

# The Role of ICT in Knowledge Creation

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**Abstract.** Nonaka's Theory of Knowledge Creation is no doubt a big contribution to the field. However, the applicability of the SECI model is being questioned primarily looking at the possibility that there is a cultural specificity in the model, which then leads to the debate known as the universal-pluralistic debate. One of the main areas being investigated is the concept of "ba", which may exist through physical or virtual interactions. It is in this case why I think it is also important to examine the importance of studying modern tools and practices that enforce cooperation and group effort, which in this research would be specific in the field of Information Communications Technology (ICT).

**Keywords:** Theory, ICT Tools and Practices, Information and Knowledge Management

## 1. Introduction

The Theory of Knowledge Creation by Nonaka was highly influenced by the work of Polanyi (1962) where the distinctive aspects about tacit and explicit knowledge were presented. Briefly, tacit knowledge is subjective, experience-based and context-specific while explicit knowledge is objective, rational and context-free (Nonaka, 1997). Nonaka and Takeuchi (1995) argue that these tacit and explicit knowledge create new knowledge in the process defined in the SECI Model, which is an acronym for Socialization, Externalization, Combination and Internalization. The first entails transfer of tacit knowledge in one person to tacit knowledge in another person (usually between individuals) through a series of direct interactions. The second is making tacit knowledge explicit between individuals within a group allowed by sharing beliefs and ideas. At the third phase, the explicit knowledge acquired then is further transferred to become tangible and thus transfers explicit knowledge among groups within an organization by conveying them in documents, email and databases. Last, internalization is where organization and group's explicit knowledge is understood and absorbed into tacit knowledge by the individual (Nonaka, 1997; Hong 2010). The entire process starts again after the enriched tacit knowledge of individuals are shared with others.

### 1.1. ICT Practices

ICT researches are often seen to examine the tool's contribution towards productivity and other positive benefits (Miller, 1996). However, there are other researches that focus on ICT for its other value. Pablo (2007) found the value of studying metaphors on websites. There are other researches that link knowledge, specifically, tacit and explicit knowledge with ICT.

In Mohamed's earlier study (2008), he argued that much of the knowledge management systems available are designed in a formal structure while there is less effort to capitalize into capturing the tacit information from individuals. He proposed a knowledge model that will capture the tacit and explicit knowledge from the software engineering domain.

Mohamed (2010) then studied and characterized the tacit knowledge acquisition from the software requirements specification stage of the software lifecycle model. According to him, software requirements engineering (RE) is the initial phase where customers' requirements are identified, which involves lengthy customer-developer and developer-developer deliberations. This gradually leads to conclude complete, accurate and unambiguous list of software project requirements. And since this phase involves intensive

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discussions and deliberations, it is identified as having the richest tacit knowledge interaction. Despite this fact, there are still numerous studies that assert failure of software projects due to poor articulation of requirements. The representation of tacit knowledge through requirements specification is a complex process since it may take many forms in order for the requirements to be understood such as gestures, signs, and other forms of personal expression (Mohamed, 2010). The richness of these discourse elements (Pablo, 2007) are hardly mapped into formal media.

Another ICT area that has a big room for collaborations and interactions are pair programming and code review practices. First, Pair programming is a social skill that takes time to learn. It works as a cooperative way to work with partners regardless of corporate status. There are five known essential ways as part of this practice: communication, simplicity, feedback, respect, and courage. There is constant communication with customers and fellow programmers. Also, they get feedback after testing. “Every small success deepens their respect for the unique contributions of each and every team member. With this foundation extreme programmers are able to courageously respond to changing requirements and technology” (Extreme Programming, 2012). There is a series of collaborations and discussions involved and a lot of transformation of one’s tacit knowledge to explicit knowledge by allowing each member of the pairs to transcribe their ideas into code.

Code Review is another, but similar to the concept of Pair Programming. Code Review, however, focuses on identifying bugs, encourages collaboration, and keeps code more maintainable. SmartBear (2012) conducted the world’s largest-ever published study on code review, which includes two thousand five hundred sessions of code review for the fifty programmers and three million two hundred thousand lines of code at Cisco Systems. It is in this study that they were able to come up with eleven best practices for performing code reviews.

