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THE MANGLE OF PRACTICE IN ENTERPRISE SYSTEM IMPLEMENTATION: TEMPORAL EMERGENCE AND MATERIAL KNOWING

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Abstract

In this Research-in-Progress paper, we explore a practice-based view of Enterprise System (ES) implementation. Drawing on Andrew Pickering's "Mangle of Practice", we discuss how an Enterprise System becomes a workable system over time through a dialectic of resistance and accommodation. Based on a longitudinal study of an ES implementation project in a global IT organization located in the U.S, we identified the temporal dimensions of an ES that emerged as a result of organizational practice. We further explore how activities of knowing are conducted through organizational practice. The study indicates some promising contributions. First, the study will contribute to IS research by offering a novel view that allows IS researchers to understand ES implementation as a cultural and historical practice. Second, the study will contribute to IS methodology by showing how a longitudinal research study is powerful to study ES implementation when we adopt a practice-based view. Third, the study will contribute to knowledge management literature by especially focusing on how the materiality of technology plays an important role in knowing activities in ES implementation projects. Finally, the study will contribute to practitioner research by bringing back managerial attention to 'practice' and explains how bringing attention to organizational practice is important in ES implementation.

Keywords: Sociomateriality, Practice, ERP, Enterprise System, IS Implementation, Time, Space, Temporality, Field Study, Case Study, Qualitative Method

1 INTRODUCTION

Although organizations anticipate the potential benefits of Enterprise System (ES), they are often unable to realize these benefits because of difficulties experienced during the implementation process (Scott and Vessey, 2002; Grant, Harley, and Wright, 2006). For example, according to the worldwide survey conducted by Fuß et al. (2007), the greatest cost of an ES implementation related to the inflexibility of ES packages. The built-in 'best practice' component of such packages often does not fit existing work processes in an organization so that organizations are forced to adapt their existing processes to fit the requirements of the software or customize the software to support existing user practices (Wagner and Newell, 2006; Kallinikos, 2004; Wagner, Scott, and Galliers, 2006; Light, 2001; Chiasson and Green, 2007).

In order to understand how ES implementations can be supported or discouraged, researchers and practitioners have identified Critical Success Factors (CSFs) such as culture (Umble, Haft, and Umble, 2003) and an alignment of people and technology (Karimi, Somers, and Bhattacherjee, 2007; Esteves and Pastor, 2001). Although these CSFs, to some extent, may be able to provide organizations with important guidelines that can be useful for a successful ES implementation, they have been criticized for a number of reasons. First, CSFs are difficult to implement and maintain in the daily practices in organizations as ES implementations often need to deal with situational and emergent problems (Newell and David, 2006). For example, one of the important CSFs at an organizational level is support from senior executives (Dong, et al., 2009). However, in reality, a typical ES implementation lasts for years and it is unusual that the senior executives who initially championed the project stay in the same position and so can provide continuous support for the project.

Moreover, a formal project plan is considered a CSF; however, in practice, a formal plan represents how 'it should be' and does not capture how actually ES implementation is carried out in practice (Cicmil and Hodgson, 2006; Suchman, 1987; 2007). Formal plans/schemes are typically complemented by informal and emergent practices (Suchman, 1987; 2006). Many formal tasks, procedures, and system usage are typically supported by numerous informal work practices that are not formally documented (e.g. they do not belong to anybody's job description) (Strauss, 1988; Schmidt and Bannon, 1992; Newell and David, 2006). For example, Wagner and Newell (2006), through an ethnographic study, explain how multiple stakeholders who are involved with ES implementations create social order through negotiations. These studies have shown that a 'workable system' is a temporal entity that is constantly negotiated in terms of its desirability for various stakeholders' needs; that is, an ES is emergent as a result of changing situational needs (Wagner and Newell, 2004; 2006; Elbanna, 2006; Yeow and Sia, 2008; Constantinides and Barret, 2006).

