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Encouraging knowledge-sharing in engineering firms—part I: incentives, disincentives, and the impacts of firm context

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Knowledge management (KM) is critical for organizations to capitalize on organizational knowledge and gain competitive advantage. Encouraging knowledge-sharing is the cornerstone of a successful KM system. However, the effectiveness of different strategies for knowledge-sharing may be contingent on different firm characteristics, which often affect how individual employees interact. The objective of this research is to add to the emerging literature of KM by deriving a contingency view of how to effectively promote knowledge-sharing. Since the sharing of knowledge closely relates to the competitive and cooperative relationships between employees, we adopted the game theory for modelling. This study consists of two parts. In Part I of this paper, we identify critical incentives and disincentives for knowledge-sharing between individuals as well as firm contextual variables that may affect these incentives through the case study method and literature review. These results add to our existing knowledge about knowledge-sharing behaviours between individuals and highlight the impact of firm size and task repetitiveness on these behaviours. In the subsequent paper, Part II, these results are used to construct a game theory model and derive contingent strategies to encourage knowledge-sharing.

Keywords: Game theory, knowledge management, knowledge-sharing, organization, strategy.

Introduction

The importance of knowledge, and as a result, knowledge-sharing, to an organization has been well recognized (Cohen and Levinthal, 1990; Grant, 1996; Spender, 1996; Haas and Hansen, 2007). While information is only data in a context, knowledge is actionable information or the 'know-how', which is used to transform data, information, or a combination of the two into new information. The knowledge-based view of the firm recognizes knowledge as a resource with as much importance as financial capital (Conner and Prahalad, 1996; Grant, 1996; Spender, 1996). Recently, many firms have devoted tremendous resources to knowledge management (KM) efforts due to their need for sharing scarce, specialized intra-organizational knowledge. In particular, for the project-based industry of engineering and construction, effective knowledge exchange helps organizations to capture tacit project-based knowledge needed to coordinate their specialized and interdependent activities to design and construct future projects (Jin and Levitt, 1996). However, implementing KM solutions in practice has had varied success, with indications that the majority of KM solutions fail to meet initial expectations (Akhavan *et al.*, 2005). In fact, many KM attempts have failed after expensive investments in KM platforms when firms naively believed that the employees would

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begin or be motivated to share knowledge simply by the implementation of information technology platforms for KM.

Knowledge does not flow spontaneously; instead, immobilized knowledge will remain at rest (Nissen, 2005). Implementing KM platforms alone will not automatically enable knowledge flow in an organization. Intra-organizational knowledge-sharing requires a focus on understanding why and when individuals are willing to share their knowledge internally with peers. However, the dynamics of intra-organizational knowledge-sharing are quite complex with multiple forces—both positive and negative—at play. Ho *et al*. (2011) argue that strategic interactions between employers and employees play a crucial role in how knowledge is shared in a firm. However, they did not study how the interactions between individual employees will respond to firm's strategies for knowledge-sharing.

In this research, we aim to develop a set of contingent strategies for effective knowledge-sharing by modelling the knowledge-sharing interactions between individual employees. Since the sharing of knowledge relates to the competitive and cooperative relationships between employees, the game theory will be used in a subsequent paper to model the knowledge-sharing dynamics. In this paper, Part I of the findings, literature review and multiple case studies were conducted to provide empirical grounding for the game theory modelling and analysis reported in Part II.

Research approach

Our multi-method research approach integrates the game theory modelling with ethnographic case studies and the literature review to analyse the interactive knowledge-sharing dynamics between individual employees and construct a new theory on knowledge-sharing strategies. Game theory modelling consists of three basic steps. First, the problem under study is abstracted for modelling and a game model is developed. The second step is to solve for conditions of all possible or specific solutions of the game model developed in the first step. The third step is to derive strategy implications or build a new theory by identifying possible variables of strategic importance, called contextual variables, and then linking the contextual variables to model solutions. The first and third steps require sufficient knowledge of the problem in order to make appropriate assumptions to simplify the problem by focusing on a few critical components. In particular, we need sufficient knowledge of individual knowledge-sharing behaviours and interactions. Unfortunately, existing literature on this topic is sparse (Foss *et al*., 2010). While the existing literature provided a starting point, we gathered empirical findings from case studies to ground our model assumptions and to provide deeper insights into the problem for model abstraction and strategy derivation.