## **1.2. Research Problem**

There are several enablers or factors that exist at the individual and organization levels for the above-mentioned processes in Nonaka’s knowledge creation to take place (von Krogh et al., 2000). To name two are: the requirement for a more proactive role in the knowledge creation process and the maintenance of the shared context at the organizational level or “ba”. Nonaka and Toyama (2003) defined “ba” as “an existential place where participants share context and create new meanings through interactions” either physically, socially or virtually (in nature). It is the continuous participation in “ba” that allows members to develop a shared sense of purpose and create new knowledge (Nonaka et al., 2008; Hong, 2010). Japanese organizations are commonly organized in teams in order to address daily problems; there is a stronger inclination to work collaboratively thus formation of work groups. It is in these groups where formal and informal participations are imposed that help establish and strengthen relationships with co-workers. It is through the notion of being engaged in group dialogues that members are able to bring out and share their tacit knowledge and be “explicitized” (Hong, 2010).

It is now clear that human interactions are critical for the carrying out of the processes involved in the knowledge creation theory. However, this depends largely on the willingness and the capacity of the individuals to be able to participate in activities that involve interactions and collaborations. The main argument against Nonaka’s claim for universality is the trace of Japanese influence. Primarily, the concept of “ba” was assumed from the Japanese philosopher Nishida, who specifies the importance of having a shared mental attitude towards knowledge creation, a trait particular to Japanese culture. As presented earlier, collaborations and interactions among humans give consent to the movement of the processes in the model. However, since the model was patterned from Japanese organizations where there is a suspected cultural bias, the debate whether Nonaka’s model is relevant for non-Japanese institutions arises. It is thus worth researching the aspect of its applicability. Noting that in the discussion of “ba”, physical or virtual interactions are emphasized, it is also important to examine the importance of studying modern tools and practices that enforce cooperation and group effort, which in this research would be specific in the field of Information Communications Technology (ICT). I, therefore, want to pursue the research question: What is the value of studying ICT tools and practices in understanding the applicability of the SECI model in a non-Japanese organization?

## **2. Case Study**

### **2.1. Case Site**

This research studied, primarily, the company's offshore applications development workforce focusing on the ICT approaches and implementations employed in the team and the observed effects to its employees. I looked at the interactions involved between the employees in the international location based in the Philippines and the employees in the parent company based in the US. Primarily, the company was interesting to study for the following reasons:

First, it is a non-Japanese organization. Specifically, it is a United States (US)-owned company. According to Hofstede (1980), the US is the exact opposite of Japan in terms of High and/or Low Uncertainty Avoidance and Collectivism/Individualism. The debate discussed in the research problem dwelled on the cultural specificity of the model to Japanese organizations. It is then important to look at the other side of the coin. Second, it is also important to study an organization that did not only originate from a non-Japanese organization but should also have relevantly established a different culture from Japanese. There is a wider aspect of complexity in terms of cultural differences as all directives come from the parent company and being upheld in international location. Third, the company employs or reflects the SECI model through their collaborative ICT practices. The applications development team uses various ICT practices that encourage collaborations and a series of tacit-explicit interactions, which is the most basic or intrinsic characteristic of the SECI model. Last, the members of the applications development team of both locations come from different backgrounds. Aside from the difference in location and culture, the members have different educational degrees (some in computer science, mathematics and even journalism). This difference requires the members to interact most often as all instructions for the applications or software being created come from the parent company.

### **2.2. Data Gathering Techniques**

Pablo (2007) contrasted two among some research approaches, primarily between positivism and interpretivism. Orlikowski and Baroudi (1991) suggest that researches that involve ICT phenomenon have been dominated by the positivist tradition and much would be gained if other approaches are pursued. It is also my belief that since the research question calls for studying the interactions and discursive activities involved among human beings, specifically while the members of the applications development team perform their duties, I immerse myself to the environment and my notion towards the subject is therefore an expression or reflection of how I make sense of the situation. I, therefore, take the stance of an interpretivist and consequently, a qualitative analysis would be required. This entails the use of observation, surveys in a form of a questionnaire, face-to-face interviews, and document review. I spent over six months to gather data focusing on the four applications development team members, who are based in the Philippines, four times a week usually Mondays through Thursdays on their regular work shift which is about from twelve noon until eleven evening.