In order to understand *how* an ES becomes a workable system through organizational practices of project members and end users, we use a *practice-based perspective* as the theoretical lens. Recently, Information Systems (IS) researchers have become increasingly interested in adopting *practice-based* perspectives (Orlikowski and Scott, 2008; Schatzki, Knorr-Cettina, and von Savigny, 2002; Checkland, 1985; 1990; Currie and Galliers, 1999). *Practice-based* perspectives allow IS researchers to study the processes of how phenomena of interest are constantly negotiated and configured through local actions in organizational practices over time. Practice-based perspectives have contributed to the field of Information Systems by allowing us to understand the process of implementation of group support systems (Orlikowski, 1992), distributed work systems (Orlikowski, 2002), organizational learning (Lave and Wenger, 1991), and boundary-spanning activities (Levina and Vassat, 2001; Brown and Duguid, 1991). Using *practice-based perspectives*, researchers have been able to shed light upon work practices that bring to life Information Systems in organizations (Scott and Orlikowski, 2008). For example, practice-based perspectives offer a dynamic view of knowledge sharing processes – knowing – (Boland and Tenkasi, 1995) through examining the diverse activities of communities engaged in different practices (Lave and Wenger, 1991). Moreover, *practice-based perspectives* also allow us to understand a continuity of past, present, and future projects. For example, Engeström, Kerosuo, and Kajamaa (2007) demonstrated how current projects

are related to past projects through project participants' collective remembering efforts of past projects.

Although *practiced-based perspectives* are increasingly receiving attention from IS scholars, this area of research is still in its infancy. Therefore, more research is called for. In the next section, we introduce our theoretical lens. The following three concepts are applied as sensitizing devices: "The Mangle of Practice" (Pickering, 1993, 1995), "Sociomateriality" (Orlikowski and Scott, 2008; Suchman, 1987; 2007), and "Material Knowing" (Orlikowski, 2006). Following this, we will explain the research design and in the fourth section, we will present our preliminary findings.

2 THEORETICAL LENS

In Information Systems (IS) literature, the concept of *practice* is understood in various ways. This is because *practice-based perspectives* are built on various theoretical foundations (Schatzki, Knorr-Cettina, and von Savigny, 2002; Osterlund and Carlile 2005). Within the field of sociology, Pierre Bourdieu developed his theory of practice (1990) to explain the mechanism of practice. According to Bourdieu, the way individuals practice is different from the way individuals make calculated decisions. In order to explain this difference, Bourdieu (1990) introduced the concept of *habitus*, to describe an actor's disposition when he has built up embodied knowledge gained from the past. Based on this past, the actor acts on *habitus* and applies it to *fields*. For him, *habitus* is not a calculated action, but the *feel* for the game. Therefore, the mechanism of practice cannot be considered separately from the cultural and historical activities of agents (Chaiklin and Lave, 1996). Similarly, Anthony Giddens (1979) introduced the concept of structuration as a mechanism of practice whereby agents interpret existing structures and act on their interpretation of structures. New structures are reproduced as a result of these actions. Another practice theory that specifically focuses on the role of communities in practice is 'Communities of Practice' (CoP), developed from ethnographic studies by Lave and Wenger (1991). These authors studied apprenticeship in traditional occupational communities such as midwives and investigated how knowledge is shared or transferred to newcomers. Therefore, *practice* is tightly connected to both individuals' and groups' historical and cultural activities. *Practice-based perspectives*, therefore, do not assume a dichotomy of agency and structure (Schatzki, Knorr-Cettina, and von Savingny, 2002). Rather, *practice-based perspectives* assume that agency and structure are mutually constituted through the mechanism of practice.

Although the above *practice-based perspectives* contributing to IS studies represent our various ways to understand practice, they do not adequately capture the *temporal emergence* associated with practice. The aspect of *temporal emergence* is important especially if we want to understand how technology comes to be practiced in organizations. For example, IS researchers have found that temporal work processes that align cross-functional team efforts temporarily emerge through IT implementation efforts (Lee, 1999). These temporal processes necessarily emerge to overcome challenges that are associated with ES implementation that requires cross-functional coordination efforts. Therefore, the aspect of *temporal emergence* in practice may be important for IS researchers to consider in order to understand how ES comes be practiced. Here, we introduce another practice theory that may explain the practice mechanism that can help us to better understand this *temporal emergence* – The "Mangle of Practice', which is introduced in the following section.

