

## **The Mediating Role of Artifacts in Position Practice at Work: Examples From a Project-based Context**

Drawing on examples from a case study of a global product technology company, we discuss the mediating role of artifacts in position practice in project-based contexts. Findings revealed three types of mediation – professionalization, integration, and collaboration – and pointed out the key role of organizational remembering and forgetting in these mediation processes. These findings extend our understandings of how artifacts contribute to organizational practices. We discuss implications for theory and practice, and offer directions for future research.

Keywords: Artifacts; remembering; forgetting; position practice; project-based contexts

### **Introduction**

Artifacts play a crucial role in organizational studies (Scarbrough et al., 2015; Carlile et al., 2013; Desouza, 2003; Turel et al., 2010; Dougherty, 2004; Szulanski, 1996; Szulanski and Jensen, 2004; Orlikowski and Iacono, 2006; Benbasat and Zmud, 2003; Reid et al., 2016; van Gigch and Le Moigne, 1990). Artifacts have been discussed in relation to their instrumentality, aesthetics, and symbolism (Vilnai-Yavetz and Rafaeli, 2006); brand and identity (Schultz et al., 2006); and emergent and situated uses in organizations (Orlikowski, 2000; Dougherty, 2004). More recently, artifacts have been assessed in relation to knowledge management (Mariano and Awazu, 2016, 2017). Artifacts contribute to knowledge-related processes such as knowledge creation (Nosek, 2004), accumulation (Cacciatori, 2008), transfer (Szulanski, 1996), sharing (Di Maio, 2013), and/or reproduction (Martin de Holan and Phillips, 2004).

Artifacts represent crucial vehicles for human activities, including mediated interactions (Maaninen-Olsson et al., 2008; Kajamaa, 2011), with academic research

highlighting the importance of artifacts in situated practices in collaborative settings (Carlile, 2002; Star and Griesemer, 1989; Nicolini, Mengis and Swan, 2012). For instance, artifacts have been studied to understand how they contribute to sharing practices, group cognition, and sensemaking (Nosek, 2004), and how they enable the mobilization of knowledge in collaborative work at the group (Mueller, 2012) or organizational level (Brichni et al., 2014). Two key positions have emerged in the artifact literature depending on the nature of organizational knowledge and where it resides.

A first position considers organizational knowledge embedded in cognitive bins (Walsh and Ungson, 1991) or behavioral routines and practices (Nelson and Winter, 1982; Cohen and Bacdayan, 1994); therefore, artifacts such as physical repositories (Walsh and Ungson, 1991), objects (Cohen, 2012; Nicolini et al., 2012; Swan et al., 2007), assets (Martin de Holan and Phillips, 2004), and technology (DeSanctis and Poole, 1994; Guillemette et al., 2017; Lee et al., 2014) contribute to knowledge accumulation (Cacciatori, 2008), preservation (Walsh and Ungson, 1991), reproduction (Martin de Holan and Phillips, 2004), coordination and control (Becker, 2004), or changes to organizational routines (Pentland and Feldman, 2005, 2008). This research has shown that artifacts such as tools, visuals, instructions, how-to, policies, and checklists help organizational members navigate daily routines (Kogan and Muller, 2006; Latour, 2005), mediate the relationship between individual skills and routines (Cacciatori, 2012), and provide archival traces of how routines are performed (Pentland and Feldman, 2005; Tsang and Zahra, 2008). Moreover, simple artifacts, such as an Excel workbook, have the ability to embody product memory as well as act as vehicles of distributed memory systems (van Gigch and Le Moigne, 1990), balancing knowledge preservation and adaptation processes (Cacciatori, 2008).

A second contrasting position focuses on knowledge as participation (Gherardi, 2001; Brown and Duguid, 1991), which provides an alternative explanation of where knowledge

resides in organizations. It conceptualizes organizational knowledge as a product of participatory and collective efforts (Feldman and Feldman, 2006) of situated actors (Giddens, 1984) who perform in social contexts. This social perspective emphasizes how situated actors form knowledge in social relationships (Feldman and Feldman, 2006; Engeström et al., 1990) and includes the analysis of sense-making processes (Weick, 2000), surrounding contexts (Lave and Wenger, 1991; Yakhlef, 2010), and identities and roles (Ciuk and Costera, 2010). Situated actors are able to produce and reproduce themselves and to remember and, at times, forget their position practice within a social system. In this theoretical context, artifacts help define situated actors' positions and social spaces (Nicolini et al., 2003) in the formation of organizational knowledge.

In this paper, we embrace this social perspective on organizational knowledge that defines knowledge in relation to practice to understand the role of artifacts in project-based contexts where organizational actions often fall short (Cohen, 2012). Extant literature has investigated the role of artifacts in project-based contexts because projects are, to some extent, collaborative settings where project participants share and exchange knowledge to work together toward shared goals. For example, Fenton (2005) argues that certain types of artifacts, such as process maps, function as visual boundary objects that make change concrete and negotiable for groups involved in the change implementation process. The practice of discussion and drawing process maps draws organizational members into the change process, thereby helping to create ownership of the change. This contributes to the reality of the proposed change in people's minds.

Although researchers discuss the importance of artifacts in project settings, studies that investigate the role of artifacts specifically in relation to practices and processes are relatively underinvestigated. In this view, researchers focus on a mediating role of artifacts and studied them as emergent, fragmented, and constantly evolving phenomena that interact

with human activity (Nicolini et al., 2003, 2012). Using the findings of a longitudinal case study of an information system (IS) development project, Doolin and McLeod (2012) consider how boundary objects are related with social and material practices in project settings by tracing the production and use of a prototype. They proposed the concept of “boundary objects-in-practice” to illustrate the fact that the effectiveness of boundary objects only comes into life when they are situated in practices. When artifacts are situated in practices, they can help sustain project memory among various situated actors over time, contributing to collective remembering. However, they also found that such memory can decay over time, for instance when some types of artifacts are lost, deteriorate, or fall into disuse.

In order to understand how artifacts mediate human activity, we consider position practice as our theoretical lens (Nicolini et al., 2003, 2012). In project-based contexts, multiple units have to work together; however, their interactions are dynamic and roles can be negotiable over time. Position practice helps us understand how situated actors reproduce identities and/or modify roles originally assigned to them within different positions. Therefore, the dynamic interactions among individuals, artifacts, and social contexts and the related influence of remembering and forgetting shaping these interactions (Feldman and Feldman, 2006; Blackler et al., 1999; Engeström, 1987, 1991, 1993) can represent a crucial component of organizational performance and survival (Orlikowski, 2002, 2007, 2010; Carlile, 2002).

Drawing on examples from a case study of a U.S. global product technology company, we discuss how artifacts mediate position practices, and how remembering and forgetting influence these practices. These findings expand current theorizations of artifacts from a practice perspective and provide a more granular description of their key mediating roles influenced by remembering and forgetting. Therefore, our research questions are: How

do artifacts mediate position practices in project-based contexts, and how do remembering and forgetting influence these practices?

This paper is divided into four sections. We first discuss the background literature and definition of key terms, providing an overview of position practice and remembering and forgetting associated with artifacts. We clarify our research design and methodology, and present our findings. We discuss how these findings contribute to theory and practice, and we provide directions for future research.

### **Background Literature and Definition of Key Terms**

In developing our discussion, we focus primarily on three streams of research that are important to our analysis of artifacts, and that helped us define our key terms. These three research streams include work on position practice, artifacts, and organizational remembering and forgetting.

#### ***Theoretical Lens: Position Practice***

Originally introduced by Giddens (1984), the notion of position practice has been further extended by Cohen (1989) and Stones (2005) to understand how actors reproduce identities and/or modify roles assigned to them within different positions in a network of social relationships.

Cohen (1989) illustrates position practice as follows: “To speak, for example, of... a Chief Executive Officer, is not only to refer to a positional identity, but also to a set of structured practices which position-incumbents can and do perform” (p. 210). This position practice theoretical lens conceptualizes knowledge as a result of collective efforts performed by situated actors in social contexts (Giddens, 1984). Situated actors apply knowledge in the “production and reproduction of day-to-day social encounters; the vast bulk of such knowledge is practical rather than theoretical in character” (Giddens, 1984, p. 22). According

to this theoretical lens, an in-depth understanding of sense-making processes, contexts, identities, and roles becomes thus crucial.

Building on works of Giddens (1984), Cohen (1989), Stones (2005), and more recent contributions (e.g., Coad and Glyptis, 2014), in this paper we define position practice as the *social actions conducted by situated actors within a practice-based context that is dependent upon their praxis, positioning, and capabilities*. Situated actors contribute to the production and reproduction of context-based social processes that are, by nature, evolving and dependent upon situated contingencies. Situated actors are individuals who act within a network of social relationships. Key position practice inter-related elements are praxis, positioning, and capabilities.

