

Managing Knowledge In Offshore Software Development

Experiences of a small UK firm offshoring to Bangladesh

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Abstract

The particular problems of managing knowledge faced by small firms engaging in offshore software development remain unexplored. Drawing on Walsham's (2004) model of communicating knowledge and empirical data from a longitudinal case study, relevant knowledge management challenges and practices are analysed through the concepts of knowledge representation, sense-giving and sense-reading. This paper presents a case study of offshore software development involving a small UK software firm offshoring to Bangladesh. The contribution of the paper lies in the development of a theoretical framework drawing on the framework of knowledge and communication enabling an analysis of the use of knowledge representatives such as ICTs and Groupware Application in knowledge management practices by small firms. The main theoretical contribution of this study is its enhancement of the understanding of the practices of small firms in managing knowledge by unpacking the ideas of communicating knowledge into three main elements: knowledge representation, sense-giving process, and sense-reading process. This study suggests few 'best practices' for small firms in managing knowledge of offshore software development that could be useful to the stakeholders in offshore outsourcing, especially the client and vendor.

Introduction

Offshore software development is the process of sending tasks at various stages of the software development life cycle to wholly owned development centres located in different countries. The Offshore Location Attractive Index in 2007 shows twenty-five countries that have attractive characteristics in terms of people skills and availability, business environment and financial structure (A.T. Kearney, 2007). India, China and Malaysia are the most attractive locations for offshore outsourcing, followed by Czech Republic, Singapore, Philippines, Brazil, Canada, Chile, Poland, Hungary, New Zealand, Thailand, Mexico, Argentina, Costa Rica, South Africa, Australia, Portugal, Vietnam, Russia, Spain, Ireland, Israel and Turkey (A.T. Kearney, 2007). The global outsourcing market is estimated at \$386 billion and is estimated to be growing at a rate of 25 percent (Tangliabue, 2007).

It is not only big companies that choose the option of offshore software development. Small and medium sized enterprises (SMEs) of software companies are also increasingly engaging in offshore software development (Carmel and Nicholson, 2004). Coward (2003) found that factors such as cost savings, personal connection, and critical mass of skilled technical professionals influenced the decisions of these SMEs to go offshore. Small firms often face shortage of staffs and the owner have to get involve heavily in operational and managerial tasks (Carmel and Nicholson, 2004). Without appropriate resources and management skills, the firms may face failures (Sahay et al., 2003). According Chan and

Chao (2008), SMEs often encounter uncertainties and face threat of failures despite dedicated attempts to follow the prescribed knowledge management guides and success path. Approximately 71% of the respondents said their management has put more attention on initiating knowledge management programs, while there are inadequately formulated plans to direct employees on what or how to apply knowledge to improve efficiency or regulate strategic direction (Chan and Chao, 2008). Eventhough, the potential contribution of ICT for SMEs has long been recognized (Fathian et al., 2008), the management of information systems are generally not well developed, piecemeal and fragmented and lacking a link to broader business strategy (Foong, 1999). Therefore, there is a need to understand how small firms use ICTs to manage knowledge.

The main research question are; (1) how does small firms manage knowledge in offshore software development work? and (2) to what extent does the use of ICTs or Groupware Application assist small firm in managing knowledge? This paper aims to understand the complexity of managing knowledge in offshore software development work and the use of Groupware Application as a strategy. For this purpose, an interpretive qualitative case study approach is adopted, using a longitudinal case study of a small software firm based in the UK offshoring to Bangladesh. A comprehensive theoretical framework was developed from the data analysis and related literature, drawing from Walsham's (2004) ideas of communicating knowledge and incorporating the ideas of knowledge representation, sense-giving and sense-reading into the process of managing knowledge in offshore software development.

Following this introduction, the next section will provide literatures and theoretical framework to understand the complexity of managing knowledge in offshore software development process by small firm. This follows with methodology section that explains the research approach and the case study background. The finding and analysis section provides empirical evidence on issues and strategy of the firm in managing knowledge. Finally, discussion and conclusion section provides overall views of the analysis and theoretical contribution and useful practical implications.