2.1 The Mangle of Practice

The 'Mangle of Practice' (Pickering, 1993) idea has recently been introduced in the IS literature (Orlikowski and Scott, 2008). Developed through Andrew Pickering's efforts to understand practice, the concept of 'mangle' captures an entanglement between the human and the material. Like other practice theorists, Pickering (1995) defines the concept of practice as a cultural and historical activity which is "the work of cultural extension and transformation in time" (p.5). The entanglement between the human and the material, therefore, is practiced culturally and historically. Studying the innovation of the bubble chamber, Pickering explored its emergence as a result of dialectic actions of resistance and accommodation. Resistance, which Pickering defined as 'the occurrence of a block on

the path to some goal" (p.569, Pickering, 1993) emerges through interactions between human and material, then, this resistance is accommodated through different interactions. In this case, accommodation is some tentative human approach that circumvents the obstacles. This dialectic mechanism captures how the materiality of bubble chambers emerges over time.

The adoption of the mangle of practice has been encouraged by Jones (1998) and Orlikowski (2008) particularly in Information Systems to study how the materiality of Information Systems emerges, is sustained, and is configured. Pickering (1995) himself applied his 'mangle of practice' to the case of technology implementation in the context of workplace automation. Specifically, Pickering (1995) took the example of the installation of numerically controlled machine tools drawing this from the study *Forces of Production* (1986) by David Noble. In this book, Noble illustrated the development of numerically controlled (N/C) machine tools at the General Electric (GE) Aero Engine Group plant at Lynn, Massachusetts, in the early 1960's.

GE management initially assumed that the installation of the new N/C tool was going to be done smoothly and believed that the new tool would increase shop floor productivity by automating some of their work processes. However, the shop floor workers resisted this new tool and their productivity didn't go up, but went down. Part of the reason for this resistance was, for example, that the new tool required shop floor workers to use more skills. However, their rate of pay was not changed. The shop floor workers claimed that it was not reasonable for them to work at the same rate, because the new tool required them to use new skills. In addition, the new tool was not able to deliver a completely automated process but rather required manual intervention from shop floor workers. In order to overcome this situation, GE executives accommodated this situation by increasing the pay rate of shop floor workers. However, the increase was not enough to surmount the obstacle. Therefore, the first accommodation failed, in the sense that "the production problems remained, the unreliability, the programming errors, the excessive downtime, compounded by scheduling problems, worker and management turnover, and low morale." (p.161, Pickering 1995). Then, GE management tried a second accommodation effort by improving labor relations and formulated a task force which executed a pilot program of 'job enrichment'. Although this pilot program was effective for a certain period, eventually it was cancelled.

Pickering (1995) analyzed this story of a series of resistances and accommodations as instances of mangling. There are two important observations from this story. First, Pickering's concept of the mangle illustrates the importance of *temporal emergence* in practice. For example, the very first resistance against the new tool was not anticipated by the GE management. The resistance only emerged after the actual materials (i.e., the N/C tools) were in place. Then, a new role – a computer programmer –was created during the installation of the new tool. Also, existing shop floor workers' job descriptions were expanded and relations with management were changed through the pilot program and these changes became materialized around performance with the new tool. During this pilot program, the identities of existing workers were mangled as occupational boundaries were temporally lost.

Another observation that Pickering made relates to the posthuman aspect of the mangling. For instance, the mangle cannot be explained by only focusing on the social or human aspects. The material form of the N/C tools and its potential performance has to be seen as constitutive of the "trajectory of emergence of work discipline at GE" (p.168, Pickering, 1995). Putting it another way, the performance that is associated with the material form of the N/C tools cannot be realized without complements of work processes and work roles that are temporally emergent. This observation is further discussed in the following section.