Because the research explores an area of largely uncharted territory, an exploratory case study approach is valid (Eisenhardt, 1989; Yin, 2003). These case studies relied primarily on interviews with construction and engineering firms to obtain a deeper understanding of knowledge-sharing dynamics in order to model the problem. The interviews were conducted with employees to understand the circumstances under which employees shared or withheld their knowledge from others in the firm. In total, seven firms were studied and 41 interviews were conducted. The studied firms all had active ongoing initiatives to promote KM, although with varying success. The interviews were semi-structured, allowing for open-ended responses to questions to obtain additional context behind the responses. The interviews focused on knowledge-sharing behaviours, incentives for and obstacles to sharing, their feelings about sharing knowledge, and what firms did to encourage sharing. We also collected and analysed each firm's internal documents associated with KM to enrich the data for analysis. These interviews helped to determine the variables selected for the game model and helped us analyse the results to develop a new theory. Table 1 summarizes the background information of the seven studied firms. Table 1 highlights the number of employees and the level of repetitiveness of tasks are indicated for each firm. As we shall discuss later, the two dimensions play important roles in the magnitudes of model variables.

Incentives and disincentives for individuals' knowledge-sharing

In this section, we identify the incentives and disincentives for individuals' decisions on sharing knowledge and discuss the rationales behind these variables. These (dis)incentives will be used as players' payoff variables in the subsequent game theory modelling in Part II. Table 2 lists these (dis)incentives and their meanings for future references in the paper.

The incentives for sharing

According to the literature review and case study results, we find that the main incentives for sharing come from intrinsic rewards due to altruism, reputation, and socialization. While most incentives are positive payoffs from sharing, one particular incentive comes from the avoidance of the negative payoffs due to 'not sharing'. Here we discuss the major incentives

Table 1 Background information and firm context of studied companies

Studied company	Business scope	Number of employees (firm size)	Level of task repetitiveness[a]
A	A global firm in engineering consulting, design, planning and project management	7000+ (large)	Mixed
B	An engineering consulting firm based in Taiwan	1800+ (smaller)	Mixed
C	The design, R&D, engineering, construction, and project management arm of a firm in entertainment industry	1000+ (smaller)	Less repetitive
D	A global company that delivers engineering, procurement, construction, maintenance, and project management	36 000+ (large)	Repetitive
E	A company specializing in engineering, project/construction management, business consulting, and operational services to the mining, metallurgical, energy and infrastructure industries	6000+ (large)	Repetitive
F	A global firm specializing in construction, development of commercial and residential projects	60 000+ (Large)	Mixed
G	A construction firm specializing in design-build construction, general contracting and construction management	140 000+ (large)	Repetitive

[a]In large multinational organizations, there is typcially a wide-variety of tasks. The level of task repetitiveness listed for each organization is based upon the respondents interviewed within each company.

Table 2 Incentives and disincentives for individuals' knowledge sharing

Payoff variables	Incentives and disincentives for knowledge-sharing
A	Self-satisfaction from knowledge-sharing
$\mathbf{B_s}$	Benefits from increased professional reputation due to sharing knowledge
$\mathbf{B_o}$	Benefits of receiving knowledge from others in a firm
$\mathbf{R_1}$	Social rewards from knowledge-sharing
$\mathbf{R_2}$	Social punishment faced due to withholding one's knowledge
C[a]	The costs of knowledge-sharing: including explicit costs and implicit costs

[a]The only disincentive for sharing identified in this paper.

for individuals' sharing and how they affect employees' payoffs.

A. Self-satisfaction from knowledge-sharing

From our interviews, we find that employees can gain intangible rewards through self-satisfaction. This self-satisfaction can be attributed to altruistic motivations and the pure enjoyment of certain activities (Calder and Staw, 1975). When sharing useful knowledge, the sharers may feel very positively about helping others, being a valuable person to the firm, or their self-images. Ho *et al.*'s (2009) empirical study showed that, among their studied knowledge-sharing motivators, altruism is one of the most influential ones. Javernick-Will's (2012) study found that approximately 10% of responses regarding the reasons people shared knowledge were due to altruistic intentions. Similarly, in our interviews, many respondents expressed that, no matter what others do, sharing their knowledge is the 'right' thing to do. One manager from Company A commented, 'I think some people are natural knowledge sharers—they enjoy teaching and telling other people their experiences'. In addition, they feel that they are adding value to the organization by sharing their knowledge. As another manager from Company A commented, 'I think it is just a genuine concern and genuine desire to make sure everything goes right'. For the game theory modelling purpose, we shall use the variable 'A' in the game model to represent the positive payoffs due to the self-satisfaction from sharing knowledge.