*Praxis*. Praxis refers to agency and describes the actions of situated actors within the wider institutions they operate in, and contribute to. “Praxis” comprises power, communication, and sanctions. “Power” derives from its asymmetrical distribution within a network of social relationships and relates to “the relation of domination and subordination in social practice” (Coad and Glyptis, 2014, p. 145); “communication” involves the creation of shared meanings during interactions that depend on reasons for actions and normative grounds (Giddens, 1979, 1984; Coad and Glyptis, 2014); and “sanctions” relate to normative expectations and consequences that express structural asymmetries of power (Giddens, 1979). Although power, communication, and sanctions are extensively analyzed in structuration studies, in this study we employ a more wide-ranging definition of praxis that we understand as *the action that situated actors carry out in a practice-based context and to which they contribute*.

*Positioning*. This refers to *the identity of individuals within a social relationship network in a practice-based context*. It differs from a role which is a script that situated actors try to follow to the best of their knowledge. Identities, social relationships, positions, or roles

are not predetermined, but they are based on continuous interactions within a context and network of relations (Giddens, 1984).

*Capabilities.* Capabilities include the *competences to exercise existing practices and manipulate resources in purposeful activities, and to predict future position–practice relations*. Of note is that, although Giddens’s (1984) original notion refers to knowledgeable ability, the notion of capabilities employed in this paper includes the notion of agency that is the capacity to act (Giddens, 1984). This notion of capabilities, thus, encompasses the capacity to choose the right praxis and to act upon it.

### ***Artifacts, Position Practice, and Organizational Remembering and Forgetting***

Following a social perspective conceptualization of organizational knowledge and employing a position practice theoretical lens, in this study we conceptualize artifacts as emergent, fragmented, and constantly evolving (Nicolini et al., 2003, 2012) and broadly define them as “tools, stories, symbols, websites, and the like” (Wenger, 2003, p. 83). According to this conceptualization, artifacts play a mediating role such as to help define the position and social spaces of situated actors who have a great deal of latitude to produce and reproduce themselves within a social system. As described by Nicolini et al. (2003), “these artifacts do not play a merely background role. On the contrary, they participate actively in the stories, carry history, embody social relationships, distribute power, and provide points of resistance” (p. 22). Mediation, according to Maaninen-Olsson et al. (2008), is explained in the context of boundary spanning activities where boundary objects (such as repositories, standardized forms, or maps) function as intermediaries of organizational knowledge shared in practice. In our study, we will define mediation as an *intervention in a process or in a relationship of situated actors within their social spaces*.

Studies on artifacts taking a position practice perspective include conceptual (e.g., Svabo, 2009) as well as empirical contributions analyzing, for instance, the practices of

knowledge managers and the mediating roles of objects in these practices (Perrin, 2012) or the role of boundary objects in permanent and temporary work practices (Maaninen-Olsson et al., 2008). In these investigations, time and space become crucial and organizational remembering and forgetting contribute to defining position practices aided by artifacts as well as the actions of situated actors in a network of social relationships. In particular, remembering becomes “the way the self interprets new experiences, distinguishes her/himself from others, and maintains a stable identity over time” (Feldman and Feldman, 2006, p. 867), whereas ruptures or isolation of individuals who lose their capacity to remember key events or to recall how things are done (Blackler et al., 1999) determines forgetting. In this theoretical context, artifacts surround individuals, provide sensory stimuli, and mediate knowledge that is culturally situated and socially distributed (Blackler et al., 1999; Engeström, 1987, 1991, 1993) connecting “unlimited numbers of individuals and group actions” (Engeström et al., 1990, p. 143). The emergent, fragmented, and expanding nature of artifacts becomes a source for negotiations and contradictions; therefore, when a failed connection between individuals and artifacts happens, forgetting is likely to manifest.

### **The Case – Background**

The case study is based on a global product technology company (which we refer to as GLOB-TECH), located in the U.S.A. The company sells product life-cycle development technologies to manufacturing firms. GLOB-TECH is a mid-size company that employs approximately 5,000 employees globally. GLOB-TECH became interested in implementing a particular type of Enterprise Systems (ES) – a Customer Relationship Management (CRM) system – in the early 2000s and more recently, the organization introduced a new Partner Relationship Management (PRM) module, which is a web-based portal application that allows GLOB-TECH to manage reseller relationships. The organization saw a new opportunity with PRM to integrate data at an extended enterprise level – integrating partners



(resellers) into their database system. Implementing ES that could be used by their resale partners was thus a new challenge. The study followed GLOB-TECH's newest technology challenge – the Lead-to-Order (LTO) project, which basically allows GLOB-TECH to integrate front-end and back-end work processes as part of the larger PRM project, that is, from lead identification to deal registration. This system functionality is supposed to allow GLOB-TECH to have a centralized system that integrates the Lead-to-Order process, which crosses various units such as marketing, finance, and sales.

### **Methodology**

Practice-based research mainly employs qualitative methods that allow researchers to immerse themselves in a research organization, including ethnographic fieldwork and in-depth case studies (Elbanna, 2006; Locke and Lowe, 2007; Scott and Wagner, 2003; Yeow and Sia, 2008). This is necessary because the epistemological stance of practice-based research requires that researchers immerse themselves in the field by observing subjects of interest and sometimes by participating in their activities (Agar, 1980; Emerson et al., 1995; Klein and Myers, 1999; Nicolini, 2009; Orr, 1996; Spradley, 1979, 1980; van Maanen, 1988).

In this research study, we conducted a field study of a mid-sized software manufacturing organization in the U.S.A. The field study involved collecting various types of data such as narrative interviews, archival records, and direct observations of meetings, which helped researchers understand the complex nature of practice (Nicolini, 2009). To build credibility with interviewees, we conducted prolonged engagement, persistent observation, and triangulation (Elrandson et al., 1993). For prolonged engagement, the researchers made an effort to spend enough time in the organization to understand events, for example by attending several informal events and having a large number of informal interactions with project participants to understand the organization's culture. Also, to gain credibility, the researchers conducted persistent observations by attending weekly meetings.

Collecting interview data and consistent sequential observations were a part of data triangulation, where it was important to elicit the various and divergent constructions of reality (Erlandson, et al., 1993; Klein and Myers, 1999). This helped, for example, to overcome limitations of certain types of data, e.g., interview data which could suffer from weaknesses such as recallability and bias (Creswell, 2003). A total of approximately 40 interviews and more than 50 direct observations of meetings were collected over the period of summer 2008 to early January 2010. The details of data collection and data analysis are discussed in the following sections and summarized in Tables 1 and 2.

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Table 1 and Table 2 about here  
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### ***Data Collection***

Following Pozzebon and Pinsonneault (2005), we collected longitudinal data by critical events and regularity. Critical events were associated with two roll-out dates and three periods. The first roll-out date was the end of May, 2009, at which point a system with limited functionalities was to be implemented. The second roll-out date was during the first week of November 2009 and included, by this point, additional functionalities. We considered these roll-out dates as “critical” events based on our conversations with the core project members and the atmosphere that was evident during these times while we were at the research site. We collected data at three points in time during Fall 2008-December 2008, January 2009-Summer 2009, and Summer 2009-Early 2010. Additionally, we collected data regularly by attending weekly meetings and saving meeting agendas. Regular data collection was pragmatically important to follow how an implementation effort is conducted in real-time; it was also necessary for data triangulation. During the first period, we performed an initial collection of multiple interviews to obtain information about the company background and the LTO project. The first author attended both a weekly meeting and a steering

committee meeting that focused on decision-making by senior executives. During this period, we also started collecting individual interviews, and had access to archival documents that included presentations and project-related documents that helped us understand the historical context of the project. During the second period, the first author regularly attended both project team weekly meetings and steering committee meetings and started to show up in the workplace to observe how project participants worked to have opportunistic and informal interactions with them. Multiple interviews with core project members, project participants, and senior executives were also conducted. The third period of data collection was less intensive and was mainly focused on follow-up on the progress of the implementation of the LTO project.

Interviews were conducted by applying a historical narrative strategy, which is a research strategy for understanding practices in real-time (Pickering, 1995; Wagner and Newell, 2004; Schatzki, 2006). Researchers using this strategy let participants speak for themselves, to recount their memories (Pickering, 1993). The open-ended interview that focused on retrospective narratives asked participants to talk about their experiences and involvement with the project. Interviewees were identified through the field researcher's observations and interactions with project members according to a snowball sampling strategy. In this way, researchers were able to identify not only core project members but also project participants who played an important role in the project. Each interview that lasted at least 30 minutes was recorded and transcribed. Observations were conducted during business weekly meetings, steering committee meetings, project-related meetings, while participants worked in the workplace. Archival documents that are related to the project were also collected.