2.2 **Sociomateriality**

How IS researchers treat the materiality of Information Technology can be understood through considering various ontological assumptions about IT used in the IS literature. Recent studies discuss three research streams that represent three distinct ontological assumptions about Information Technology in organizations (see Leonardi and Barley, 2008; Scott and Orlikowski, 2009; Markus and Silver, 2009). The first research stream is that researchers treat IT as an object that influences

organizational practices. In this research stream, the ontology of IT is discrete and independent of objects, which separates the IT artifact from the human users. This ontological assumption about technology allows researchers to study and estimate the impacts of technology in organizations. The second stream of research denies this deterministic view of technology. The ontological assumption about IT in this research stream is that IT is an object that is interdependent with humans. In this research stream, technology and humans shape each other through ongoing interaction. Underlying theories in this research stream include symbolic interactionism, social construction of technology and social shaping of technology. Unlike the first research stream, technology is not treated as a deterministic entity. Researchers in this research stream try to understand the process by which technology is socially constructed by humans. The third research stream, which is chosen for this study, is an emergent research stream and introduced under an umbrella term 'sociomateriality' (Orlikowski and Scott , 2008; Suchman, 1987, 2007).

The concept of sociomateriality extends our traditional view of the materiality of technology, by understanding technology as sociomaterial assemblages (Latour, 2005; Orlikowski and Scott, 2008; Markus and Silver 2008). This denies ontological separability of human and technology. Instead, technology and human are co-configured through social actions and understood by social relations that are constantly revised through ongoing social interactions. The sociomateriality of technology means that technology exists not only as a tool to accomplish some task or as a symbolic object that is interpreted by agents but exists only in relation to activities, actions and configurations.

The concept of sociomateriality is well-explained in Pickering (1995). A machine tool has a non-human agency element, because it can accomplish things that human agency cannot accomplish (e.g. it's a potential Performability to cut metal to precise specifications). However, borrowing the concept of *cyborg* (Harraway, 1991), he explains the sociomateriality of the machine tool:

> "However, it is important to note that traditional machine tools do not cut metal of their own volition. They need a skilled operator to channel their agency in desired directions. This does not undercut my idea that material machines capture nonhuman agency; it implies, rather, that what matters in metal cutting is a human-machine couple – the lathe and its skilled operator come together as a single unit of machine capture, in industrial production, they constitute a composite human/nonhuman agent, a *cyborg*, to borrow Donna Haraway's (1991b) term. And we can take the cyborg idea further. According to Noble, within the frame of twentieth-century corporate capital, little cyborgs composed of the conjunction of a single human being and a single machine have not been very important. Instead we find sociocyborgs: arrays of lathes and milling machines in a corporate machine shop, operated by wage labor within a classic Taylorite disciplinary apparatus of specified social roles and relations – a hierarchical command structure, precise job descriptions, production targets, rewards and penalties, and so forth. (p.159, Pickering, 1995)."

Applying the concept of sociocyborg to ES implementation, we can see an organization that develops and maintains a workable ES can be understood as an organization that becomes a sociocyborg. This status of sociocyborg can only be realized through organizational practice that allows organizations to configure and re-configure their relations to ES. To become an ES sociocyborg, organizations may need to figure out their relations with ES and may need to come up with new work processes that accommodate ES. Through their practice with materiality - the mangling of practice - humans will know themselves by configuring their identities, their desire, their capabilities, and their vision for the future. This idea will be expanded in the next section on 'material knowing' (Orlikowski, 2006).

2.3 **Material Knowing**

In order to explain 'material knowing', we take a constructionist view of knowledge. A constructionist view of knowledge claims that knowledge only can be understood through the activities of knowing (Nicolini, et al., 2003; Tsoukas, 1996). Knowledge cannot be codified without contexts and cannot

reside in an agent's mind. Instead, knowledge is situated, emergent, pragmatic, and contested (Blackler, 1995). Therefore, knowing is cultural and historical practice (Nicolini, et al. 2003). The concept of material knowing can be best described by the notion of 'scaffolding'. Orlikowski (2006) introduced the notion of 'scaffolding' to explain 'material knowing'. The notion of scaffolding is helpful for us to understand how our knowing can be scaffolded by the materiality of technology. Orlikowski (2006) provided illustrative examples to explain this point. For example, in any type of project, meetings are necessary. In those meetings, the size of a meeting room chosen scaffolds the way meeting members may interact. Capabilities of a conference call machine may scaffold what kind of communications project members can make during meetings. By interacting with these material forms and configuring relationships with them, project members will know their capabilities. On certain occasions, people resist the materiality of technology and then they come up with ways to accommodate and overcome this resistance. As a result, new work processes or work forms emerge. Therefore, material knowing is also closely related to temporal emergence of new practices or work processes. For example, Orlikowski (2002) studied knowing activities in global projects. One of her findings was that the emergence of frequent face-to-face meetings was closely related to their efforts to know players in the game. Members who are involved with global projects typically never have a chance to work together. This is especially true in the context of a large ES project. Typically, there is no one who can know everything about the project. The emergence of boundary documents such as meeting documents is also closely related to knowing efforts, because such boundary documents can indicate what each project member knows and how their work needs to be coordinated.

