

The Coevolution of Organizational Routines and IT Systems in IT-enabled Organizational Transformation

Full Paper

Faqir Taj

School of Business IT and Logistics,
College of Business, RMIT University
Email: faqir.taj@rmit.edu.au

Karlheinz Kautz

School of Business IT and Logistics,
College of Business, RMIT University
Email: karlheinz.kautz@rmit.edu.au

Vince Bruno

School of Business IT and Logistics,
College of Business, RMIT University
Email: vince.bruno@rmit.edu.au

Abstract

This paper proposes a conceptual framework to study the phenomenon of IT-enabled Organizational Transformation (IT-enabled OT) as a coevolution process of organizational routines and a new IT system to understand IT-enabled OT in a holistic and integrated manner by investigating how actors perceive, interpret, appropriate and enact the new IT system in their work routines. It allows the examination of the reciprocal interactions between different aspects of organizational routines and a new IT system. The framework emphasizes appropriation where the actors use the new IT system in a different manner than intended by its designers, and enactment where the logic of the new IT system is locally adopted through planned as well as unplanned actions. The conceptualization of IT-enabled OT as a coevolution process of organizational routines and a new IT system enhances our understanding of how change unfolds in the organization during the implementation and use of a new IT system.

Keywords: IT-enabled OT, organizational routines, coevolution, appropriation, enactment

1 INTRODUCTION

The concept of IT-enabled Organizational Transformation (IT-enabled OT) describes substantial changes occurring to the structure and work practices of an organization due to the implementation and use of a new IT system (Orlikowski 1996; Besson & Rowe 2012). Orlikowski (1996) presented a study of a customer support system where the structure and organizing practices of a software company radically changed over a period of two years following the introduction of the system. The nature of work changed from unstructured to more structured, patterns of interactions changed from reactive to proactive, and coordination mechanisms changed from functional to cross-functional. Orlikowski (1996) argues that the introduction of the system triggered the process of OT, but the transformative change actually also happened through situated actions and improvisations as the organizational actors were enacting the new system in their work routines (Vaast & Walsham 2005; Leonardi & Barley 2010). Academics and practitioners have been struggling for a long time to understand how the implementation and use of a new IT system transform organizations (Leonardi & Barley 2010; Besson & Rowe 2012).

This paper proposes a conceptual framework that depicts IT-enabled OT as a coevolution process of organizational routines and a new IT system. The conceptual framework considers an organization as a collection of routines (Felin et al. 2012), where an organizational routine is a repetitive, recognizable pattern of interdependent actions, carried out by multiple actors (Feldman & Pentland 2003). It also considers an IT system as a collection of affordances and constraints (Leonardi 2011). A technology affordance refers to an action potential, that is, what actors can do with an IT system in their work routines whereas a constraint addresses the way an IT system may be holding back the actors to achieve their goals (Leonardi 2011; Verhulst & Rutkowski 2017). The purpose of defining IT-enabled OT as a coevolution process is to investigate how the new IT system shapes organizational routines, as well as how the evolution of routines shapes the features and functions of the new IT system (Leonardi 2009). Unlocking the coevolution process of organizational routines and a new IT system allows us to study IT-enabled OT in a comprehensive manner. The conceptual framework integrates different perspectives and provides a new way to study the phenomenon of IT-enabled OT in a holistic manner by enabling us to investigate how actors perceive, interpret, appropriate and enact the new IT system in their work routines. This enhances our understanding of how change unfolds in an organization during the implementation and use of a new IT system.

The next section describes our approach for reviewing the existing IS literature about IT-enabled OT. We then present the theoretical background of IT-enabled OT particularly highlighting five social constructivist perspectives on IT system implementation. The fourth section introduces the concept of organizational routines. In the fifth section we then develop our integrated framework which conceptualizes IT-enabled OT as a coevolution process of organizational routines and a new IT system. The fifth section provides the conclusions of the work.