### ***Data Analysis***

Data were analyzed by employing analytic induction, which is a systematic examination of social phenomena to identify similarities to develop concepts or ideas by conducting iterative data analysis (Eisenhardt, 1989; Klein and Myers, 1999; Miles and Huberman, 1994; Ragin, 1994). Therefore, data analysis and data collection sometimes overlapped as the initial data analysis influenced the later data collection process.

The initial analysis was conducted after the first phase of data collection. We undertook a detailed reading of the various documents, which included archival documents and interview transcripts that described the organization's past experiences with ES implementation. Based on iterative analysis, two emergent themes that are associated with the project's primary challenges were identified: personnel management, which mainly regarded the shortage of skilled staff in the project; and knowledge sharing issues related to the lack of a shared image of the developed system between IT and business units. Once these challenges were identified, data related to these themes were analyzed to identify practices. More specifically, in order to unpack the identified practices, following the hermeneutic circle (Klein and Myers, 1999), we used the technique of "Zooming in, Zooming out" suggested by Nicolini (2009). Identification of practices occurred not only after the initial data analysis but also simultaneously whenever we had a chance to observe. By zooming in, we focused on micro-level details of practice – looking at what people and things were doing or what the ways of working were. In zooming out, we considered what we observed at a micro-level in a broader context by connecting it to other practices, including political, cultural, and sociological norms and rules. If a new practice emerged during the analysis, we tried to figure out how the new practice emerged in terms of the interactions with various interconnected practices. Then, we started to make sense of how and why different practices were intertwined. Related practices were identified through common or shared artifacts or/and people who were involved with practices. These processes were iterative. Once we felt

comfortable with an episode that captured how a certain issue that was based on the emergent themes was being practiced, we finalized our data analysis. Table 3 summarizes the findings.

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Table 3 about here

## **Findings**

In this section, we will introduce three types of mediation fostered by artifacts in three episodes of organizational practices. In each episode, we analyze position practice, the mediating role of artifact(s), and the influence of remembering and forgetting. It should be noted that the episodes selected are chosen from a much larger number of episodes collected around the two primary challenges and five emerged practice-related stories. Given space constraints, however, we only present episodes, which are most illustrative of the points that we wish to subsequently make in our analysis and discussion, providing a visual depiction of our findings in Figure 1.

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Figure 1 about here

### ***Type of Mediation: Professionalization***

Around the time of the LTO project, GLOB-TECH had made the strategic decision to globalize its IT department, which had led to a restructuring and a loss of several senior members. This layoff situation was independent of the organization's decision to implement an ES module; however, it did put the IT organization under considerable strain.

Subsequently, some people were rehired because of the need to staff the LTO project, although these new hires were young professionals who, unlike the senior members who had left, did not have significant work experience. The first episode illustrates how two newly hired graduates – Mark and Parin – tried to position themselves as professionals in their new roles.

*Position Practice: Praxis, Positioning, Capabilities.* Mark is a fresh graduate with a marketing major from a local university. He joined the LTO project approximately 1 month after he began working at the company. Parin, another associate business analyst, was a fresh college graduate, also with a marketing degree. After spending a few months as an intern in a different firm, she was hired by GLOB-TECH. The LTO project was her first big project.

As newly hired junior analysts, they had to quickly learn how to do their assigned job – systems scenario testing. They needed to know the requirements that had been submitted by various departments and the various scenarios that test the newly designed system. Ideally, they could learn from senior analysts; however, due to the lack of availability of these senior analysts, they had to learn by reading the functional requirements document, which had been prepared by senior analysts who had left the company before Mark and Parin were hired. Being able to understand the document and obtain an overall picture of the LTO project was important to demonstrate their professional knowledge.

In the beginning of the project, Mark was very confident that he would be able to perform well on the assigned task, of developing testing scenarios based on understanding the functional requirements of the system. He began to read the functional requirements document with confidence; however, he found it difficult to understand the system by simply reading about it. Mark's praxis was reproducing his student behavior. He said:

“...Honestly at the time, and I think maybe it is coming right out of college, I said to myself, I can sit here and read it, and I'm going to know exactly what every single thing is going to be. You look back now; you were never going to get 100% of the story from that document...” (Mark, Associate Business Analyst)

Without having access to senior business analysts who could guide him, he initially tried to solve the problem using the same practices that he had used as a successful college student. In the end, he realized that the document was not similar to the textbooks that he knew; rather it was a document that, although described as “a great document”, contained

information that required knowledge about how an ES works in GLOB-TECH, which is not what Mark knew well.

A similar account was also provided by Parin, who recalled the situation as follows:

“It was a struggle; it was a difficult process, especially in the beginning. There was no clear cut way...There was no way to look at it, visualize it and understand it in a simplistic manner...You can read though this document, this great document that we have, and understand what’s going to happen to every single lead, but if you don’t see it as a whole picture, If you’re just reading scenario by scenario you don’t get all the connections [about how business works], then when you test it you wouldn’t know if you’ve missed a situation” (Parin, Associate Business Analyst)

Part of this failure was due to the fact that, as newcomers, Mark and Parin were not the ones who contributed to the development of the artifact (i.e., the system functional requirements document). Therefore, Mark and Parin did not have the capabilities to carry out existing praxes to position themselves as professionals. Additionally, they were not able to ask the project community for help to understand the functional requirements of the system.

Their interactions with the artifact let them realize the limits to their capabilities and change their praxes into new ones that involved their direct exposure to the ES. Mark looked back and described the situation as follows:

“From my end, I look back now, and I was very confused when I first looked at designs as to what they were actually referring to...I think that is something, maybe at the time I thought I could learn more from the functional designs than I actually could without seeing the system in process. I really had almost no exposure to [the ES]...I would say one of the big challenges was trying to come up with these testing scenarios before I necessarily fully understood the system...As far as what I did personally, I wish I would have jumped into the system earlier than I did...” (Mark, Associate Business Analyst)

*Professionalization.* The above episode describes how an artifact plays a key role in the position practice of newcomers to the LTO project. Part of their assignment as newly hired analysts was to test the system using various scenarios. In order to perform these

assigned tasks, newcomers needed to “know” the “system” that they were testing. They were expected to understand the system by reading the document that was about functional requirements of the system itself. However, neither Mark nor Parin could accomplish the task by reading the document that was compiled by senior analysts who had already left the project. The knowledge of these senior analysts was preserved in the document; however, the newcomers did not have the required capabilities to retrieve this important knowledge, nor could they refer to how things used to be done in the past. This is because they could not exchange knowledge with senior analysts who were no longer part of the project-based context. The document reinforced Mark’s positioning as a student, not as an analyst. This positioning was not very successful, because he did not have the capabilities to understand the document and had to carry out a different praxis to complete the required task. Similarly, Parin could not make a connection with the document due to her lack of capabilities and a praxis that did not work, reinforcing her positioning as a newcomer and not as a professional. Eventually, new praxes emerged, as Mark and Parin both decided to directly interact with the system. For both Mark and Parin, the document was not effective for them to position themselves as associate business analysts. Rather, they had to learn new praxes that helped them go through a process of professionalization – *a process of becoming analysts or professionals*. Becoming, thus, is an ongoing process of change from a lower level of potentiality to a higher level of actuality (e.g., Tsoukas and Chia, 2002). This becoming involved interacting with the system, which proved to be better for Mark and Parin to position their new identity as Analysts. In this vignette, the artifact played an important role for enacting newcomers’ position practice in a project-based context.

*Remembering and Forgetting: Connecting with the Past.* In this first episode, Mark and Parin were initially not able to position themselves as professionals and, remembering their identity as students, they reproduced similar behaviors. This was mainly due to the use



of a functional requirements document that mediated their positioning within the project community and prevented their professionalization as associate business analysts. The incapacity to recall how things were done due to the departure of senior members amplified this effect, determining accidental organizational forgetting of valuable knowledge that was previously possessed by departing employees.

***Type of Mediation: Integration***

During the project, for various reasons such as a layoff related to operational cost reduction, additional newcomers became involved in the LTO project. These newcomers were not new to the organization. However, they were new to the LTO project. The following episode was about the position practice of Jane who was hired as a temporary replacement for Sydney. Sydney was an administrative assistant who worked in the IT department. Jane had to make a transition from being a temporary worker to becoming a full-time worker; at the same time, she had to position herself from being an administrative assistant to becoming a professional in the LTO project. Artifacts mediated her position practice through integration.