B_s: Benefits from increased professional reputation due to sharing knowledge

From our interviews, we identified two benefits of knowledge sharing that are directly associated with

professional reputation and career development. The first are the benefits derived from gaining professional reputation and recognition within the company due to sharing knowledge, denoted by B_s. Our case study indicated that an increase in reputation is one of the major factors that motivate people to share in a firm. Multiple respondents indicated that recognition from peers and the firm was an important motivator for knowledge-sharing. For example, Company D publicly provides honorary 'expert' titles to recognize employees sharing valuable knowledge and helping peers. By doing this, this company publicizes its experts, or 'who to know', rewards knowledge-sharing behaviour, and indicates that knowledge-sharing is important to the company's mission. As two knowledge managers of a community of practice from Company D indicated, 'we have the KM [award title] nominations that allow [knowledge sharers] to be recognized across all levels and regions in the company. As a community, we recognize and spotlight them in our community'. One respondent from Company A indicated that if an employee wanted to be promoted, they would recommend that 'you need to raise your personal profile … if you hadn't been promoted, I may say, "Well, you are doing all the right thing in all the right places, but nobody's noticing" … the best way to raise your personal profile is to share your knowledge and be recognized for your expertise'.

Literature also confirms our findings. For example, in Xerox's widely admired Eureka system (Bobrow and Whalen, 2002), service technicians stated that building a reputation for competence within their 'natural community of practice' of fellow service technicians was a significant and major incentive for knowledge-sharing. Javernick-Will and Levitt (2010) also suggested that including knowledge providers' names along with shared knowledge is one meaningful way to harness this important positive reinforcement for sharing knowledge.

B_o: Benefits of receiving knowledge from others in a firm

The second type of professional or career development benefits are the benefits of receiving knowledge from others, B_o. As most informants in our case firms expressed, searching, posting and reading answers posted by others help them quickly solve problems. This is particularly true in firms with repetitive tasks, where many respondents indicated that the past experiences of other colleagues can be reutilized in future projects. In addition, individual employees can benefit from others who share knowledge by acquiring new work-related knowledge. The new knowledge can broaden their knowledge base and increase their productivity and job performance. Eventually, the firms can also benefit from increased organizational knowledge and thus performance at the collective level. Such benefits are the fundamental rationale in literature (see Nonaka and Takeuchi, 1995) for companies implementing KM.

R_1: Social rewards from knowledge-sharing

In addition to benefits associated with career growth and personal fulfillment, many people share knowledge due to the social rewards they receive from sharing their knowledge. Javernick-Will (2012) argues that the most frequently mentioned motivations for sharing knowledge are social motivations, including reciprocity, conformity to a corporate culture and expectations, or honoring a commitment to develop trust among peers. One respondent from Company C indicated 'I think if you share more, then you become more likable and more approachable. If you tend not to share, then people find you unapproachable'. Another respondent from Company C indicated that individuals who shared their knowledge freely became respected for these behaviours: 'I think both [employee's name] and [employee's name] share everything and I think people really respect them for that'.

R_2: Social punishment faced due to withholding knowledge

From behavioural economics and behavioural game theory perspectives (Camerer, 2003), in social interactions and economic activities, human beings tend to impose punishment on individuals who exhibit antisocial behaviours such as 'free-riding' or not being a good citizen of a society. Reciprocity—the social obligation to repay others for what a person has received —is one of the strongest and most persuasive social forces. Experiments have also confirmed that people tend to behave pro-socially and punish antisocial behaviour in groups and teams (Gintis, 2000). Fehr *et al.* (2002) term this behavioural propensity, 'strong reciprocity', which emphasizes the tendency to punish non-cooperators. To consider such behaviour characteristics and the associated consequences, we consider the avoidance of the social punishment faced, R_2, due to withholding one's knowledge in addition to the social rewards, R_1, an important incentive for knowledge-sharing.