2 HERMENEUTIC APPROACH FOR CONDUCTING THE LITERATURE REVIEW

We used a hermeneutic approach to review the existing IS literature and to understand how the concept of IT-enabled OT evolved over the last decades as a basis for the development of a framework for IT-enabled OT. The hermeneutic approach is an iterative approach for conducting a literature review, which includes the following phases: searching, reading, mapping and classifying, critical assessment, and argument development (Boell & Cecez-Kecmanovic 2014). In the first hermeneutic cycle, we identified four paradigms of IT-enabled OT: a) planned change models b) technological imperative c) punctuated equilibrium (PE) models d) social constructivist perspectives (Orlikowski 1996; Leonardi & Barley 2010). In the second hermeneutic cycle, we dismissed the first 3 paradigms because they do not consider emergent change, which is relevant in today's organizations (Orlikowski 1996). The third hermeneutic cycle then focused on the different social constructivist perspectives: perception, interpretation, appropriation, enactment, and alignment as distinguished by Leonardi and Barley (2010). These authors also identified two major issues in the application of constructivist perspectives to investigate the phenomenon of IT-enabled OT. First, different constructivist perspectives are associated with the construction of different social processes, and hence operate at different levels of analysis (Leonardi & Barley 2010). Second, extant studies based on social constructivist perspectives are not considering the evolution of the new IT system itself in the implementation process. To overcome these issues, the fourth hermeneutic cycle focused on the coevolution of organizational routines and a new IT system (Pentland & Feldman 2005; D'Adderio 2008; D'Adderio 2011), which resulted in the development of a new conceptual framework.

3 THEORETICAL BACKGROUND: PERSPECTIVES ON IT-ENABLED ORGANIZATIONAL TRANSFORMATION

Theoretical perspectives on IT-enabled OT can be classified into four paradigms (Orlikowski 1996; Leonardi & Barley 2010): a) planned change models b) technological imperative c) punctuated equilibrium (PE) models d) social constructivist perspectives.

| OT Paradigms Attributes | Planned Change Models | Technological Imperative | Punctuated Equilibrium | Social Constructivist Perspectives |
|-------------------------|--------------------------------|--------------------------|----------------------------|------------------------------------|
| Philosophical stance | Voluntarism | Determinism | - | Social Constructivism |
| Change enablers | Actors | IT | Actors | Actors' Interaction & IT |
| Change type | Small or Big/ Short or Long | - | Episodic & Radical | Continuous & Cumulative |
| Change process | Sequential & Time bound | - | Sequential & Time bound | Non-linear & Ongoing |
| Notion of emergence | No | No | No | Yes |

Table 1. The Paradigms of Organizational Transformation

The planned change models paradigm presumes that people deliberately initiate and implement changes to improve the performance of the organization and make it fit with the environment (Dunphy & Stace 1988). Planned change models are criticized for their high reliance on the rationality of managers directing the change and treating it as a separate event from the ongoing processes of organizing (Orlikowski 1996). The technological imperative paradigm considers an IT system as the main driver of organizational change, so that the adoption of a new IT system creates predictable changes in the structure and work practices of an organization (Huber 1990). The technological imperative paradigm is mainly criticized for ignoring the role of actors to explore, learn and adjust to different organizational situations. The punctuated equilibrium models paradigm posits that organizations are evolving through relatively long periods of stability in their basic patterns of activity, which are punctuated by relatively short periods of revolutionary change (Gersick 1991; Romanelli & Tushman 1994). The punctuated equilibrium models paradigm is mainly criticized for its assumptions of moving the organization to some sort of stable state or equilibrium state, whereas contemporary organizations are characterized by frequent change, learning, flexibility and self-organizing (Orlikowski 1996). The planned change models, technological imperative and punctuated equilibrium models paradigms do not consider the phenomenon of emergent change (Orlikowski 1996; Leonardi & Barley 2010). Emergent change is relevant because unprecedented environmental, technological and organizational developments facilitate patterns of organizing, which cannot be prescribed by a priori plans or intentions. The social constructivist perspectives paradigm uncovers the notion of emergent change during the implementation and use of a new IT system. Scholars who study IT-enabled OT from constructivist perspectives generally hold that organizational change emerges from an ongoing stream of social actions in which actors respond to an IT system's affordances and constraints (Leonardi & Barley 2010). The introduction of a new IT system triggers the process of organizational transformation, but the actual change happens over a period of time through situated actions and ongoing improvisations (Orlikowski 1996). The focus of this paradigm is that change may not always be as planned, inevitable, or discontinuous as we expect rather it is realized through ongoing variations and adjustments when the actors try to accommodate a new IT system in their work routines (Orlikowski 1996; Leonardi & Barley 2010). Table 1 provides a summary of these 4 paradigms.