*Position Practice: Praxis, Positioning, and Capabilities.* Before Jane took the assistant position, which was a temporary job, she was actually a full-time employee in GLOB-TECH, working as a receptionist at the guest visitor center. Unfortunately, she was let go due to the company's financial difficulties in early 2009. She saw an internal job posting for a temporary administrative assistant in the IT department and thought that she would "give it a shot." The position was for a temporary replacement for Sydney, an administrative assistant who had been working for the IT department for several years; however, she took a medical leave of absence due to an injury to her left hand. Jane was assigned to the position and began to work as a temporary administrative assistant. Because her background in GLOB-TECH had nothing to do with the IT department or to the administrative assistant

position, she started learning her temporary work through artifacts such as Sydney's e-mail account. Jane said:

“More through learning and I'm working out of her email as you know. Kind of just practicing and seeing what I can do. I know that Sydney has lots of other project she's working on. I don't know the full scope of her day-to-day work. But for me, in the temporary role, I've basically just been doing her email and calendar management.”  
(Jane, Temporary Administrative Assistant)

Her “temporary” role was reinforced by those artifacts that Jane had to interact with on a daily basis, handling Sydney's e-mails and managing the calendar for the Senior Vice President of IT. Sydney, the permanent administrative assistant, was working on a broader range of projects. The temporary nature of Jane's work was represented by her minimum involvement with Sydney's job and role. Moreover, the desk and the computer Jane used belonged to Sydney. The desk was fully occupied by Sydney's personal belongings such as pictures with her husband and friends, and other personal items. Additionally, the organization did not create Jane's e-mail account for a while so she had to use Sydney's account. Only later, the organization created Jane's e-mail account. However, whenever Jane sent e-mails regarding anything related to the new job, she sent them “on behalf of Sydney.”

This temporary work did not satisfy Jane, which led her to initiate new praxes to change her current positioning as a temporary administrative assistant to a new positioning as a full-time professional worker. When we interviewed Jane, she was not only handling some of Sydney's tasks, but she was also handling some IT-related tasks that were involved with the LTO project by helping Parin. Because Sydney was not handling any IT-related tasks, we asked Jane how she became involved with IT-related tasks; Jane replied as follows:

“...So when I started I was just doing the calendar management and phones and e-mail, and I'm used to a really heavy work load. So I was bored. So I approached Matt and said, you know, I would love to do more work and make sure that I'm really helping out while I'm here. So he was like “Great, you want more work, we can give

it to you.” So that’s how they brought me on to LTO and testing...” (Jane, Temporary Administrative Assistant)

She started basically helping the LTO project by getting herself involved with the user acceptance testing, a type of scenario testing task. She watched others perform testing and then she also performed testing. She tested the system by pretending to be a reseller who places an order. She went through various different scenarios for this task. These scenarios varied with different hypothetical situations. For example, one scenario could be: create an order, and add new ship-to contact, e-mail and phone; another scenario could be: first create an order and then change payment terms. The latter case may use the shipping information that was already on the system.

Jane did not have any IT-related background or capabilities, academically or professionally. However, the other associate business analysts, Parin and Mark (see above), also did not have an IT-related background. Parin told us that she used a different method (compared to what she had previously experienced herself when learning on the job) when she worked as Jane’s mentor:

“...So when I was teaching Jane I think what I did differently from what my experience was, I learned, like I said, day-by-day, step-by-step, making my own mistakes. I sat with her for long sessions to fill out, explaining everything. And I would do it in an overview the first time, then a little more detail the next time, basically go over the same stuff. Then, I would ask her to run through a scenario for me to watch her. To see what I was missing, to see the gaps, to see what she wasn’t understanding so we could reiterate that point, I could explain it to her. Maybe from a different angle, or give her a better idea of a process so she could grasp the full picture on her own. I never got the big picture. From Day 1, it was a very stop-and-go, stop-and-go and then I built the full picture in my own mind. So for her I tried to give her the full picture from the beginning so that everything kind of clicked and all the links were there, it wasn’t like some major gap between one process and another for her. That’s what I did differently.” (Parin, Associate Business System Analyst)

After working with the IT department, helping Release 1.0, Jane was promoted to the position of a full-time IT associate analyst. At this point, she moved from Sydney's desk to a different desk, and she received her own laptop. Jane's early involvement with the LTO project and her learning from Parin paid off. For example, at the May Go-Live event, Jane played a substitute role for Parin who was off on that day.

*Integration.* The above episode focuses on artifacts that prevented Jane from positioning herself as an administrative assistant. Jane, as a temporary replacement, had to keep all of Sydney's office belongings on her desk. These artifacts referred to furniture and office layouts and did not particularly contribute to problem-solving processes. They "preserved" Sydney, contributing to a form of preserved remembering of her position at work. This reminded project members about Sydney as their permanent member of staff and kept them constantly remembering Jane as a "temporary" administrative assistant. This limited Jane's potential to perform more than as a temporary replacement. In order to break away from her limited temporary assistant positioning, Jane decided to become involved with project-related tasks that made use of artifacts such as systems and functional requirement documents. In her case, she did not need to go through what Mark and Parin had to, because Parin came up with a new practice, which guided Jane step-by-step. This, in turn, helped Jane's new positioning from a limited temporary assistant to an actively involved member position, integrating herself in the new context. The new practice, thus, helped Jane to get up to speed quickly and to position herself in a project role that was originally prevented by artifacts such as having to use Sydney's email account, the use of "on behalf of" terminology in e-mail correspondence, and Sydney's personal belongings on the desk she used. Jane, thus, successfully developed her new position practice becoming integrated as a professional full-timer in the project community.

*Remembering and Forgetting: Connecting with the Present.* In this second episode, a group of Sydney's artifacts (her email account, the use of "on behalf of" terminology, and her personal belongings on the desk) preserved remembering Sydney's position at work as a permanent member and kept the project community constantly remembering Jane as a "temporary" administrative assistant. On the other hand, the practice developed by Parin to navigate the LTO testing system helped Jane forget about her temporary position and contributed to her becoming a full-time IT associate assistant in the project community.

***Type of Mediation: Collaboration***

The business units and the IT organization involved in the LTO project had different prior ES implementation experiences. The marketing unit had implemented an ES module and had its own way of using it. However, the channels unit was quite new to an ES. The IT department had experiences in implementing ES modules in the past, but this was the first time that they had used a global development approach. Perhaps not surprisingly given this context, we saw classic conflicts between IT staff and business staff about the implementation of the LTO system, which led to numerous negotiations. The following episode is one of these numerous negotiations between Business and IT. IT and Business did not have a shared understanding about the ES module: The business side cared mainly about the user interface, while IT was more concerned about data and process integration. The scope was moving and changing, because Business was not clear about their requirements and IT was not sure about their capacity to respond to all of the business requests. Here, multiple artifacts such as gap analysis documents and PowerPoint presentations mediated the negotiation processes by amplifying both IT's and Business's knowledge.

*Position Practice: Praxis, Positioning, and Capabilities.* In order to convince the business side to "sign off" for the development of the LTO system, the IT team gave a gap analysis presentation to the business organizations. The gap analysis was initially presented

as a document that summarized how work processes associated with the ES would be different from old processes. The purpose of the gap analysis for the IT team was to convince the business team to allow the IT team to move to the development phase. However, the business side was not convinced by the presentation and the meeting turned sour, ending in the business team not giving the IT team permission to develop the system. In short, the intangibility of the ES system was a problem for the business side. The document did not contain sufficient information for the business side because, they argued, they could not imagine what the final system would look like (and given their concerns with the user interface this was important). One of the business side members, Shane, a Senior Director of Marketing Operations, stated how IT presented the gap analysis to the business team:

“The IT team was like... “Here are the PowerPoint 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...” (Shane, Senior Director of Marketing Operations)

The IT team realized that the lack of tangibility was an issue that needed to be addressed. Then, the CIO Ray suggested that the IT team offer a short demonstration of a prototype that might help the business side imagine the ES that would be developed. Although the IT side still did not develop a demonstration that allowed the business side to actually try it, they did offer a 1 hour session showing a visualization of the new system user interface. Following this, the business side gave IT a “go” to develop the LTO module. Here, we see a power struggle between IT and business in terms of effective communication and decision-making. Even though it was a new context, IT acted as if they could simply dominate the communication and force others to agree with them; this, however, was rejected by the business side. As a result of this conflict, a visualization practice emerged that helped the business units to imagine the LTO system. Although the visualization worked for both sides to move forward to the development stage, it also actually ended-up sowing the seeds

for another problem in the user testing cycle. The visualization provided was a PowerPoint presentation that was not what the actual end-product looked like; rather, it was a simple presentation that showed a sample graphical user interface. However, the visual presentation that was presented was interpreted by the business side as-if it was the final product image that would be fully loaded with existing business data.