Extrinsic rewards for knowledge-sharing

Some companies implement extrinsic rewards, such as monetary rewards or compensation, to encourage knowledge-sharing. While the offering of monetary rewards is intuitively sound, Bobrow and Whalen

(2002) and Bock and Kim (2002) show that monetary rewards exert much less influence on knowledge-sharing than either reputation or altruism, and can even be negatively associated with knowledge-sharing. Ho *et al.*'s (2009) case study also indicates that the sharing of irrelevant or low quality knowledge induced by monetary rewards can pollute firms' knowledge bases. They argue that the use of high monetary rewards is not advised because (1) high monetary rewards usually encourage high frequency but low quality-sharing, such as the sharing of irrelevant knowledge or low-value information, and (2) it is difficult to evaluate and price the shared knowledge. Therefore, they suggest that monetary rewards should be small or simply a means to publicly recognize the sharing efforts. From this perspective, the proper use of extrinsic rewards should be associated with the benefits from increased professional reputation due to sharing knowledge, B_s. Therefore, in this research, we exclude extrinsic rewards from the direct incentives for sharing knowledge.

The disincentives for sharing

The major disincentives for sharing are the costs incurred by the individuals who share their knowledge. Whereas explicit sharing costs, such as the time and effort required for sharing, are obvious and can be significant, the less obvious implicit sharing costs may be equally or more significant. For example, employees may be afraid that sharing their knowledge might reduce their uniqueness and personal value within a firm (Goh, 2002; Carrillo and Chinowsky, 2006; Ho *et al.*, 2011).

C: The costs of knowledge-sharing

According to Ho *et al.* (2011), two types of costs for sharing knowledge were modelled: the explicit costs and the implicit costs. The explicit costs refer to the time and effort needed to share knowledge. Generally, explicit costs are higher when the shared knowledge is more complex or tacit. Formalizing complex, tacit knowledge requires additional time and efforts that employees may not be willing to spend. As one manager from Company A stated, 'I tend to see people not sharing knowledge because they don't have the time … there doesn't seem to be a reluctance to share knowledge, but some people just don't have the time to do it'.

In addition to the direct explicit costs of sharing knowledge, employees can also incur implicit costs. These costs are due to the indirect negative consequences that employees experience when they share their knowledge. In particular, if an employee possesses 'unique' valuable knowledge or worries about competition from other colleagues, the employee's implicit sharing costs will be high because of the negative impacts on his uniqueness and value in the firm. Here 'uniqueness' is defined by the situation where the knowledge that is important to a firm's competitive advantage is owned by very few employees and that the knowledge owners are often valued highly by the firm or enjoy excessive earnings. The magnitude of the implicit sharing costs mainly depends on the degree of the uniqueness of the employee or knowledge.

To avoid complicating the analysis with too many variables, we combine the explicit costs and implicit costs into one single variable, C. However, it is crucial to remember that, conceptually, C consists of the two different types of costs discussed.

Contextual variables and assumptions for knowledge-sharing

Previously, we focused on the micro-level payoff variables of incentives and disincentives for sharing knowledge. Nevertheless, there are factors related to organizational characteristics that may have crucial impacts on the micro-level payoff variables. In this paper, these organizational or situational factors are called 'contextual variables'. After analysing the contextual variables, contextual assumptions concerning how the contextual variables affect individuals' payoff variables are made for game theory modelling. By considering the contextual assumptions, game equilibria can be transformed into new sets of equilibria that are contingent on different contextual situations. These new equilibria are useful for deriving applicable contingent strategies for encouraging knowledge-sharing. Since literature provides few references on contextual variables for knowledge-sharing, we rely again on the case studies to inform our results. From the case studies, we identified two contextual variables that will affect the contextual assumptions required for game modelling.

Firm size as a contextual variable

According to our case studies and prior research (Javernick-Will and Levitt, 2010), it appears that the size of the organization has a significant impact on two variables: namely, the costs of sharing knowledge, C, and the reputational benefits of sharing one's own knowledge, B_s. As shown in Table 1, among the seven studied firms, three, Companies D, F and G, are the largest companies, with over 36 000 employees each; whereas two, Companies A and E, are the second largest firms, with less than 10 000 employees each;

and finally, two, Companies B and C, are the smallest firms, with each employing less than 2000 employees. Comparing knowledge-sharing patterns according to firm size reveals different patterns between the large firms, i.e. Firms A, D, E, F and G, and smaller firms; i.e. Firms B and C. Thus, in our model, we differentiate firms into 'large' firms and 'small' firms. More detailed definitions of 'large' versus 'smaller' firms are provided at the end of this section.