Literature Review and Theoretical Framework

'Knowledge' refers to the tacit and explicit knowledge owned and required by each team member during the process of software development. Polanyi (1966) indicates that knowledge is socially constructed and can either be tacit or explicit; tacit knowledge refers to the experiences of individuals that are used to integrate new experiences and to discover new knowledge, while explicit knowledge is like the content of a book which is meaningless without an individual's tacit knowledge (Walsham, 2002a). Managing knowledge means managing the process of communicating knowledge between team members during the software development process. The related theories in knowledge such as communities of practice (Wenger et al., 2002), embedded knowledge (Lam, 1997) and situated learning (Lave and Wenger, 1991) suggest ways of managing knowledge. However, there is a need to investigate how small firms engage in the process of managing knowledge especially between geographically-separated team members in offshore software development.

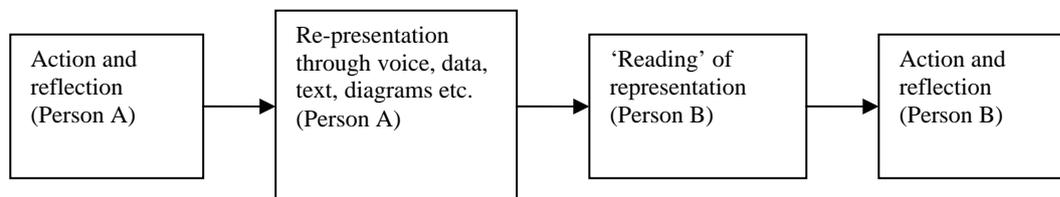
This study suggests that problems in managing knowledge are very much related to the process of communicating knowledge, and there are still limited studies in the area. Communicating knowledge means the process of generating and integrating knowledge between onshore and offshore team members that often takes place in shared electronic spaces or virtual settings using different types of communication media. Related theories such as media richness (Daft and Lengel, 1986) and social presence (Short et al., 1976) provide understanding of how team members communicate in virtual settings using ICTs but there is still a question of how team members communicate knowledge in virtual settings.

Since knowledge in software development is embedded in the process of communication between team members (Quintas, 1993), this study will specifically focus on the process of communicating knowledge between onshore and offshore teams. This study hopes to provide further understanding on the process of managing knowledge in offshore software development by focusing on the process of communicating knowledge between the onshore and offshore teams.

Model of Communicating Knowledge

The process of communicating knowledge (Walsham 2004) emphasizes on the process of sense-giving and sense-reading. Based on Polanyi's (1966) original work, Walsham (2004) suggests a focus on effective interaction between people through sense-reading and sense-giving processes. Sense-giving refers to the ability to communicate one's experience to another person using a medium of communication, while sense-reading means the ability to use one's tacit power to read the representation of the other person's experiences (Walsham, 2004). The basic model of communicating knowledge is displayed in Figure 1.

Figure 1: A Model of Basic Communication



Source: Walsham (2004)

Figure 1 indicates how people experience the sense-reading and sense-giving during the process of communicating knowledge. As explained by Walsham (2004), a traveller (Person A) is/was engaged in a whole range of sense-reading activities by his actions and absorption of subsidiary sights, sounds and events at the place of visit. When Person A communicates some of this experience to Person B through media such as data, text or other technologies, he is actually carrying out a re-presentation of his experience to Person B or making the effort of sense-giving. However, that data and text cannot re-present the entire experience of individuals and may be open to different interpretation depending on the prior experiences of the individuals. In this case, although the experience is re-presented in data or text, Person B's understanding of the data or text may differ from that of the experience by Person A. In other words, the meaning of the text remains rooted in Person A's tacit knowing. Person B 'reads' the re-presentation of Person A's experience using his tacit knowledge by integrating the re-presentations of Person A with his prior knowledge and knowledge of Person A. Finally, Person B will then engage in action and reflection of his own, influenced by the change in his tacit knowledge brought about by his interaction with Person A's re-presentation experience. The tacit knowledge of individuals may alter after the process of communicating knowledge.

There are some limitations to these ideas of communicating knowledge: (i) there is a question of the role of the communication medium as knowledge representation, (ii) there is also a requirement to understand how the knowledge and cultural background of individuals influences their sense-giving especially when they originate from diverse geographical and sociological backgrounds and, (iii) there is still a need to understand how Person B interprets the re-presentation made by Person A during the process of sense-reading. In order to overcome these limitations, this study suggests more explanation is required on each of the three elements of the process of communicating knowledge: knowledge representation, sense-giving and

sense-reading. The theoretical framework of this study extends the ideas by providing more explanation to these elements.