*Collaboration.* The above episode shows how IT and Business teams tried to position themselves as a united team but they failed with the gap analysis document. Their positioning practice became successful with the use of a PowerPoint presentation that helped remember the essentials of collaboration between the two teams. More specifically, replacing the original artifact (the gap analysis document) with a more convincing new artifact (the PowerPoint presentation) aided forgetting of previously shared structures and mental models to make room for new options and future opportunities. This helped the business team develop an image of the final system and sign off for prototype development as originally requested by the IT team. We see how a popular artifact used in collaborative settings – PowerPoint – plays an important role in negotiating and positioning between the business and IT sides. At first, the artifact used by the IT team did not help both teams come to a shared mental model and so a similar understanding of intentions and goals. In order to convince the business side to sign off on the project, the IT team used a new artifact that did help to develop this shared understanding. Having a shared image of the system was necessary for the project team to work together. PowerPoint (the new artifact), in this case, not only helped to develop the shared future image, but also reminded both sides that they were engaging in collaboration as part of project community.

However, while this collective future development was temporarily successful for the purpose of signing off, it was not effective in terms of the long-term collaboration. The image created and shared was a sample image, not an actual image of the system. This later caused

some conflicts between the business side and the IT side. Nevertheless, the emergent visualization practice allowed the LTO community to agree some shared goals that were mediated and exchanged in conversations distributed in the network of social relationships within the project-based context.

*Remembering and Forgetting: Connecting with Future.* This third episode shows how an artifact helped connect with the future system through the development of a shared image. In this episode, the IT team had to remember the essentials of collaboration and replace the original artifact (gap analysis document) that did not convince the business team to approve the following project steps. This, in turn, helped forget previously shared structures and mental models to make room for new options.

### **Discussion and Future Research Directions**

Artifacts have long been investigated in organization studies (Nicolini, Mengis and Swan, 2012; Scarbrough et al., 2015). The purpose of this study was to understand the mediating role of artifacts in position practices in project-based contexts, and the influence of remembering and forgetting on such practices. As reported in Figure 1, findings showed a mediated relationship between situated actor(s) and position practices in project-based contexts where artifacts contributed to three identified types of mediation i.e., professionalization, integration, or collaboration. Findings also showed the contribution of remembering and forgetting to position practice, with three identified types of connection to past, present, and future positioning.

In this discussion section, we will offer our key observations regarding these findings and will provide potential future research directions.

Our first observation of our work suggests three types of mediation of artifacts to position practice in project-based contexts – i.e., professionalization, integration, and collaboration. It suggests an extension of previous work that has pointed out how artifacts



participate in the development of organizational stories, social relationships, power, and constraints (Nicolini et al., 2003; Elsbach and Pratt, 2007). Because artifacts have been proposed to surround individuals, provide sensory stimuli, and mediate knowledge practices that are culturally situated and socially distributed (Blackler et al., 1999; Engeström, 1987, 1991, 1993), this study provides a means to start better understanding how this mediation is achieved, and how artifacts can become a source of contradictions and negotiations. This suggests the need to depart from thinking about artifacts as predefined facts to artifacts that are inherently open and can change their meaning, style, and presence. Through everyday practices, epistemic cultures emerge, are sustained, and perhaps disappear as the activities of knowing are played out. Epistemic cultures are sustained through “objectual practice” (Knorr-Cetina, 2000), which is the practice of knowing that is sustained through interactions with objects. In this case, the idea of “becoming” becomes artifacts (but they are never completely closed in terms of their meaning) through practice.

Our study also extends the notion of position practice by adding the element of artifacts. Our findings suggest an important role that artifacts play in relation to position practice through mediation, which was not explicitly discussed in the original notion of position practice. Future research could investigate artifacts further with position practice. For example, Cacciatori (2012) discusses different types of artifacts in project settings i.e., generic versus specific (depending on how much they refer to a certain occupation); and silent (e.g., furniture, office layouts) versus speaking artifacts (e.g., reports, procedures), where the former dichotomy regards their intrinsic conflict potentials derived from different ways of framing problems when specialization increases, while the latter refers to the capacity of the artifact to embed problem-solving potential. Understanding how mediation could be varied with these different types of artifacts and how it can be intertwined with position practice would be interesting, especially if this could refine the current

understanding of generic artifacts to help institutionalize individual agency in collective processes and routines, and mediate the relationship between subjects and objects in an organizational context.

Moreover, these findings also contribute to our current understanding of practice theory by extending the theory of position practice. Although various practice theories (e.g., Pickering, 1995; Orlikowski, 2007; Bourdieu, 1977) are applied to and discussed in organizational studies, position practice is still an underapplied practice concept. Our findings show how position practice can be applied to understand organizational contexts, especially in project-based settings, where multiple parties interact with each other and constantly negotiate their positions. Intricacies of these three elements of position practice – praxis, positioning, and capabilities – help us understand project-based contexts better, especially in relation to other practice theories and organizational concepts. First, we observed various types of praxes in our study. Some of them were closely linked to situated actors' past experiences and routines and their natural acts to reproduce what they have already known. This kind of praxis was almost naturally produced regardless of its effectiveness for situated actors to perform their tasks. This kind of praxis is also discussed in other practice theories (e.g., Bourdieu, 1977) as praxis of reproducing existing structures. Bourdieu (1977) explains how social class and social domination can be reproduced through practice. According to Bourdieu, individuals' everyday practice is based on knowledge acquired in past actions that are tightly linked to structures back then. These structures are somewhat implicit and often they can be merely part of actors' memories but artifacts play a role to symbolize and materialize these structures through actors' praxis. On the other hand, our findings show a different kind of praxis that is relatively more forward-looking such as negotiating and imaging the future in a collaborative setting. Future research can investigate how these different types of praxes are connected or contracted to each other in project-settings and also

investigate how position practice can be related to other practice theories. Second, our findings indicate various types of knowledge required in project-settings through understanding the second element of “capabilities.” We observed that project knowledge or knowledge required to accomplish projects is complex enough for situated actors to figure out by their every day practice of projects. Although actors might have some ideas about a general project description, they do not always know what they need to know to perform their tasks. They need to understand based on different situations. Our findings show that their capabilities to know are significantly influenced by the artifacts with which they interact. Future research can investigate more details about these different types of knowledge in relation to project learning. Third, our findings also show the dynamics of project-settings in terms of organizational roles through the third element of “positioning”. Our findings tell us that the role in project-settings is nothing simple like being composed of project members and project manager. The nature of large projects (e.g., long implementation period) does not allow such a simple setting; hence, various organizational members are involved with the project. There is no simple promotion structure to become a member of the project. The element of “positioning” describes not only how the project was carried out by participations of organizational members but also how these organizational members become part of the project. Future research can investigate “poisoning” further in relation to human resource and training practices in project-based contexts. Lastly, our findings indicate that position practice sheds light to power dynamics that is somewhat hidden in project-based contexts. Position practice assumes an imbalance in distribution of power, which means that there is no symmetrical power distributed in organizational settings. In position practice, practice is an act of situated actors to try to change its distribution of power by identifying, sustaining, or gaining positions. These actions are observed in our findings that show how nonproject member tries to become a project member, how newcomers try to become more recognized

and experienced members of the project, and how business and IT negotiate their positions to create the shared image of the system. Our study, by adding artifacts, shows a complex picture of these position practices by situated actors, because their practice is intervened by artifacts. In this case, we also have to admit that artifacts' power can be activated through their interactions with situated actors. Future research can investigate a more complex picture of "power" in project-based contexts.

Our second observation of these findings indicates a new more dynamic conceptualization of project work (e.g., Licorish and MacDonell, 2016). For example, the study by Elbanna (2010) which investigated an ES implementation found that the boundaries of project work were not as project management methodology suggests; rather the boundaries were continually crossed and project spaces were negotiated and new boundaries emerged. It does not matter whether one is a formal project member or one has the necessary expertise. Future studies could investigate more about the dynamic interactions between project boundaries and practice boundaries and how artifacts could influence such boundaries. For example, looking more closely at dynamic interactions between project boundaries and practice boundaries and how artifacts can influence such boundaries (Elbanna, 2010). Future research could also be conducted to expand and test our observations derived from empirical data. For instance, we propose a mediating role of artifacts in organizational contexts from a position practice lens. Empirical research could further investigate our interpretations of this specific theoretical lens, because we found that artifacts contributed to the modification of the network of relationships in the project-based context we observed. Another related observation may refer to the concept of mnemonic community because our findings suggest that project participants acted as a temporary emergent community of remembering and forgetting about past, present, and future, which is mediated by artifacts. Mnemonic communities are communities that conduct social remembering to remember history events,

incidents, people, (Zerubavel, 2003), working as an “imagined community” (Anteby and Molnar, 2012) where members feel connected not only through face-to-face interactions but through a remembered history and connections. This last aspect could be worth exploring in future studies. For example, considering the contribution of temporal mnemonic communities in organizations to position practice developments (Zerubavel, 2003; Anteby and Molnar, 2012) could help advance current understanding of the key role of artifacts in organizational and project-based contexts.

