation.

3.2.2.3. Flexibility of Integration. As suggested in the earlier discussion, the flexibility of integration is closely related to how continuous innovation is exploited and nurtured. In other words, the level of flexibility is shaped by an organization’s capacity to build one innovation initiative on top of another. The need to draw on past innovation for future innovation is reflected in the notion of infusion [7] that portrays how organizations increase their effectiveness by synthesizing lessons learned from past innovation experience. Referring to the GOil and IEngineering cases, it is clear that their strong emphasis and dependence on innovation to survive had facilitated the development of integration flexibility. However, this does not suggest that DBank and TRetailing had under-emphasized the need for continuous innovation. As one manager from TRetailing noted, “we are suffering from initiative overload and inability to cope with change consistently and successfully”. A similar experience was also found in the DBank case. Nevertheless, it was clear in the DBank and TRetailing cases that, even though innovations had been continuously initiated, there was little synergy generated from these initiatives.

Observed differences between the level of integration flexibility across the four cases can be explained using the distinction between adaptive and generative modes of learning as proposed by Senge [33]. According to Senge, an organization cannot learn effectively simply by concentrating on fixing problems with quick solutions. Such adaptive learning is insufficient. Rather, it is vital to promote generative learning by constantly evaluating the way in which solutions are created. Findings derived from the GOil and IEngineering cases suggest that integration flexibility is developed through generative learning. For example, a knowledge management program was initiated in IEngineering when the implementation of ERP was almost completed. The reason for this new initiative was that those involved recognized the limitations of the ERP solution. They recognized that the free flow of information enabled by ERP did not necessarily lead to the sharing of tacit knowledge. In order to improve the sharing of this tacit knowledge, various product-related innovation communities were formed under the knowledge management initiative. In contrast, evidence collected from the DBank and TRetailing cases suggested that the capacity to enhance integration flexibility had been undermined by the fire-fighting mode of adaptive learning. In particular, in the TRetailing case, interviewees commonly agreed that BPR did not generate the expected outcome largely because stakeholders were not equipped with the understanding that a fundamental change was needed. Given that adaptive learning appeared to be the norm in this organization, differences in perceiving the need for innovation between the project team and stakeholder groups seemed to be inevitable. Even though business users in the DBank case considered that the implementation of CBD was crucial to support their trading, they did not perceive the necessity of acquiring basic technological knowledge that is crucial to maximize the benefit of CBD.

Moreover, differences in the way in which external consultants contributed to the level of integration efficiency were evident between the TRetailing and IEngineering cases. Instead of facilitating the BPR implementation, the external consultant team was appointed by TRetailing simply to carry out the evaluation study. They were not involved in the actual implementation because the company wanted to save on the consultancy fee. Since the internal team had limited knowledge about the concept of BPR, the evaluation report produced by the external consultants proved to be useless. It was therefore perhaps unsurprising to find that the adaptive mode of learning became the dominant style in the BPR team. In contrast, the external consultant team appointed by IEngineering had been a long-term strategic partner of IEngineering. Past experience in collaborating on large scale projects had enhanced the integration flexibility, which not only benefited IEngineering, but also its strategic partner.

3.2.2.4. The relationship between integration efficiency, scope and flexibility. As shown in Fig. 1 and elaborated earlier, three forces, namely social capital, past integration experience and embedded practices, appeared to collectively influence the level of coordination achieved and the way in which the scope of integration was accommodated. The influence of these three forces, as evident in the comparison of the four cases, suggests that to develop higher levels of coordination and fulfill the demand of larger integration scope requires more than just the development of teamwork within the project team itself. Our results have demonstrated that it is equally important for team members to engage with other stakeholder groups through utilizing their social capital. Social capital is important both for helping to develop cohesion within the team itself, but also for aligning different stakeholders to ensure that stakeholders are committed to the project by prioritizing the project on their agenda [19]. Grant’s conceptualization of knowledge integration under-emphasizes the role of social capital. Our findings demonstrate that knowledge integration within the context of cross-functional project implementation is in essence a continuous process through which social capital facilitates the connection, disconnection and/or reconnection between different stakeholder groups. In addition, an organization’s past
integration experience is found to be a prerequisite condition, formed based on the collective results of past project implementation experience. Finally, embedded practices reflect an organization’s structure, which may either facilitate or impede knowledge integration.