Theoretical Framework

The framework suggests the use of appropriate communication media such as ICTs (e.g. e-mail and e-chat), Groupware Application, document and face-to-face meetings or middle person as knowledge representation. This contributes to the understanding of the use of the communication medium rather than the use of text (Polanyi, 1966), databases (Walsham, 2004) and intranet (Vaast and Walsham, 2005) as knowledge representation. In addition, it suggests that knowledge representation between client, onshore teams and offshore teams varied from face-to-face, telephones, e-chat, e-mails and documents to a complete Groupware Application. In the process of sense-giving, this study suggests a focus on the influences of cultural issues such as the use of language and questioning behaviour, especially between geographically-separated team members. In the process of sense-reading, the framework proposes that the differences in individuals' prior knowledge including their educational background and experiences can contribute to problems in the process of sense-reading. This can be explained by the interpretation of the experiences using imagination.

Sense-giving Process: The sense-giving process may involve cross-cultural issues as it involves team members who are geographically separated. Differences in the rules and resources of social structures affect the process of expressing (sense-giving) and interpreting the messages (sense-reading) being communicated (Walsham, 2002b; Sahay et al., 2003). Often, individuals have to apply norms of social context or culture to interpret messages and respond accordingly (Spears and Lea, 1994). The sense-giving process should take into consideration the influences of cross-cultural issues such as the use of language and questioning behaviour. The use of language is important for effective coordination of action with others. For example, if one person's utterance is not intelligible to others, there will be a communication breakdown (Winograd and Flores, 1986). Questioning behaviour is equally vital as it is necessary to reduce knowledge gaps. By addressing or formulating questions that will elicit information to resolve such gap (White, 2000)

Knowledge Representation: While prior studies provide examples of the use of text (Polanyi, 1966), databases (Walsham, 2004) and intranet (Vaast and Walsham, 2005) as knowledge representation, this study provides further explanation concerning the use of documents, ICTs (such as e-mail and e-chat), Groupware Application and face-to-face meetings as knowledge representation. Geographical distance requires team members to communicate in virtual settings using such communication media. The use of ICTs such as e-mail is not fully integrated with other forms of communication, on the other hand, Groupware Application as a computer-based system that supports groups of people engaged in a common task (or goal) and that provides an interface to a shared environment (Ellis et al., 1991). According to Ngwenyama (1998), Groupware can affect the pattern of organisational communication, the culture of communication and the organisation structure.

Sense-reading Process: In the process of sense-reading, Walsham (2004) has highlighted the possibility of different interpretations as a result of different knowledge backgrounds of the participants. This study suggests that these differences may contribute to the difficulties in the process of sense-reading taking into consideration the needs for imagination. Imagination means a mental model or a mind that effectively connects bodies through the associate mediation of images (Mackenzie, 2003). For instance, when someone writes a program, he has to imagine in his mind a systematic correspondence by which the contents of certain storage cells represent objects and relationships within the subject domain (Winograd and Flores, 1986). The imagination process is dependent upon individuals' ability to translate and recreate knowledge using their prior knowledge. Prior knowledge means tacit

knowledge of individuals that is accumulated through the process of practical hands-on experiences (Lam, 1997) and formal education or training (Lam, 2000).

Methodology

This study adopts a qualitative design with an interpretive case study approach (Walsham, 1995). Data was collected using a triangulation approach that included interviews, documentation, and observations. The decision to adopt the qualitative, interpretive, and longitudinal case study approach has taken into consideration of nature of the research questions. This study is a longitudinal one over a period of at least two years following the various phases of several software development projects over time. This includes historical reconstruction to observe changes over time from the inception of the companies' offshore centres (Das from 1997 to 2002) and during the field study period from 2002 to 2004. The results from the historical period are then compared to the real-time period (Walsham and Waema, 1994).