Our third observation of our findings suggests a direct influence of remembering and forgetting in position practices in project-based contexts and, therefore, proposes the inclusion of remembering and forgetting processes (Engeström et al., 1990; Martin de Holan and Phillips, 2004; Feldman and Feldman, 2006) as a means to better understand position practice. Because previous research has started highlighting the crucial role of forgetting in knowledge dynamics (Blackler et al., 1999) and has called for more detailed investigations of its mechanisms and outcomes (Mariano et al., 2015), the findings from our analysis could contribute to this call and help explain the evolution of complex structures of mediated and collective human agency (Roth and Lee, 2007) where remembering and forgetting processes intervene and shape internal dynamics (Mariano and Casey, 2013, 2016). This is especially important in a complex system that cannot be understood alone as a simple collection of individual components, but has to be analyzed from a holistic perspective where each part equally contributes to the evolution of the system, including its related mechanisms of knowledge preservation and loss (Bagnara et al., 2009), primary/secondary remembering (Engeström et al., 1990), and accidental/intentional forgetting (Martin de Holan and Phillips, 2004), refining our proposed current understanding. From a practitioner’s perspective, the study offers various suggestions that managers could adopt to leverage artifacts for effective human resources practice, especially in project-based contexts. In the study, we show how

artifacts play an important role in newcomers' learning and motivations, which eventually could affect project progress. The study suggests that newcomers could benefit by directly interacting with the system that could inspire their imagination, and foster better sense-making. This is especially important in the project-based context where governance is less structured and time and resources are relatively limited. The study also highlights the emergent nature of project work by showing how a temporary administrative assistant contributed to project work. It is important for managers to acknowledge such contributions and motivate them to get involved more to overcome skill shortages. Lastly, the findings from this current study indicate the important role of objects in relation to visualization in collaboration and decision-making practices. In the example of "collaboration", PowerPoint helped collaboration between IT and Business by inspiring them to build a shared image of the future.

### **Limitations**

This study has limitations. The study is based on a single organization. The practices that were identified cannot be statistically generalizable; however, they can be analytically generalizable (Yin, 2002). Also, the identified practices possibly can be found in other organizations or in other contexts if there are common activities. For example, Monterio et al. (2012) analyzed the relationship between technologically mediated work practices separated in time and space (in different and distributed organizations). Drawing on a longitudinal case study, they studied how similarity in work practices is achieved in different places. They found that achieving absolutely similar (or "best") practices was not attainable; however, they identified three constituting strategies (differentiation, assembling, and punctuation) through which a family resemblance of work practices was crafted. This implies that the identified practices in this study can be identified in different organizations if similar praxes (or constituting strategies) were used. Nevertheless, we also recognize that other sites or

industries may experience distinctive characteristics or be qualitatively diverse. Moreover, this study did not include all members employed in the selected organization, although the broad and multilevel nature of the sampling strategy, which included members from diverse departments as well as hierarchical levels, contributed to reduce this potential limitation of our research findings. Lastly, the episodes presented in this manuscript were selected, as the most illustrative ones, from a much larger number of episodes that are associated with five practice-related stories. While there can be possibilities of other episodes that could have been potentially introduced, however, they are not presented in this manuscript, due to length constraints.

## **Conclusion**

This study investigated the mediating role of artifacts in position practice in project-based contexts. Our empirical evidence extrapolated from a case study of a U.S. global product technology company, found three types of mediation – professionalization, integration, and collaboration – and pointed out the key role of related organizational remembering and forgetting which helped situated actors connect with the past, present, or future depending on developed praxis and positioning. These findings extend current understanding of how artifacts contribute to organizational practices and provide a more granular description of the mediating role of artifacts and related mechanisms in project-based contexts. In particular, these findings provide a means to better understand how artifact-mediation is achieved, how project work can be conceptualized more dynamically, and how remembering and forgetting can influence position practices in project-based contexts. This becomes especially important in complex systems that include related mechanisms of knowledge preservation and loss, primary/secondary remembering, and accidental/intentional forgetting. We believe that these findings extend our current

understanding of position practice in project-based contexts, and provide useful directions to future research endeavors.

## References

- Agar MH (1980) *The Professional Stranger: An Informal Introduction to Ethnography*. New York, NY: Academic Press.
- Anteby M and Molnár V (2012) Collective memory meets organizational identity: Remembering to forget in a firm's rhetorical history. *Academy of Management Journal* 55(3): 515–40.
- Bagnara S, Montanari SP and Pozzi S (2009) Designing organizational oblivion. In: Schlick CM (ed) *Industrial Engineering and Ergonomics*. Berlin: Springer, 233–42.
- Becker MC (2004) Organizational routines: A review of the literature. *Industrial and Corporate Change* 13(4): 643–78.
- Benbasat I and Zmud RW (2003) The identity crisis within the IS discipline: defining and communicating the discipline's core properties. *MIS Quarterly*. 27(2): 183–194.
- Brichni M, Mandran N, Gzara L, Dupuy-Chessa S and Rozier D (2014) Wiki for knowledge sharing, a user-centred evaluation approach: a case study at STMicroelectronics. *Journal of Knowledge Management*. 18(6): 1217–1232.
- Blackler F, Crump N and McDonald, S (1999) Organizational learning and organizational forgetting: Lessons from a high technology company. In: Easterby-Smith M, Araujo L and Burgoyne J (eds) *Organizational Learning and the Learning Organization: Developments in Theory and Practice*. Thousand Oaks, CA: Sage, 194–216.
- Bourdieu P (1977) *Outline of A Theory of Practice*. Cambridge, UK, Cambridge University Press.



- Brown JS and Duguid P (1991) Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organization Science* 2(1): 40–57.
- Cacciatori E (2008) Memory objects in project environments: Storing, retrieving and adapting learning in project-based firms. *Research Policy* 37(9): 1591–1601.
- Cacciatori E (2012) Resolving conflict in problem-solving: Systems of artefacts in the development of new routines. *Journal of Management Studies* 49(8): 1559–85.
- Carlile PR (2002) A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization Science* 13(4): 442–55.
- Carlile PR, Nicolini D, Langley A and Tsoukas H (eds) (2013) *How Matter Matters: Objects, Artifacts, and Materiality in Organization Studies*. Oxford, UK: Oxford University Press.
- Ciuk S and Kostera M (2010) Drinking from the waters of Lethe: A tale of organizational oblivion. *Management Learning* 41(2): 187–204.
- Coad AF and Glyptis LG (2014) Structuration: a position-practice perspective and an illustrative study. *Critical Perspectives on Accounting* 25: 142-161.
- Cohen IJ (1989) *Structuration Theory: Anthony Giddens and the Structuration of Social Life*. London, UK: MacMillan.
- Cohen MD (2012) Perceiving and remembering routine action: Fundamental micro-level origins. *Journal of Management Studies* 49(8): 1383–88.
- Cohen MD and Bacdayan P (1994) Organizational routines are stored as procedural memory: Evidence from a laboratory study. *Organization Science* 5(4): 554–68.
- Creswell JW (2003) *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, CA: Sage.
- DeSanctis G and Poole MS (1994) Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science* 5(2): 121–47.

- Desouza, KC (2003) Strategic contributions of game rooms to knowledge management: some preliminary insights. *Information & Management* 41(1): 63-74.
- Di Maio P (2013) Knowledge objects as shared system representation. *Knowledge Management Research & Practice*. 11(1): 23–31.
- Doolin B and McLeod L (2012) Sociomateriality and boundary objects in Information Systems development. *European Journal of Information Systems* 21: 570-586.
- Dougherty D (2004) Organizing practices in services: capturing practice-based knowledge for innovation. *Strategic Organization* 2(1): 35–64.
- Eisenhardt KM (1989) Building theories from case study research. *Academy of Management Review* 14(4): 532–50.
- Elbanna AR (2006) The validity of the improvisation argument in the implementation of rigid technology: The case of ERP systems. *Journal of Information Technology* 21(3): 165–75.
- Elbanna, AR (2010) Rethinking IS project boundaries in practice: A multiple-projects perspective. *Journal of Strategic Information Systems* 19: 39–51.
- Elsbach KD and Pratt MG (2007) The physical environment in organizations. *The Academy of Management Annals*, 1(1): 181-224.
- Erlandson DA, Harris EL, Skipper BL, and Allen SD (1993). *Doing Naturalistic Inquiry: A Guide to Methods*. Thousand Oaks, CA: Sage.
- Emerson R, Fretz R and Shaw L (1995). *Writing Ethnographic Fieldnotes*. Chicago, IL: University Of Chicago Press.
- Engeström Y (1987) *Learning by Expanding: An Activity Theoretical Approach to Developmental Research*. Helsinki: OrientaKonsultit.
- Engeström Y (1991) Activity theory and individual and social transformation. *Multidisciplinary Newsletter for Activity Theory* 7(8): 6–17.