Material knowing in practice in the context of an ES implementation project can be studied through the lenses of *time* and *space*, since *practice* is a historically (time) and culturally (space) specific activity. The practice of knowing is expanded over time (e.g. timeline) and space (e.g. multiple stakeholders, various expertise) (Schatzki, 2006; Nicolini, 2007). An ES implementation project is typically a large complex project that is corporate wide, which includes project members in various departments and geographical locations. Sometimes the project is too complex for any individual to understand what he/she is supposed to do. Individuals need to understand what happened in the past using their previous experiences and also need to know what they can do in the future. At the same time, this is not an easy task, since they also need to know how their actions will influence others. This requires project members to know their relations with others. Knowing is a fundamental challenge in an ES implementation project.

Time: The concept of *time* is understood in multiple ways (Halford and Leonard, 2005; Saunders and Kim, 2007; Sawyer and Southwick, 2002). Broadly, there are two aspects of *time*. One aspect is an objective time. In the context of an ES implementation project, this aspect can be represented by a timeframe or timeline of the ES implementation. In ES implementation, there is always a timeframe that describes the software development period, user testing period, and go-live dates. A timeframe tends to be revised if there is delay in any of tasks associated with a certain period. Delays happen for a variety of reasons, for example because of a lack of available resources due to external effects (e.g. recession, etc.) or underestimation of necessary resources (e.g. ill-defined resource requirements). Therefore, a possible question is how project members will know about the project timeframe through organizational practice.

Another aspect of *time* is subjective time. In the context of ES implementation, this refers to how project members interpret the timeframe. For example, in reality, ES implementation may not be clear cut in terms of different phases (e.g. development, testing, etc.). In this case, each project member or each department may interpret the timeframe in different ways. For example, there may be no clear cut consensus of 'post-implementation' since many organizations have multiple 'go-live' dates. The IT group may define post-implementation as being after 'go-live' of a pilot system; however, business may define post-implementation as being after 'go-live' of a massive roll out. Moreover, how project members feel about *time* can be different. For example, three weeks may be enough time for the user testing period from the IT side; however, this may not be enough time from the business side.

Space: The concept of *space* is understood in multiple ways too (Halford and Leonard, 2005; Sahay, 1997; Nicolini, 2007). In short, *space* refers to distributedness. One aspect is an objective space which can be represented as geographical distributedness. In the context of ES implementation, this aspect can be represented by physical proximity/ distance. In ES implementations, project members are often geographically (and most likely globally) distributed. Knowing about geographical or global distributedness is important in the context of ES implementation because work processes that are distributed across different geographical regions require project members to coordinate their work by considering time gaps and available communication tools. Another aspect of distributedness is expertise difference. ES implementation requires cross-departmental collaboration. A typical ES implementation requires project members from different business units such as marketing, finance, IT, sales, etc. The third aspect of distributedness is perceived proximity. An example of this is culture, including various types of culture such as national culture, organizational sub-culture, etc.

The theoretical lens, introduced above, built on the three concepts - "the mangle of practice", "sociomateriality", and "material knowing"- is used as a sensitizing device for our study. Using this sensitizing device, we explore how ES becomes a workable system. Specifically, we are interested in studying the following question: **How does a workable ES emerge through the mangle of practice during ES implementation?* In the next section, we will explain how our study is designed to answer the above question.