Leonardi and Barley (2010) have approached IT-enabled OT from five coherent social constructivist perspectives: perception, interpretation, appropriation, enactment, and alignment to explain the social construction of a newly implemented IT system. They argue that these perspectives build a comprehensive approach to study how an organization and an IT system interact with each other in creating a new social reality in the organization.

The perception perspective seeks to explain why actors come to share similar perceptions about the usefulness of a new IT system. The perception perspective also investigates how shared perceptions lead to the acceptance or rejection of the new IT system (Leonardi & Barley 2010). The social construction of the new IT system occurs through the convergence of attitudes, values, and beliefs among the actors of a new IT system (Vishwanath 2006). The social construction process ceases once actors have made an initial decision to adopt the new IT system (Leonardi & Barley 2010). The decision to continue further use of the new IT system depends on users' evaluation of the IT system's performance. The interpretation perspective asks how people draw on familiar frames to make sense of and interpret the

new IT system in unfamiliar situations (Orlikowski & Gash 1994; Leonardi & Barley 2010). According to Orlikowski and Gash (1994), frames are built up repertoires of tacit knowledge that an actor uses to impart meaning to an ambiguous situation. Frames implicitly guide actors to make sense of uncertain situations and then act accordingly. The social construction involves the transfer of knowledge and the modification of previously held frames to cope with new situations during the implementation and use of a new IT system (Hsiao & Wu & Hou 2008). The appropriation perspective investigates whether people use the new IT system as it was designed and intended by the designers (Leonardi & Barley 2010). According to Poole and DeSanctis (1990), the design of an IT system has two aspects: a) spirit, the general goals and attitudes that the IT system aims to promote, and b) structural features, the technical features and functions of the IT system. The designers inscribe affordances and constraints into an IT system to encourage certain patterns of actions and behaviours (D'Adderio 2011). Actors appropriate the features and functions of the new IT system consistent or inconsistent with the designers' intentions (Leonardi & Barley 2010). The appropriation perspective is silent and gives rare explanations of the situated accounts why actors deviate and use an IT system in an unanticipated manner (Leonardi & Barley 2010), which is the focus of the enactment perspective. The enactment perspective studies how actors use a new IT system in their work but focuses on the evolution of work practices rather than cognitions or norms (Leonardi & Barley 2010). Weick (1979) introduced the concept of enactment into organization studies as a way of emphasizing the idea that organizing is an activity and that organizational actors wittingly and unwittingly craft organizations as they try to make sense of and respond to their environments. The enactment perspective narrates how the institutional embedding of an IT system into the social system takes place (Berente et al. 2008). The enactment perspective aims at identifying micro-level processes, which translate the working logic of the new IT system into the routines and work practices of the implementing organization (Orlikowski 1996; Leonardi & Barley 2010). The enactment perspective ignores the implications of macro-level structures with respect to the implementation and use of new IT system, which is the focus of the alignment perspective (Leonardi & Barley 2010). The alignment perspective focuses on the adaptation of an IT system, in which the social order of an organization and the newly implemented IT system reconfigure and adjust to each other (Leonard-Barton 1988; Sabherwal, Hirschheim & Goles 2001). The alignment perspective investigates how the social order of an organization shapes the use of a new IT system and how the use of a new IT system alters an existing social order (Leonardi & Barley 2010). The central theme of the alignment perspective is to examine how roles and relationships change during the implementation and use of a new IT system (Barley 1990). The social constructivist perspectives are summarized in table 2.