Data collection in the main study consisted of two stages, the first stage being largely based on the interviews and an external documents review, while the second stage was based on the fieldwork in Bangladesh and Malaysia. The first stage of data collection in Das had been completed during the pilot study at the end of 2001, where the researcher had developed familiarity with issues in the company. In the second stage, the researcher prepared a detailed data collection plan based on issues that arose in the first stage of data collection. Data

Table 1: Detail of interviews

JOB TITLE	DAS		
	UK	Malaysia	Bangladesh
Director, Operations Director	7 hours	9 hours	4 hours
Project Manager, Consultant	-	9 hours	1.5 hours
Project Leaders	-	-	1.5 hours
Senior Developer, Developer, QA Analyst	-	-	12 hours
Admin, Marketing, Technical Support	-	3 hours	6 hours
Customer	-	-	-
Total hours	7 hours	17 hours	25 hours

collection method during this stage included interviews, internal document review, archive e-mails and e-chats and observations during fieldwork at the offshore sites in Malaysia and Bangladesh. At least ten days were spent at each of the offshore sites. The second stage of data collection in Das was arranged in January 2004. The researcher visited Das' offshore centres in Malaysia and Bangladesh in January 2004. There have been a total of 49 hours of interviews with Directors, Operation Directors, Project Managers, Project Leaders, Senior Developers, Developers, Quality Analyst, Administrator, Marketing and Technical support (summarized in Table 1). Because of distance, interviews were handled in different ways including face-to-face co-present, conference call, telephone and e-chat. Interviews lasted for at least one and maximum two-and-half-hours. The interviews were transcribed and subsequently summarized. The interviews were as far as possible tailored to each particular

person and focused on their background, experience and their perception of events they had experienced, on how decisions and actions were influenced and issues resolved, the individual's particular role, attitude and motivations, and other issues related to offshore software development and knowledge management. The data once collected was analyzed by identifying themes related to knowledge transfer.

Case Study Background: Das & Co.

Das is a software development company with headquarters in London, UK and with a software development centre in Bangladesh (hereafter known as Das (Bangladesh) and a subsidiary in Malaysia (hereafter known as Das (Malaysia)). Das was founded in 1994 by Clara and James and at the end of 2003, the company had a total of fifty staff in the UK, Malaysia and Bangladesh. Clara is British and lives in the UK, while James is Bangladeshi, educated in UK and married to a Malaysian. In the initial six months period of setting up the company, they began consultancy work and for the first two years, the company grew to 6 or 7 people. At the end of the second year, they employed 15 full-time staff. During this period, they continued building up their infrastructure and business applications as well as recruiting new programmers. In 1997, Das set up a wholly-owned software development centre in Bangladesh. One of the important projects during the earlier period of setting up the offshore centre is project E. Project E was the first UK project that was sent to Bangladesh in 1997. The onshore teams in the UK prepared a Functional Requirement Specification (FRS) and analysed the client's systems requirements before sending the FRS to the offshore teams for coding. Testing was performed in Bangladesh and the UK according to test plans and scripts that were prepared at the project's outset. In 1999, Das launched its new subsidiary in Malaysia to serve the local software market. Das (Bangladesh) became the wholly-owned software development centre serving both Das (UK) and Das (Malaysia). Two main projects during this period included project M and project H. Das (Malaysia) started project M in 2001, which took eighteen months to complete. For this project, Das (Malaysia) sent development work to Bangladesh. In 2002, Das introduced Lotus Groupware Application as the primary communication tool between the onshore and offshore teams. This application provides virtual space where team members meet and discuss issues.

Findings And Analysis

The focus of the analysis is based on the changes over time during: (i) the initiation stage from 1997 to 2001; and (ii) the growth stage from 2002 to 2004.

Initiation Stage (1997 to 2001)

Knowledge Representation: In the initiation stage, knowledge representation for communicating knowledge between the onshore and offshore teams is mainly based on the use of ICTs, especially e-mail and e-chat. As indicated by one of the offshore team leaders in Bangladesh:

“Earlier, they would send the functional specifications and if we did not understand, we would e-mail but it was taking time, sometimes more than two or three days.” – Offshore Team Leader, Bangladesh

The offshore team leader complains that using email is very slow due to the time taken to explain, send, re-explain and re-send until the explanation is clear to the other party, which results in project delay, especially when e-mail is asynchronous type of communication that lacks the capability to provide immediate feedback (Ngwenyama and Lee, 1997).