3 RESEARCH DESIGN

The research design takes the form of an in-depth single case study. First, the case strategy allows us to study a contemporary phenomenon (Yin, 2003). Second, the case study methodology is ideal for this study as we do not seek to control behavioral events. The case study method also allows us to collect various sources of evidence such as meeting records, archival records, direct and participant observations, and interviews (Yin, 2003). In addition, a single case study helps us generate rich descriptive and exploratory insights into the critical issues of the study (Elrandon, et. al and Lincon and Guba, 1985). One of the rationales to choose a single-case study is that it can be done longitudinally. As Yin suggests:

> "A fifth rational for a single-case study is the longitudinal case: studying the same single case at two or more different points in time. The theory of interest would likely specify how certain conditions change over time, and the desired time intervals to be selected would reflect the presumed stages at which the changes should reveal themselves (Yin, 2003, p.42)

Our single case study takes the form of a longitudinal case, because our objective is to understand how a workable ES emerges through practice over time. Our epistemological stance is interpretive (Walsham, 1995). Researchers began to visit a global IT organization in the summer of 2008 to understand the organization's historical background related to its ES implementation. Multiple interviews with core project members were conducted. Then, the researchers began field work by attending weekly staff meetings and executive meetings, observing how project members work, collecting project related documents, and taking observation notes. This is an ongoing study and this paper presents our preliminary findings from the first seven-months of our field study.

3.1 Background

This field study is based on a global product technology company (MFG), which is based in Massachusetts in the U.S. The company sells product development technologies to manufacturing firms. The Enterprise System which we were following is a CRM system which was adopted to enable MFG to conduct an integrated solution for its sales, channels, marketing, and service functions. The company's initial implementation effort of the system began in the late 1990's. The company was

under pressure to integrate data which is distributed through the company to perform a better sales prediction and control knowledge possessed by the sales force. The initial implementation effort was not successful because end users (i.e., the sales force) did not adopt the new system. Since then, the company has been struggling with the implementation of its CRM system.

This paper reports on their recent implementation effort which closely followed one particular CRM project – Project Ω. The Project Ω focuses on a 'Lead-to-Order solution' that basically allows MFG to integrate front-end and back-end work processes, that is, from lead identification to deal registration. The CRM system allows MFG to have a centralized system that integrates the Lead-to-Order process. Sales representatives identify sales leads and then fill in information of leads in the system. Once the leads purchase MFG products, they become customers. The Lead-to-Order process is completed once a deal with customers is closed. The CRM system that focuses on the LTO solution is an integrative system that automates this whole LTO process.

The LTO project was initiated in MFG in 2007. Since the beginning, a project team that includes members from various business units that are composed of IT, Marketing, Sales, Channels, and Finance, has been working together. The first year was spent in discussion, then, around fall 2008, MFG began to finalize their development plan. One of the challenges is that cross-functional alignment is necessary to understand how the new work processes can be coordinated and how the needs from business can be translated into the new system. MFG's roll out plan is based on the volume of their user base. The initial roll out, which is called as a 'pilot' roll out' was in June 2009. The pilot program targets only MFG's partners. The regional roll out (which includes their UK and Ireland clients and South Asia clients) was in late July 2009. The final roll out that includes all North American clients is scheduled to be in early November.

3.2 Data Collection

We collected data in two different ways. Following Pozzebon and Pinsonneault (2005) and Langley (1991), we collected data based on a grounded strategy (Langley, 1991) by using direct observations, meeting attendance, informal talk, and interviews. The field researcher was also assigned her desk and was allowed to stay and observe the workplace. She also had frequent informal interactions with project members. The weekly business status meetings gather core project members who are closely involved with the ES implementation efforts. Researchers also were allowed to access all project documents stored in a shared electronic space that is maintained by project members.