| | Perception | Interpretation | Appropriation | Enactment | Alignment |
|---------------------------------------|---|---|--|---|--|
| Implementation phase of new IT system | Adoption | Use | Use | Use | Adaptation |
| Social Construction | Convergence of attitudes, beliefs, and values | Transference of knowledge & modification of Schemas | Emergence of patterns of deviations & conformity | Situated improvisations & Evolution of work practices | Reconfiguration of roles & relationships |

Table 2. The Social Constructivist Perspectives of Organizational Transformation

As stated above, IS scholars have been facing two major challenges when applying social constructivist perspectives to study the phenomenon of IT-enabled OT. First, different constructivist perspectives are associated with the construction of different social processes, and hence operate on different levels of analysis (Leonardi & Barley 2010). The perception perspective focuses on the convergence of attitudes, beliefs, and values; the interpretation perspective focuses on the transfer of knowledge; the appropriation perspective focuses on the patterns of deviation and conformity; the enactment perspective focuses on the evolution of work practices; the alignment perspective focuses on the reconfiguration of roles and relationships (Leonardi & Barley 2010). The investigation of IT-enabled OT demands however to examine the construction and evolution of all social processes simultaneously (Leonardi & Barley 2010; Besson & Rowe 2012) as only then IT-enabled OT can be understood in a holistic and integrated manner. So far only few studies have combined some of the different social constructivist perspectives to investigate the phenomenon of IT-enabled OT in a comprehensive manner. Second, extant studies based on social constructivist perspectives are skewed towards studying social processes during the implementation and use of a new IT system (Leonardi & Barley 2010). It is however also important to explore how the new IT system itself evolves during implementation process (Leonardi 2009). These issues can be resolved to a great extent if we conceptualize IT-enabled OT as a coevolution process of organizational routines and a new IT system (Pentland & Feldman 2005;

D'Adderio 2008; D'Adderio 2011) which enables us to holistically study the five social constructivist perspectives in a single organizational setting.