## **3. Findings and Conclusion**

I focused on the socialization and externalization initially as this is the first phases in the model. I found that even when there are a lot of opportunities for the Participants to acquire knowledge through a series of interactions and collaborations through several types of meetings, the socialization and externalization phases hardly mobilized the learnings due to cultural difference during the initial stages of the project. Some manifestations that emerged out of this difference include: the Participants thinking that the US developers are of higher authority because they speak English better, being overly quiet during meetings, that the Participants think the US developers as reviewers of their works and that they do not hold the same levels of expertise but things are different when their counterparts are non-US and that asking questions would mean they are incapable of their tasks. However, this research also found that the cultural difference that existed between the two groups is being amplified by inappropriate use of ICT tools. It is found that during group meetings where all developers from both groups are present, and where videoconferencing is employed and set up in such a way that would bring further distance and intimidation, the developers became overly quiet. But one-on-one and face-to-face group meetings showed that the Participants were fluent and confident. It also appeared in the study that the responsiveness of the Participants depended on the use of available ICT

tools. The use of emails extensively and solely through emails as a mode of communicate may further promote Power Distance. Unlike frequent use of chat, screen sharing while talking over the phone, may relax the atmosphere and may bring about “personal touch” that lessens the intimidation that the Participants feel. Also, chat is preferred as the tool provides a feature for previous discussions to be saved and easily referenced in the future. Presenting that aside from cultural difference, these ICT tools can affect the ability of the Participants to connect with the developers in the US means that the use of these tools should be carefully thought of by managers before implementation.

It showed that both socialization and externalization were largely affected as these involved transformation of knowledge out of tacit. It is inevitable that these can only be learned with continuous collaborations and interactions with the other members of the team. In order to cope and compensate for the knowledge that should have been acquired from the two earlier phases, the Participants spent more time in the next two phases in the model (combination and internalization). For combination and internalization, knowledge is transformed out of which has already been explicitized. The Participants took advantage of the available technical frameworks available in the SVN, technical documents in the Sharepoint repository, the features of Visual Studio for providing breakpoints that allow the developers to trace code and understand the logic behind them, the installation of VPN access that allowed the developers to telecommute making resources available almost anywhere where there is Internet, and as simple as the choice of laptop installed with complete list of necessary software products over a desktop that allowed the portability of work to be brought anywhere even offline. Aside from these tools, other ICT practices and methodologies such as the use of pair programming, code review, and the various software lifecycle methodologies (waterfall, evolutionary, trial and error, and agile) lead to a better understanding of requirements and eventually to successful delivery of software applications by the participants.

It is evident that the study of ICT tools, methodologies and practices played a critical role in understanding the applicability of the SECI model. First, cultural difference affects the initial phases of the SECI model particularly socialization and externalization. However, ICT tools may either aggravate or bridge the gap, which leads to further research on whether ICT tools are value-laden or not, centering its discussion to their use affecting the way people behave. Second major interesting finding is that while the effect of cultural difference is strong at the initial phases, it is the same reason why combination and internalization were primarily focused on by the participants leading to an argument that unlike the original model, it may be possible that the SECI model appropriately starts from combination or internalization where there is cultural specificity. Another important observation in this study is the non-existence of a smooth flow contrary to the original model where a cycle exists that starts from socialization, then externalization and moving on to combination and internalization. What transpired are cycles within each phase emphasizing the detailed process of knowledge transformation within each cycle such as in the case of Participant 3, his knowledge improved by moving mostly from internalization to combination where he was able to find solutions by himself through a series of self-study techniques and ICT methodologies such as trial and error method. However, Participant 1 exhibits the possibility that the non-existence of a smooth flow of the SECI model is only apparent at the early stages where the Participants had little knowledge. This suggests that cultural difference has a great impact to the model but its applicability towards knowledge creation is still present.

In addressing the research question, the study also made significant contributions to practice. It is known that ICT tools affect how the responsiveness of the Participants. It is therefore important that management and other ICT policy-makers make the right decision in employing ICT solutions within their organizations. It is therefore encouraged that managers take an effort to be more theoretically grounded instead of making decisions out of merely gut feel. It is necessary to be able to identify the dynamics of the team and what ICT tools and solutions bring harmony between these human and material resources. The issue on technology being value-laden or not calls for managers and ICT practitioners to think about planning the use and design of ICT in order for the organization to maximize the benefits and outweigh the dangers. Thus, it is recommended that these tools and practices are studied as they determine how we can further become productive, effective and efficient.

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