We also used a narrative strategy. Understanding the dynamics of practice requires researchers to look at actions in real time (Pickering, 1995; Schatzki, 2006). Historical narrative is a qualitative method based on interview data. Researchers let interviewees speak for themselves, to recount their memories. Historical narrative is a research strategy for understanding practices in real-time (Pickering, 1995; Wagner and Newell, 2004). Interviewees were identified through the field researcher's observations and interactions with project members. In this way, researchers were able to identify not only core project members but also project participants who play an important role in the project. Each interview lasts 30-60 minutes and currently more than 30 interviews have been conducted. The sample of core project members includes the marketing director, sales director, IT director, etc. The sample of non-core project members includes consultants hired temporarily for specific tasks, etc. Interviewees are distributed geographically, hierarchically, and in terms of expertise. Building credibility with interviewees, researchers conducted prolonged engagement, persistent observation, and triangulation (Erlandon, et al. 1993) A field researcher spent enough time to understand events in the organization (prolonged engagement). The field researcher not only attended the business weekly meeting, but she also attended several informal events (e.g. IT department's potluck party, birthday party, etc.) and had a lot of informal interactions with both project members and non-project members to understand the organization's culture. Also, to gain credibility, the field researcher conducted persistent observation by attending weekly meetings. The consistent attendance is important for the field researcher to be seen as 'native' in the context of the research. Collecting interview data and consistent sequential observations are a part of data triangulation, which is important to elicit the various and divergent constructions of reality (Erlandon, et al. 1993). For example, interview data sometimes suffers from

weaknesses such as recallability and bias (Creswell et al. 2007). In addition, we also were given access to a shared project portal where all shared documents for the project are stored. In this research-in-progress paper, we present our preliminary findings based on MGF's recent implementation effort which began around Fall 2008.

4 PRELIMINARY FINDINGS

Over a year of preparations and discussions, around fall 2008, MFG realized that it was time for them to begin to develop a system if they want to meet their deadline (the initial go-live date was scheduled in January 2009 but was eventually postponed to June). However, without having an agreement from the business side, the IT was not allowed to begin to develop the system. Here, the mangle of practice begins. We have identified a number of mangles that emerge over time, but describe just the first in this paper to illustrate the usefulness of our theoretical lens.

In order to convince the business side to 'sign off' for the development of the CRM system, the IT team gave a presentation regarding a gap analysis. The gap analysis is a document that summarizes how work processes associated with the CRM would be different from old work processes. The IT team developed the gap analysis document and gave a presentation to the business side. The original scenario was that the business side will 'sign off' after the IT team's presentation regarding the gap analysis. However, resistance comes from the business side.

Resistance: The purpose of the gap analysis from the IT team was to convince the business team to allow the IT team to move to a development phase. However, the gap analysis was only presented through documents which did not allow the business side to imagine the developed product they will test. The IT side created an MS-word document that illustrates the gap between the old work processes and the new work processes associated with the CRM system and gave a presentation using a power point document. In short, this intangibility of the CRM system was a problem for the business side. One of the business side members, a senior director of Marketing Operations, stated how the IT team presented the gap analysis to the business team:

> "The IT team was like… "Here are the power point documents. The documents that we are going to show you (the business side) include all of the differences and we need to make sure you will agree with the fact that everything would be different in the new system. But we are not going to show the system"…"

The business side was not convinced by the presentation provided by the IT side and the meeting turned sour, ending in the business team not giving the IT team a permission to develop the system..

Accommodation: The IT team realized that the lack of tangibility was an issue that needed to be addressed and they held additional meetings to discuss the business team's resistance. In the meeting, the CIO suggested that the IT team offer a short demonstration of a possible prototype that might help the business side to imagine the CRM system that would be developed. Although the IT side didn't develop a demonstration that allowed the business side to actually try, they offered a 1 hour session showing a visualization of the new system user interface. Eventually, the business side agreed with the IT team and gave them a 'go' sign to develop the CRM system.

Temporal Emergence of Visualized ES: As a result of the mangle of practice, a temporal ES emerged. Initially, this was neither a tangible nor visualized system. The system that the IT team would develop was presented in texts and verbally presented by the IT team. Although the IT team had a vision about what kind of system they will develop, the business team found it very difficult to imagine the final image of the system. Then, by responding to the business team's resistance towards this unclear image of the system, the IT team offered a visualized version of the system. This visualized system was not

actually a tangible demonstration that the business team was able to try; however, this visualized version of the system was enough for the business team to be convinced and gave the IT team permission to begin to develop the system. This visualized system temporarily emerged as a result of the mangle of the practice. Moreover, this visualized version of the system worked enough for the Project Ω to move forward.