- Engeström Y (1993) Developmental studies of work as a testbench of activity theory: The case of primary care medical practice. In: Chaiklin S and Lave J (eds) *Understanding Practice: Perspectives on Activity and Context*. Cambridge, UK: Cambridge University Press, 64–103.
- Engeström Y, Brown K, Engeström R and Koistinen K (1990) Organizational forgetting: An activity-theoretical perspective. In: Middleton D and Edwards D (eds) *Collective Remembering. Inquiries in Social Construction*. Thousand Oaks, CA: Sage, 139–68.
- Erlanson DA, Harris EL, Skipper BL and Allen SD (1993) *Doing Naturalistic Inquiry*. Thousand Oaks, CA: Sage.
- Fenton EM (2005). Visualising strategic change: The role and impact of process maps as boundary objects in reorganisation. *European Management Journal* 25(2): 104-117.
- Feldman RM and Feldman SP (2006) What links the chain: An essay on organizational remembering as practice. *Organization* 13(6): 861–887.
- Gherardi S (2001) From organizational learning to practice-based knowing. *Human Relations* 54(1): 131–39.
- Giddens A (1984) *The Constitution of Society: Outline of the Theory of Structuration*. Los Angeles, CA: University of California Press.
- Giddens A (1979) *Central Problems in Social Theory*. London, UK: Macmillan.
- Guillemette, M. G., Mignerat, M. and Paré, G. (2017) The role of institutional work in the transformation of the IT function: A longitudinal case study in the healthcare sector. *Information & Management*. 54(3): 349-363.
- Kajamaa A (2011) Boundary breaking in a hospital: expansive learning between the worlds of evaluation and frontline work *The Learning Organization*. 18(5): 361–377.
- Klein HK and Myers MD (1999) A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly* 23(1): 67–93.

- Knorr-Cetina K (2000) Objectual practice. In: *The Practice Turn in Contemporary Theory*.  
TR Schatzki, K Knorr-Cetina and EV Savigny (eds) New York, NY: Routledge, 175-188.
- Kogan SL and Muller MJ (2006) Ethnographic study of collaborative knowledge work. *IBM Systems Journal* 45(4): 759–71.
- Latour B (2005) *Reassembling the Social. An Introduction to Actor-Network-Theory*. Oxford, UK: Oxford University Press.
- Lave J and Wenger E (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press, Cambridge.
- Lee, CS, Watson-Manheim, MB and Chudoba, KM (2014) Investigating the relationship between perceived risks in communication and ICT-enabled communicative behaviors. *Information & Management*, 51(6), 688-699.
- Licorish, SA and MacDonell, SG (2016) Exploring software developers' work practices: Task differences, participation, engagement, and speed of task resolution. *Information & Management*.
- Locke J and Lowe A (2007) A biography: Fabrications in the life of an ERP package. *Organization* 14(6): 793–814.
- Maaninen-Olsson E, Wismén M and Carlsson SA (2008) Permanent and temporary work practices: knowledge integration and the meaning of boundary activities. *Knowledge Management Research & Practice* 6(4): 260–273.
- Mariano S and Casey A (2016) The dynamics of organizational routines in a startup: The EREDA model. *European Management Review* 13(4): 251–274.
- Mariano S and Awazu Y (2017) The role of collaborative knowledge building in the co-creation of artifacts: Influencing factors and propositions. *Journal of Knowledge Management* 21(4): 779–795.

- Mariano S and Awazu Y (2016). Artifacts in knowledge management research: A systematic literature review and future research directions. *Journal of Knowledge Management*, 20(6): 1333– 352.
- Mariano S and Casey A (2013) A dynamic model of knowledge shaping. Paper presented at the *Academy of Management Annual Meeting*, Lake Buena Vista (Orlando), Florida.
- Mariano S, Casey A and Olivera F (2015) Organizational forgetting: Reviewing 40 years of research. Paper presented at the *Academy of Management Annual Meeting*, Vancouver, Canada.
- Martin de Holan P and Phillips N (2004) Remembrance of things past? The dynamics of organizational forgetting. *Management Science* 50(11): 1603–13.
- Miles MB and Huberman AM (1994) *Qualitative Data Analysis: A Sourcebook of New Methods*. Newbury Park, CA: Sage.
- Mueller J (2012) Knowledge sharing between project teams and its cultural antecedents *Journal of Knowledge Management*. 16(3): 435–447.
- Nelson R and Winter S (1982) *An Evolutionary Theory Of Economic Change*. Cambridge, MA: Harvard University Press.
- Nicolini D (2009) Zooming in and out: Studying practices by switching theoretical lenses and trailing connections. *Organization Studies* 30(12): 1391–1418.
- Nicolini D, Mengis J and Swan J (2012) Understanding the role of objects in cross-disciplinary collaboration. *Organization Science* 23(3): 612–29.
- Nicolini D, Gherardi, S and Yanow, D (2003) *Knowing in organizations: a practice-based approach*. Armonk, NY: ME Sharpe Inc.
- Orlikowski WJ (2000) Using technology and constituting structures: a practice lens for studying technology in organizations. *Organization Science*. 11(4): 404–428.

- Orlikowski WJ (2002) Knowing in practice: Enacting a collective capability in distributed organizing. *Organization Science* 13(3): 249–73.
- Orlikowski WJ (2007) Sociomaterial practices: Exploring technology at work. *Organization Studies* 28(9): 1435–48.
- Orlikowski WJ (2010) The sociomateriality of organisational life: Considering technology in management research. *Cambridge Journal of Economics* 34(1): 125–41.
- Orlikowski WJ and Iacono CS (2006) Desperately seeking the ‘IT’ in IT research - A call to theorizing the IT artifact. *Information Systems Research* 12(2): 121–134.
- Orr JE (1996) *Talking About Machines*. Ithaca, NY: Cornell University Press.
- Pentland BT and Feldman MS (2005) Organizational routines as a unit of analysis. *Industrial and Corporate Change* 14(5): 793–815.
- Pentland BT and Feldman MS (2008) Designing routines: On the folly of designing artifacts, while hoping for patterns of action. *Information and Organization* 18(4): 235–50.
- Perrin A (2012) The practices of knowledge managers in Lafarge. *Journal of Knowledge Management*, 16(2): 204–214.
- Pickering A (1993) The mangle of practice: agency and emergence in the sociology of science. *The American Journal of Sociology* 99(3): 559-589.
- Pickering A (1995). *The Mangle of Practice: Time, Agency, and Science*. Chicago, IL, The University of Chicago.
- Pozzebon M and Pinsonneault A (2005) Challenges in conducting empirical work using structuration theory: Learning from IT research. *Organization Studies*, 26(9): 1353–1376.
- Ragin CC (1994) *Constructing Social Research*. Thousand Oaks, CA: Sage
- Reid M, Hultink EJ, Marion T and Barczak G (2016) The impact of the frequency of usage of IT artifacts on predevelopment performance in the NPD process. *Information & Management* 53(4): 422–434.

- Roth WM and Lee YJ (2007) “Vygotsky’s neglected legacy”: Cultural-historical activity theory. *Review of Educational Research* 77(2): 186–232.
- Scarbrough H, Panourgias NS and Nandhakumar J (2015) Developing a relational view of the organizing role of objects: A study of the innovation process in computer games. *Organization Studies* 36(2): 197–220.
- Schatzki TR (2006) On organizations as they happen. *Organization Studies* 27(12): 1863–1873.
- Schultz M, Hatch MJ, and Ciccolella F (2006) Brand life in symbols and artifacts: the LEGO company in Rafaeli, A (Ed.) *Artifacts and Organizations*. New York, NY: Psychology Press. pp. 141–160.
- Scott SV and Wagner EL (2003) Networks, negotiations, and new times: the implementation of enterprise resource planning into an academic administration. *Information and Organization* 13(4): 285–313.
- Spradley J (1979) *The Ethnographic Interview*. New York, NY: Wadsworth Group/Thomas Learning.
- Star, SL and Griesemer JR (1989). Institutional ecology, 'Translations' and boundary objects: amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-1939. *Social Studies of Science* 19(4): 387-420.
- Spradley J (1980) *Participant Observation*. New York, NY: Holt, Rinehart and Winston.
- Stones R (2005) *Structuration Theory*. Basingstoke, UK: Palgrave Macmillan.
- Svabo C (2009) Materiality in a practice-based approach. *The Learning Organization* 16(5): 360–370.
- Swan J, Bresnen M, Newell S and Robertson M (2007) The object of knowledge: The role of objects in biomedical innovation. *Human Relations* 60(12): 1809–37.