In terms of the efficiency of integration, our results have coincided with Grant’s [15] conceptualization that the level of coordination, common knowledge and organizational structure are paramount. However, our findings also suggest that in the context of cross-functional project implementation the way in which team members mobilize their social capital and diffuse project awareness through creating common knowledge across different stakeholder groups is equally crucial. As is evident in the study, the utilization of social capital by the project team is not always sufficient to achieve the stakeholders’ buy-in. Rather, to encourage the involvement of stakeholders demands the nurturing of project awareness, in particular through building common knowledge and promoting the benefit, or the “perceived usefulness” in Davis’ [11] terms, that will and can be actualized from the project.

In terms of the relationships between the integration elements, Grant indicates that an organization’s ability to integrate knowledge cross-functionally is determined primarily based on the collective effect of integration efficiency, scope and flexibility. Our findings differ from Grant’s probably because of the kinds of projects that we have examined here, that is broad, organizational-wide projects that are more complex and demand higher levels of knowledge integration than anything previously undertaken within each organization. Under these conditions, where an organization has very limited experience to apply to their current actions, our results suggest that the utilization of social capital and the creation of common knowledge within and beyond the project team is essential. In other words, when the scope of a cross-functional project is greater than all projects implemented before, to identify, acquire and share knowledge required by the project is largely determined by how the potential of social capital, specifically “referral” [28], is maximized.

Synthesizing the earlier three aspects of knowledge integration, the following section concludes the study by outlining theoretical and managerial implications.

4. Conclusion and implications

The earlier discussion has explored the efficiency, scope and flexibility of knowledge integration in the context of four cross-functional projects. It is clear that while the scope of the four projects spanned virtually all organizational divisions, the creation of common knowledge between the team and stakeholders was found to be difficult. As indicated earlier, the creation of common knowledge is driven by the way in which stakeholders perceive the value of the project. Yet, the awareness of value derived from the project does not fully explain the complexity of integration efficiency, because the development, nurturing and maintenance of social capital is equally crucial. In particular, as shown in the study, organizational structure and practice can significantly promote or oppose members’ opportunities to develop and manage their social capital. When such opportunities are limited, the efficiency of knowledge integration between the project team and stakeholders is significantly minimized. As shown in the findings, an organization’s past experience in implementing large-scale projects plays a key role in determining the level of integration efficiency and scope. Moreover, it is evident that how organizations can build on their past innovation to initiate new innovation shapes the development of integration flexibility.

Contributions made by the study are reflected in not only applying the theory of knowledge integration [15] to examine cross-functional projects, but also synthesizing our findings with other conceptualizations. Cross-functional project teams, however, represent only one of many new organizational forms. Others, such as virtual teams and inter-organizational teams, also call for more empirical studies to enhance our understanding. Furthermore, instead of focusing on projects, which have a relatively long life span, other research can potentially extend the knowledge integration theory by observing short-term and non-reoccurrence teams. Managers can learn from this study to evaluate the effectiveness of forming cross-functional project teams, in particular by assessing how past experience and organizational context facilitate or inhibit the implementation. While the benefits of involvement need to be clearly specified, an understanding of the existing network structure is equally beneficial. Due to the fact that the emotional influence of organizational members on performance is often understated [1], managers will need to encourage the development of emotional attachment between various stakeholder groups by promoting the importance of cross-functional collaboration. As noted by Robey et al. [31], collaboration requires practice. Knowledge integration, in particular in a cross-functional project, will also need continuous practice.

References

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