Material Knowing: The mangle of practice occurred because of the lack of tangibility of the system. The system was shown verbally and presented in texts. So, what does this lack of tangibility scaffold? It scaffolded the business side's imagination about the final product they will receive. Imagining the final product was very important for the business team, because without having a final image of the product, the business side felt it was difficult to imagine their future plans (e.g. resource allocations for user testing).

As a part of the accommodation, the IT team provided a visualized system. The emergent system was not a demonstration that allowed the business team to actually touch and try; however, by seeing this visualization, to some extent, the business team was able to imagine the final product. At the same time, this temporarily emerged visualized system helped both IT and business to know various issues associated with Project Ω. First, they were able to know each other's expertise. For example, from the visualized system, the business team found that the IT team had an ability to offer the image of the product they requested. The IT team also found that the business side had the expertise to understand the system. Initially, the IT team suspected that the business team may not understand technical changes associated with the new system. However, facing the business side's strong resistance, the IT team came to recognize the business side's willingness and their capabilities to understand the new system. Second, through the emergent ES, both the business team and the IT side found that they were able to work together. The business side learnt that they could negotiate with the IT side. The IT side also showed their willingness to listen to the business side.

5 IMPLICATIONS AND LIMITATIONS

This study indicates some promising contributions to IS research in the following ways. First, the study will contribute to IS literature by offering a novel view that allows IS researchers to understand ES implementation as a cultural and historical practice. Adopting the practice-based view that indicates a cultural and historical dimension to our activities sheds light on our understanding of the complex nature of IT implementation which typically is a multi-year project and involved with multiple parties distributed globally. Among various practice-based perspectives, especially, Pickering's mangle of practice is a powerful practice theory that can illustrate how various stakeholders practice Enterprise System over time. Moreover, the mangle of practice also allows IS researchers to capture how ES temporally emerges through practice. Second, the study will contribute to IS literature by showing how the concept of sociomateriality is powerful enough to understand an entanglement between human and technology. Although studies that use a sociomaterial lens are encouraged, they are still scarce. The study can fill this gap by showing how the sociomaterial lens contributes to our understanding regarding how a workable system is sustained through sociomaterial practice. Third, the study also will contribute to knowledge management literature. Although there are numerous studies about knowledge management in IT implementation, there are only a handful that show the process of knowing achieved through practice. Moreover, studies that focus on how knowing is conducted through human interactions with materiality in the context of ES implementation are scarce. The study can fill this gap.

Our research also will contribute to IS methodology The study will contribute to IS methodology by showing how a longitudinal research study is powerful to study ES implementation when we adopt a practice-based view. Our longitudinal research approach allows us to understand the process of ES implementation. For example, a combination of interviews and direct observations of weekly meetings is important for us to capture what really happens in real-time. The process was

captured by allowing us to trace how ES is practiced by attending meetings regularly and conducting narrative interviews that allows project members to reconstruct the past.

The study also will contribute to practitioners. Many organizations struggle with ES implementation projects by relying on knowledge from experts such as consultants. For example, they believe that a formal project plan, technical consultants, and change management strategy are effective and tend to ignore what they do every day – practice. They tend to forget that they have to customize knowledge from experts to their organizational processes that are unique for each organization, The study shows how practitioners actually practice ES and how these practice activities contribute to their learning. The mangle of practice lens can show that practitioners learn multiple issues from their practice.

There are several limitations in this study. First, although the business side consists of various business organizations and there is a possibility that each business unit (e.g. sales, marketing and finance) acts in the same manner, we used a simple dichotomy of business vs. IT. We believe that this dichotomy is too simple and in our final version of the paper we plan to have more detailed analysis. Second, our theoretical lens does not include several theoretical elements that might influence project success, such as change management. However, this is beyond the scope of this paper.

6 CONCLUSION

In this Research-in-Progress paper, we presented our preliminary findings from our ongoing longitudinal study. Our data collection will be completed around November 2009. Although our findings are still preliminary, we hope our theoretical lens is powerful for us to understand how ES implementation can be practiced over time. For practitioners, our practice lens suggests that knowing in ES implementation can be done through organizational practice. ES implementation projects are typically large and long projects. Because of their size and long history, knowledge management in ES implementation is challenging. Our preliminary findings show an illustrative example of how project members are able to know what they need to know about the project by practicing the ES implementation project.

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