- Szulanski G (1996) Exploring internal stickiness: impediments to the transfer of best practice. *Strategic Management Journal*. 17: 27–43.
- Szulanski G and Jensen RJ (2004) Overcoming stickiness: an empirical investigation of the role of the template in the replication of organizational routines. *Managerial and Decision Economics*. 25: 347–363.
- Tsang EWK and Zahra SA (2008) Organizational unlearning. *Human Relations* 61(10): 1435–62.
- Tsoukas, H and Chia R (2002) On organizational becoming: Rethinking organizational change. *Organization Science* 13(5): 566–582.
- Turel, O, Serenko, A. and Bontis, N (2010) User acceptance of hedonic digital artifacts: A theory of consumption values perspective. *Information & Management* 47(1): 53-59.
- van Gigch, J P and Le Moigne, J L (1990) The design of an organization information system: intelligent artifacts for complex organizations. *Information & Management* 19(5): 325-331.
- van Maanen J (1988) *Tales of the Field: On Writing Ethnography*. Chicago, IL: University of Chicago Press.
- Vilnai-Yavetz I and Rafaeli A (2006) Managing artifacts to avoid artifact myopia in Rafaeli, A (Ed.) *Artifacts and Organizations*. New York, NY: Psychology Press. pp. 9–21.
- Wagner EL and Newell S (2004) Best for Whom?: The Tension between ‘Best Practice’ ES Packages and Diverse Epistemic Cultures in a University Context. *Journal of Strategic Information Systems* 13: 305-328.
- Walsh JA and Ungson GA (1991) Organizational Memory. *Academy of Management Review* 16(1): 57–91.
- Weick KE (2000). *Making Sense of the Organization*. New York, NY: Wiley.



- Wenger E (2003) Communities of practice and social learning systems. In; Nicolini D, Gherardi S and Yanow D (eds.) *Knowing in Organizations: A Practice-based Approach*. New York, NY: M.E. Sharpe, 76–99.
- Yakhlef A (2010). The three facets of knowledge: A critique of the practice-based learning theory. *Research Policy* 39(1): 39–46.
- Yeow A and Sia SK (2008) Negotiating “best practices” in package software implementation. *Information and Organization* 18(1): 1–28.
- Zerubavel E (2003) *Time Maps: Collective Memory and the Social Shape of the Past*. Chicago, IL: University of Chicago Press.

## TABLES

**Table 1: Data Collection**

Data Collection				
Period	Aims	Methods		
		Interviews	Observations	Archival Documents
First point in time (Fall 2008-December 2008)	Background and historical context of the research organization and project i.e., how the project began	<ul style="list-style-type: none"> <li>• Chief Information Officer (CIO)</li> <li>• Senior Vice President (SVP) of Business</li> <li>• System Senior IT Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Weekly meeting</li> <li>• Steering committee meeting</li> </ul>	<ul style="list-style-type: none"> <li>• Presentations and project-related documents such as CRM historical documents and LTO project-related documents i.e., project timelines, the business systems governance model, the Siebel implementation strategy, and the initial core project member list</li> </ul>
Second point in time (January 2009-Summer 2009)*	Continuous gathering of information on the historical background as well as the current project implementation – the LTO project	<ul style="list-style-type: none"> <li>• Approximately 40 semistructured and open-ended interviews (30 minutes to 60 minutes) of core project members (e.g., Chief Marketing Officer, Chief Sales Officer, etc.) and project participants (e.g., temporary hired consultants, newly hired assistants, etc.)</li> <li>• Informal interactions and conversations with project participants</li> </ul>	<ul style="list-style-type: none"> <li>• Business weekly meetings (1 hour average)</li> <li>• Steering committee meetings (2 hour average)</li> <li>• Project-related meetings</li> <li>• Observations of how project participants work</li> </ul>	Same as above
Third point in time (Summer 2009-Early 2010)	Follow-up on the progress of the LTO project implementation	<ul style="list-style-type: none"> <li>• Project administrator</li> <li>• Project champion</li> </ul>	None	Same as above

\* Note: The examples in this study were mainly based on the data collected during the second point in time

**Table 2: Data Analysis Processes and Outcomes**

Sequence(s)	Description	Outcome(s)
First Analysis	<ul style="list-style-type: none"> <li>• Use of analytic induction (such as a systematic examination of social phenomena) to identify similarities and to develop concepts or ideas through iterative data analysis (Eisenhardt, 1989; Klein and Myers, 1999; Miles and Huberman, 1994; Ragin, 1994)</li> <li>• Triangulation of data to understand and make sense of various documents (including interview transcripts, field notes, and collected documents)</li> <li>• Overlapping of data collection and analysis at times</li> </ul>	First outcome. Two emerged themes: <ul style="list-style-type: none"> <li>• Personnel management, which mainly regarded the shortage of skilled staff in the project</li> <li>• Knowledge sharing issues that closely associated with the lack of a shared image of the developed system between IT and business units</li> </ul>
Second Analysis	<ul style="list-style-type: none"> <li>• Hermeneutic circle (Klein and Myers, 1999)</li> <li>• Zooming in, Zooming out (Nicolini, 2009)               <ul style="list-style-type: none"> <li>• Zooming in: focus on micro-level details of practice by looking at what people and things were doing or what the ways of working were</li> <li>• Zooming out: consideration of the broader context and interactions with various interconnected practices, including political, cultural, and sociological norms and rules</li> </ul> </li> <li>• Unpacking practices from the two themes emerged during the first analysis</li> <li>• Making sense of intertwined practices</li> </ul>	Second outcome. New practices identified: <ul style="list-style-type: none"> <li>• Mentoring practices that overcome the shortage of skilled staff in the project</li> <li>• Knowledge sharing practice of different organizational units</li> </ul>
Third Analysis	<ul style="list-style-type: none"> <li>• Identification of representative episodes based on the theoretical lens (position practice, artifacts, and remembering and forgetting)</li> <li>• Identification of common/shared artifacts and/or people involved with practices</li> </ul>	Third outcome. Three mediations identified: <ul style="list-style-type: none"> <li>• Professionalization</li> <li>• Integration</li> <li>• Collaboration</li> </ul>

**Table 3: Findings**

<b>Types of Mediation</b>	<b>Situated Actors</b>	<b>Praxis</b>	<b>Positioning</b>	<b>Capabilities</b>	<b>Artifacts</b>	<b>Remembering and Forgetting</b>
Professionalization	Mark and Parin: LTO project	Reproducing previous praxes associate to being a student	From Students to Associate Business Analysts	Acquiring working knowledge of the system	Functional Requirements Document; System	Connecting with past: <ul style="list-style-type: none"> <li>Remembering of previous identities as students by Mark and Parin</li> <li>Mark and Parin were not the ones who produced the artifact. Therefore, they did not know how things were used to be done in the past by seniors members who left (forgetting)</li> </ul>
Integration	Jane, Sydney, and Parin	Reproducing previous praxes such as replying email “on behalf of” replaced employee	From Temporal Administrative Assistant to full-time IT Associate Analyst	Acquiring IT knowledge	Email account, and “on behalf of” correspondence, desk and personal belongings of Sydney; new practice developed by Parin to assist the use of the system and functional requirement document	Connecting with present: <ul style="list-style-type: none"> <li>Artifacts remind project members about Sydney as their permanent member of staff and keep them constantly remembering Jane as a temporal assistant</li> <li>The new practice help Jane forget her temporary position and become a full-timer</li> </ul>
Collaboration	Business and IT Managers in the project team context	Negotiating and imagining praxes	From business to IT	Acquiring knowledge about future ES	Gap analysis document; PowerPoint presentation	Connecting with future: <ul style="list-style-type: none"> <li>IT had to remember the essential of collaboration and replace the original artifact (gap analysis document) that did not convince the business team to approve the following project steps</li> <li>The project team forgot previously shared structures and mental models to make room for new options</li> </ul>

## FIGURES

**Figure 1: Visual Representation of Findings**