Sense-giving Process: The process of sense-giving or explaining the procedures to the offshore teams is problematic because of the use of English as the medium of

communication between the onshore and offshore teams. The Bangladesh team found it hard to understand the accents of the UK team, perhaps because English is only their second language, which they learn in school. On one occasion, the offshore team could not understand the issues being communicated to them, as explained by one of the offshore team members:

“English is quite tough for me and sometimes it is very hard to understand. In one situation, Clara tried to explain things but I didn’t understand.” – Offshore Senior Developer, Bangladesh

Another issue that affected the process of sense-giving was the questioning behaviour of the offshore teams. According to Clara, asking questions is considered normal in the UK but not in Bangladesh:

“Here (in the UK), the environment is very open where people ask questions freely. It is an informal collaboration where people do not think that asking questions is a sign of failure. Bangladesh is a completely different situation partially because of their cultural and educational background. It will be a painful process to make them say something.” – Clara, Director, UK

Clara felt that the differences in the questioning behaviour are related to their cultural background as questioning is often seen as disruptive and disrespectful (Ward, 2001). Clara also felt that the lack of questioning behaviour was also due to the unwillingness to share knowledge with the team members. According to her:

“Offshore teams thought that asking questions meant that you were admitting that you don’t know something and they assumed that no one would answer their questions because they didn’t want to share their knowledge with them. These are aspects of their culture that are quite negative to them. When we try to develop systems we want them to develop things and share the information and to work together.” – Clara, Director, UK

Clara assumed this as she noticed that the offshore teams faced difficulties to work in a group and preferred to work individually. Another explanation is that although the offshore team members wanted to share knowledge, they have less confidence in their ability to contribute, which in this case was indicated by the offshore teams’ wariness of questioning. This could be also be explained by reference to Cascio (2002) who notes that the inability to be involved in the discussion is related to the presence of someone with expertise. In this case, the onshore teams are represented by Clara, who had more experience in technical knowledge than the offshore teams.

Sense-reading Process: There are issues that augment during the process of sense-reading, including issues of imagination and prior knowledge. In the process of sense-reading, offshore teams use imagination to understand the technical knowledge being communicated to them. According to one of the offshore senior developers:

“There is no picture but just text in the functional requirement specification. I have to imagine how it will look, the users, type of communication required, their business and their basic knowledge. All the information is not in the functional requirement specification.” – Offshore Senior Developer, Bangladesh

Although some studies (Berg, 1997; Sarkkinen and Karsten, 2005) indicate that the use of pictures is unnecessary to avoid ‘the deletions of layers of detail’, the senior developer explains that a picture is necessary for imagining what the output will look like. Without

pictures, he has to imagine the output, the users and their business. However, the offshore teams could not imagine properly as they did not have prior understanding about the client and the process. Therefore, the understanding of the client's requirements and processes are crucial to minimise mistakes during coding. Hence, the explanation about the specification should include details such as pictures so that the offshore teams could imagine the output of the project and integrate their domain and technical knowledge (Tiwana, 2004). Furthermore, the offshore team members have insufficient prior technical knowledge to understand the message being communicated to them. According to the offshore teams, their technical knowledge background was limited to the use of procedural language, and therefore they could not understand the new object-oriented language, especially Lotus Notes. For example, one of the senior offshore developers in Das (Bangladesh) explains the challenges that he had to face:

“In the university, I didn't study object-oriented language such as COBOL etc. I was only working on procedural languages such as Pascal etc. When working with an object-oriented language such as Lotus, I had a problem understanding it.” – Offshore Senior Developer, Bangladesh

In this case, the Bangladesh offshore teams were not taught about object-oriented language such as Lotus in the university, but the UK onshore teams are familiar with the language; hence this contributed to the differences in their technical knowledge that made the process of understanding what was being communicated to them more onerous. For example, they had problems when writing code, as there are many ways to do it, which required them to seek guidance from the onshore teams.

Growth Stage (2002-2004)

Knowledge Representation: Later, in 2002, Das introduced Lotus Groupware Application as the primary communication medium between onshore and offshore teams. The main turning point from using independent ICTs to Groupware Application was that Das experienced difficulties when several offshore developers suddenly resigned. Hans, the offshore project manager in Malaysia explains:

“In Project E, there were few developers who suddenly resigned because of better offers from outside. The new developers had to develop their own way because they don't have knowledge about the project and there was no documentation of previous code.” – Hans, Project Manager, Malaysia

In order to overcome the issues of losing undocumented technical knowledge such as codes, Das implemented the Groupware Application. In this stage, the process of communicating knowledge involved the training of using this Groupware application for communication, which indirectly affects the process of sense-giving and sense-reading. The Groupware Application is the main knowledge representation during the process of communicating knowledge. This contains features such as messaging, calendaring and scheduling, e-meetings, team rooms and e-mailing. According to one of the offshore senior developers:

“The Groupware Application provides virtual space where team members meet, discuss and refer for knowledge on a particular project.” – Offshore Senior Developer, Bangladesh

The virtual space here refers to the virtual team room that is used for meeting, discussions and references of a particular project that are categorised according to author, date and issues. Indirectly, the use of Groupware Application has an effect on the process of

communicating knowledge between team members. A team room is a collaborative medium, which is one of the main features of Groupware Application (Yates and Orlikowski, 2002) that stores the team's e-chat log and e-documents. Records saved in the team room are stored and all authorised employees have access to the latest versions of documents. Indirectly, the onshore and offshore team members are linked together and connected to the team room as a shared information and knowledge base. In addition, it serves as a point of reference to coordinate activities of team members across time and space. As one of the senior developers describes:

“In the team room we can check the document and the discussion related to the project. If we chat on e-messenger, even a single line, we will put it in the team room. We can track who is doing what, on which day, what has been done, what the errors are and whether it has been improved or not. The team room shows project steps, discussions, and deliveries.” – Offshore Senior Developer, Bangladesh

Since most technical knowledge about the project is stored in the team room, the team members are indirectly being 'forced' to access the Groupware Application. The offshore teams have to use the team room for communication and store the conversation so that it can be stored in the team room for future reference. The offshore senior developer describes:

“If there is any bug, onshore teams will create a document in the team room based on the format: task, name, date and list of bugs. We will give responses to them and if it is really a bug we give reasons and repairs. If it is not a bug, we will explain and give structure on how it works. At this stage, we are guiding them on how to repair the bugs properly.” – Offshore Senior Developer, Bangladesh

In addition to using the team room, Das enhanced its documentation using standards and procedures to ensure an effective process of communicating knowledge. As explained by Clara, the standards and procedures are necessary to minimise the problems of incorrect deliveries experienced in the past:

“We have had a problem here over the year in that what they (offshore teams) delivered to us is a total crap. We send it back and it takes so much time again to fix it. Now, we use standards and procedures for development and templates for technical specifications and functional requirement specification preparation.” – Clara, Director, UK

The standards and procedures include the use of templates or forms for preparing documents such as technical and functional specifications. As indicated by Yates and Orlikowski (2002), such systematic methods of documentation could assist in the retrieval of information. In this case, the offshore project manager agreed that the standards and procedures had improved the process of offshore software development when compared to the early years when they started doing work for the UK. For example, the team members could just follow the procedures in the document without much difficulty.

Sense-giving Process: In the growth stage, the sense-giving process includes issues on language and questioning behaviour. Clara tried to minimise the issues of language that they faced during the initiation stage using several techniques of communication. Clara explains:

“I am not using text abbreviation so much. I have to explain things in a particular way; rather than saying ‘sometimes it is this’, instead saying it likes this: ‘sometimes it is this because of that’, which to other people I don’t have to necessarily explain. Whenever we discuss something, I would get them to confirm that they understood or agreed, depending on the questions that they asked.” – Clara, Director, UK

This includes using less complex words and terms when communicating knowledge such as not using abbreviations when communicating in e-chat. Another technique is using extended sentences such as ‘because of’ when explaining to the offshore teams. The purpose is to make sure that the offshore teams can understand the issues being discussed (Taylor, 1990). Clara also develops techniques to overcome the lack of questioning behaviour and team working of offshore teams that they faced during the initiation stage. According to Clara:

“I would get them asking questions online that I know they would never ask face-to-face. When I had answered the question, if they didn’t say anything I would say ‘did you understand it, did I explain it OK, and are you happy with it?’ and whatever it is, I always get them to agree. If we have a very long discussion, I always summarise what we agreed in the course of that. If our discussion spreads out to other areas and we get down to no more detail, I will always summarise that at the bottom.” – Clara, Director, UK

The above quotes explain how Clara tried to encourage the questioning behaviour of the offshore teams during e-meetings, and indirectly tried to get them out of their “cultural chain”. For example, Clara would use sentences for confirmation or get agreement from the offshore teams on issues being discussed. She would also summarise long discussions at the end of e-meetings. Using techniques such as checking for understanding, asking appropriate questions and summarising key points is important when communicating in a virtual setting. According to White (2000), formulating or addressing questions will elicit information when communicating in an electronic environment.