Firm size and individuals' costs of sharing

First, we find that the firm size has significant impacts on the costs of sharing, C, primarily the implicit sharing costs. Within the smallest firms that we studied; i.e. Companies B and C, respondents indicated that they either withheld information to maintain their uniqueness or considered the implicit costs of sharing valuable knowledge to be significant. As one employee from Company C pointed out, 'People withhold knowledge … perceivably for personal gain … knowledge is power so some people want to maintain and retain that knowledge'. Another respondent from Company C also indicated, 'if they hold some level of knowledge … they become more valuable … they assure themselves continued employment by withholding information'. Furthermore, one respondent from Company B expressed his concern that 'If the knowledge I shared represents my value in the firm, I would worry about the negative impacts on my competitive advantage in the firm'. From these findings, it appears that employees in smaller firms bear considerable costs for sharing their knowledge.

On the contrary, employees from the large firms seldom expressed their concern regarding the loss of uniqueness and personal advantage due to the sharing of knowledge. In these large firms, the uniqueness or competitive advantage of employees seems to be less threatened by those who learn from the sharer. Large companies typically have many experts in each specific specialty domain so that the uniqueness of these experts is much lower. For example, in multinational or geographically dispersed companies, it is unlikely that an employee will be threatened by another colleague with the same level of expertise on the other side of the world, who may learn from the sharing employee. As one respondent from Company D, one of the largest studied firms, indicated: 'I just don't think I am losing anything by sharing my knowledge …' and, 'I could write my knowledge as much as I could and I still have a lot of value left …'

To summarize, we find that firm size has significant impacts on the costs of sharing. Specifically, individuals' implicit costs of sharing in large firms are much smaller than in smaller firms.

Firm size and individuals' reputational benefits due to sharing

In a large company, when an employee shares her knowledge and her contributions are recognized, instead of losing her uniqueness in the company, her name becomes recognized firm-wide and, as a result, this employee is more likely to become well-known and be promoted. For instance, in Company D, an honorable title, 'Subject Matter Expert', is given for firm-wide expertise recognition to those who share valuable or professional knowledge desired by many others in the firm. Several respondents from Company D expressed receiving benefits in their career advancement from their expertise recognition, even though there is no explicit company policy linking knowledge-sharing with promotion. A respondent from Company G, another large firm that has more than 140 000 employees, indicated that one of the primary rationales for promoting KM was to know 'who' was knowledgeable about different subjects across the organization: 'The reason for knowledge management was the owners realized that we have a huge number of staff that have tripled in recent years, so people are not aware of who people are or who to talk to … the KM system allows people to recognize others in the organization … ' On the contrary, in smaller firms such as Company C, which has only 1000 or so employees, it is generally easier to know who the experts are in each domain. In addition, the relatively small audience may lead to only a slight increase in reputation.

In summary, we find that organization size has significant impacts on the individuals' reputational benefits of sharing. Specifically, individual employees' reputational benefits of sharing in large firms are much larger than in smaller firms.

Contextual assumption and the clarification of firm size differentiation

According to the aforementioned discussion, we argue that it is reasonable to make the following assumption regarding the contextual variable of firm size for the model.

> Contextual Assumption 1: Compared to smaller firms, the implicit costs of sharing in large firms are generally much smaller and the reputational benefits due to sharing one's own knowledge, B_s, are generally much greater.

Note that, although it seems obvious that firms such as Firms D, F and G, which have more than 36 000 employees, are considered large firms, it is not practical to determine a size beyond which a firm should be considered large. For example, although Firm B, an

engineering consulting firm, has more than 1800 employees and may seem large if compared to many much smaller firms in practice, the implicit sharing costs for individual employees in Firm B are still quite significant and the reputational benefits of sharing are quite limited. This is because firm B has many specialty consulting divisions such that the number of employees with similar specialties in the firm is actually quite small. Therefore, in order to better conceptualize size differentiation, 'large firms' are qualitatively distinguished from 'smaller firms' by the criterion that the specialized communities of practice in large firms are large enough such that virtually no employees possess truly unique knowledge.

Task repetitiveness as a contextual variable

Intuitively, the nature of tasks, closely related to the characteristics of knowledge, may play a role in knowledge-sharing dynamics. According to our case studies, we find that a firm's degree of task repetitiveness has considerable impacts on B_o, the benefits of receiving knowledge shared from others. The degree of repetitiveness of a firm's major tasks is one of the perspectives that may characterize the task nature.