In addition, Clara tried to encourage team working by encouraging participation from offshore team members during e-meetings. Clara explains:

“If I call for a net-meeting, I will lead the meeting because I want something out of it. In the meeting, I walk through the technical process with them, where I am not the one who is making the decision but count on their ideas and decisions. I established relationships over time with them, so that they are not afraid of coming up with ideas or offering things without me always asking for them. In the net-meeting, I have to literally squeeze ideas out of them by asking them, ‘Are you sure you don’t have any ideas?’” – Clara, Director, UK

According to Clara, she would lead the e-meeting with offshore teams to make sure that the team participated and contributed ideas. One of the techniques that she used to encourage participation was to walk through the technical process in the requirement specification, explore ideas and ask them questions so that they would furnish ideas (Taylor, 1990). Another step that Clara used to encourage participation from the offshore team members was to establish good relationships with the offshore teams over time so that were not afraid of suggesting ideas during the meeting. In short, Das trained the offshore teams to ask questions and participate during e-meetings, thus indirectly instilling the UK working culture in the offshore team.

Sense-reading Process: In the process of sense-reading, the offshore team members have to use imagination and prior knowledge for understanding the technical knowledge

being communicated to them. In the earlier stage, the offshore teams could not imagine the output of the project as there was no picture in the Functional Requirement Specification (FRS) document. To overcome the problem of imagining, they prepared detailed documentation of the technical knowledge. The technical knowledge is made clear through procedures and standards for the developers to follow. The standards are detailed, such as a thorough description of what colour of forms are to be used in the development. As explained by the senior developer in Bangladesh:

“In one of the projects, there is a complete standard process that we followed for everything in the specifications. At first, Clara collected user requirements and mentioned them in the team room. Then, she sent an FRS, technical work from her presentation and the client’s website. Clara described the technical work clearly for the project so that we could visualise the whole project from the client’s point of view.” – Nizaar, Offshore Senior Developer, Bangladesh

The process of sense-giving by the onshore teams is enhanced not only with a detailed explanation, but also with additional information about the client. The use of documents should serve the purpose of communicating knowledge (Yates and Orlikowski, 2002). In this case, the onshore teams enclosed a document known as a Functional Work Through (FWT) and the client’s web site along with the FRS to support imagination. The FWT is similar to the presentation that the onshore teams made to the client. In addition, they also prepared a Functional Technical Specification that included a detailed explanation of how to do coding as required by the client. As a result, the offshore teams rarely made assumptions on coding. As explained by one of the offshore senior developers:

“The FRS from the UK is very detailed and I rarely make assumptions. For example, I only decide where the manual should be placed and how to make it more efficient.” – Offshore Senior Developer, Bangladesh

Hence, detailed documentation is important in communicating knowledge to the offshore teams so that they can envisage the required output.

Discussion and Conclusion

The above analysis presents the process of communicating knowledge in Das, which indirectly enhances our understanding of the process of managing knowledge in the company, especially using the concepts of sense-reading and sense-giving. Major issues in the process of sense-giving include language, questioning behaviour and team working, while the main issues in the process of sense-reading include imagination and prior knowledge of individuals. In this case, the use of ICTs and Groupware Application knowledge representation is found useful as a strategy for communicating knowledge. In the initiation stage, onshore and offshore teams used e-mail and e-chat as knowledge representation. Later, in the growth stage, Das implemented Groupware Application to overcome the loss of technical knowledge that was not documented because of the sudden resignation of some team members. The use of the application not only provides formal documentation such as the FRS or FWT but also informal documentation for the relevant issues discussed in e-chat or e-meetings. Additionally, Das developed standards and procedures such as using templates for detailed FRS preparation. The use of the team room function also allowed for a repository for e-documents and e-discussions about projects for team members. In other words, the process of communicating knowledge between geographically-separated team members has been enhanced using the Groupware Application as knowledge representation.

The process of sense-giving was initially hampered by language and questioning behaviour. These were overcome by encouraging the offshore teams to ask questions and participate during e-meetings, which indirectly instilled the UK working culture of team working and questioning behaviour. Instilling a new working culture in the early stage of the relationship could establish ways of doing things (Walsham and Barrett, 2005) later in the relationship. In the growth stage, onshore and offshore team members became familiar with each other's language and ways of thinking and that shows signs of the relationship 'maturing' (Sahay and Krishna, 2000). This case has increased our understanding of the process of sense-giving in a virtual setting using Groupware Application between culturally and geographically-separated team members. The process of sense-reading was initially found to be hindered by the issues of imagination and prior domain and technical knowledge of team members. Imagination influences the process of sense reading, which is evidenced in the initiation stage. In that stage, the offshore teams could not imagine the output of project because there was no picture in the FRS document. Later in the growth stage, Das prepared detailed technical documents with additional information about the client. In addition, prior knowledge is found to be important in the process of sense-reading. In the initiation stage, the offshore teams did not have the technical knowledge that is required for software development (e.g. Lotus Notes) and in order to overcome the issues, Das provided formal and informal training of technical knowledge. In the growth stage, the offshore teams have gained experience overtime that helped to improve their understanding of the UK projects.

The main theoretical contribution of this study is its enhancement of the understanding of the strategies of managing knowledge in offshore software development using Groupware Application. The findings enhanced the ideas of communicating knowledge (Walsham, 2004) by unpacking the ideas into three main elements: knowledge representation, sense-giving process, and sense-reading process. The use of communication media such as ICTs, documents, face-to-face meetings or a middle person, as well as Groupware Application as knowledge representation is significant in the process of communicating knowledge across borders. The process of sense-giving is influenced by the cross-cultural issues, particularly the use of language and the questioning behaviour of individuals. This is particularly important when the knowledge is being communicated across borders and when the communication occurs between individuals who originate from different cultural and geographical backgrounds. There are issues of language raised by the participants that affect the process of sense-giving especially in expressing queries or explaining client requirements, due to the variations in accent and use of 'terms' that could be interpreted differently by the other party. The findings suggest that the use of 'good' language and possessing 'good' questioning behaviour is especially significant in the process of sense-giving. This study found that the process of sense-reading is not solely influenced by the prior knowledge in general, but additionally by imagination of individuals in particular (Winograd and Flores, 1986; Mackenzie, 2003). The findings show that offshore software developers often use imagination to understand the knowledge being communicated to them. They often have to make assumptions, which were invariably sometime inaccurate, to fill in the gaps as they did not possess the requisite levels of prior knowledge. Still, individuals possess different types and levels of prior knowledge, which contributed to greater hardship in the process of sense-reading. In the process of communicating knowledge, the offshore teams had to imagine the logic behind the coding and required prior domain and technical knowledge. The findings demonstrate the need for such knowledge for imagining what is being thought by the other party. This is particularly crucial when attempting to understand the assumptions made in the design document.

This study suggests few 'best practices' for small firms in managing knowledge of offshore software development that could be useful to the stakeholders in offshore

outsourcing, especially the client and vendor. Firstly, firms should identify the suitable communication medium depending upon the types of knowledge being communicated. When dealing with technical knowledge or send only coding or standardised work offshore may use Groupware Application as a knowledge representation. This is because the application can store formal and informal documents for future reference. Firms should develop standard templates of documents that include a section for diagrams or flowcharts to ensure that important information is communicated to the offshore team. These documents should be updated when necessary for knowledge repository. Secondly, not only is the appropriate communication medium vital to communicate different types of knowledge, but the correct method of dealing with cross-cultural issues is also important. The firm should develop cultural understanding at an early stage of the relationship. Firms should be aware that their onshore and offshore teams come from disparate cultural backgrounds, where certain language is used with a variety of accents and, indeed, meanings. A firm could employ people with similar accents or use extended sentences such as ‘because of this...’ when explaining or communicating with offshore teams who have less proficiency in English. Thirdly, firms should make sure that the onshore and offshore teams have appropriate expertise in the project. Expertise of an individual is very closely linked to the said individual’s educational background and prior knowledge. When communicating knowledge, the onshore firm has to identify the knowledge required for the software work and make sure that the offshore team possesses that kind of knowledge. They could assign an offshore senior developer who has experience in the project to be a ‘mentor’ or a ‘point of reference’ during the project. Last but not least, small firms may be able to avoid failures in offshore software development if they have equipped themselves with suitable information systems for managing knowledge and understand the differences in knowledge and cultural background between team members.

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