In our cases, some companies build unique projects that are often highly context-specific and customized, such that employees within this company find that applying others' previously learned knowledge to new projects is of little benefit. For example, in Company C, where project success often relies on creativity instead of repetitive utilization of best practices, employees indicated that the current best practices are so generic that users still have to spend considerable time consulting with others to make appropriate modifications. Respondents from Company C indicated that these modifications sometimes take more effort than starting over from scratch: 'What's standard here might not be standard in another location [project]' and 'We tend to not repeat things exactly'. Another indicated, 'We don't learn that much from one building to another because we switch people to different product types and the projects change from one to another … you don't put that much effort into trying to learn something from an existing project because you know it isn't going to have meaning because the next project will be different'. Many respondents from Company C pointed out, 'We are not in the replication business; we are in the creation business … Most of the time, we are doing new things'.

In contrast, employees can benefit from other employee's knowledge when job-related tasks are similar and repeated. For example, in Company D, whose task repetitiveness is considerably high, interviewees felt that learning from peers is very useful because much of the content from knowledge-sharing can be replicated with little modification. If employees have repetitive work with similar project scopes, constraints, tasks and outcomes, they have a greater appreciation for the collective organizational knowledge because knowledge gained from past experiences can be re-utilized with minimal contextualization. For example, Company F implemented a KM system in conjunction with standardizing their designs for residential projects, a highly repetitive task. As one respondent from Company F indicated, 'If you transfer knowledge it will only be for an overall view, but if you can standardize [the design and tasks] more, it will be much, much easier to transfer … because if this building has been built a couple of times before, then we can take advantage of capturing and transferring the knowledge'. The aforementioned difference in the usefulness of shared knowledge can be explained by the re-utilization rate of existing knowledge, which is related to the concept of the 'half-life of knowledge' (Javernick-Will and Levitt, 2009).

As such, the level of task repetitiveness is a useful contingent dimension for characterizing how the nature of tasks affects the payoffs due to the incentives and disincentives for sharing and, thus, can be a contextual variable for game theory modelling. The second contextual assumption is proposed as follows.

> Contextual Assumption 2: Individual employees working for companies that primarily perform unique, less-repetitive tasks receive fewer benefits from the knowledge shared by others, B_o, whereas employees working for companies that primarily perform repetitive work receive more benefits from the knowledge shared by others.

Conclusions

This paper is the Part (I) of the research that investigates knowledge-sharing dynamics between individual employees in engineering firms and proposes contingent strategies for encouraging individuals' knowledge-sharing. This paper reports findings from exploratory case studies that contribute to theory by identifying incentives and disincentives for knowledge-sharing in engineering firms. In addition, it identified contextual variables based upon firm size and the nature of tasks that may affect the payoffs associated with these incentives and disincentives. These results help add to our knowledge of knowledge-sharing behaviours between employees within a firm and are crucial to the problem abstraction and strategy derivation steps in game theory modelling in Part (II) of this research. In addition, for practitioners, the proposed incentives,

disincentives and contextual variables can help firms focus their efforts on the factors that may encourage employees sharing valuable knowledge.

According to this study, the major incentives for knowledge-sharing in engineering firms include self-satisfaction from knowledge-sharing, benefits from increased professional reputation due to sharing knowledge, benefits of receiving knowledge from others in a firm, social rewards from knowledge-sharing, and the avoidance of social punishment faced due to withholding one's knowledge. The major disincentive is the cost of sharing knowledge, which includes both the explicit and the implicit costs of sharing.

In addition to these incentives and disincentives, we found that firm size and firm task repetitiveness impacted these incentives and disincentives and should be considered contextual variables. Specifically, we developed a contextual assumption that the implicit costs of sharing knowledge in large firms are generally much smaller and the reputational benefits due to sharing one's own knowledge are generally much greater compared to smaller firms. In addition, a second contextual assumption based upon our case studies hypothesizes that individual employees working for firms with repetitive tasks generally receive much higher benefits from the knowledge shared by others.

Since extant theories provide insufficient understanding of the incentives, disincentives and contextual variables for knowledge-sharing between employees, the use of exploratory research methods such as case study in this paper can be justified. Future studies should test the results on larger samples. However, the theoretical saturation level of the results obtained have provided the necessary knowledge needed to construct and analyse a game theory model for the second portion of this research.

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