4 THE CONCEPT OF ORGANIZATIONAL ROUTINES

Organizations accomplish much of their work through executing established routines (Feldman 2000), where an organizational routine is a repetitive, recognizable pattern of interdependent actions, carried out by multiple actors (Feldman & Pentland 2003). Organizational scholars investigate routines from two different perspectives, the capability and the practice perspective. The capability perspective focuses on routines as whole entities whereas the practice perspective focuses on the parts of the routines (Parmigiani & Howard-Grenville 2011). The capability perspective is mainly concerned about the purpose and impact of routines on organizational performance (Dosi, Faillo & Marengo 2008) whereas the practice perspective focuses on how organizational routines operate and how they are (re)produced or changed as people enact them (Parmigiani & Howard-Grenville 2011). The practice perspective is grounded in practice theory, which describes how everyday practices are accomplished, reinforced, or changed (Feldman & Orlikowski 2011). Practices are the recurrent, materially bounded and situated actions engaged in by actors of the organization (Orlikowski 2002; Vaast & Walsham 2005). Bourdieu (1990) defines a practice as shared actions performed by a group of actors. At the most micro-level, a gesture and a speech act are both practices (Collins 1981). They are microsocial actions through which work is carried out. At the meso-level a practice consists of multiple microsocial actions that together constitute a socially recognizable practice (Orlikowski 2000). Negotiation and interaction among actors represent practices, which occur at a meso-level (Barley 1986). Practices can be conceptualized as the aggregate of meso-level actions into macrosocial categories such as an organizational routine (Feldman & Pentland 2003). For example, the hiring routine can be seen as a combination of meso-level actions such as screening applicants, conducting interviews, and negotiating contracts. The emphasis of the practice perspective is to uncover the internal working of routines (Feldman & Pentland 2003) to open the black box of an organizational routine and reconceptualise it as being made of two interacting parts- its ostensive aspects and performative aspects. The ostensive aspect represents the ideal or schematic form of the routine. It is the routine in principle (Feldman 2003; Feldman & Pentland 2003). The performative aspect captures specific actions, by specific people, at specific times and places (Feldman & Pentland 2003). It is the routine in practice. Initially, when a routine is put into practice the actors use the ostensive aspect to guide their actions, refer to the pattern of interactions and evaluate the performance outcomes (Feldman & Pentland 2003). When the routine does not produce the outcome as expected actors bring about variations in the performance of the routine through adjustments, accommodations and improvisations (Feldman & Orlikowski 2011). This causes the actors to modify and recreate the ostensive aspects of the routine. Hence, there are recursive relationships between the two aspects, both are mutually constitutive and essential for the development, evolution and adaptation of organizational routines (Feldman & Pentland 2003; Pentland & Feldman 2005). Routines act as key mechanism to capture change in the organization by investigating how change is occurring to the underlying practices in an organizational routine (Nelson & Winter 1982). Variation and selective retention of patterns of actions bring change in the performance of an organizational routine. Pentland and Feldman (2005) conceptualize an organizational routine as a generative system with internal structure that can produce a wide variety of performances depending on the contextual situations. Examining the internal structure of a routine involves considering the interactions between ostensive aspects of a routine, performative aspects of a routine, and the artifacts that play a fundamental role in influencing both the aspects of a routine (D'Adderio 2008). Uncovering the interactions between ostensive aspects, performative aspects and artifacts provides a sound foundation to understand change in the organization (D'Adderio 2011). IT systems as artifacts are key in the production and reproduction of routines, directly influencing the rate and direction of change in the organizational routines and therefore their evolution and adaptation (D'Adderio 2011).

5 IT-ENABLED OT AS A COEVOLUTION PROCESS

IT systems constitute an important category of technological artifacts and play an important role to accomplish work in contemporary organizations (D'Adderio 2011). They enable as well as constrain the performance of organizational routines (D'Adderio 2008) and, enrolled as artifacts in the composition of an organizational routine, play a fundamental role in its creation and evolution (Pentland & Feldman 2008). Figure 1 adopted from Pentland and Feldman (2008), depicts how artifacts, of which IT systems are an instance, influence both the ostensive and performative aspects of an organizational routine.

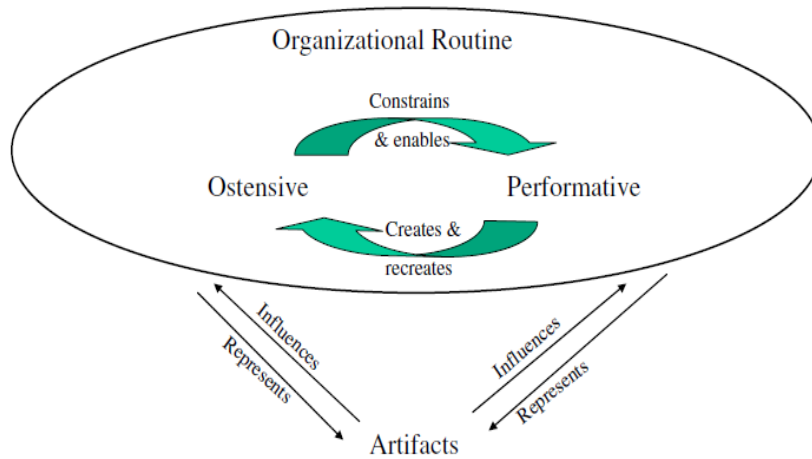


Figure 1: *The Impact of Artifacts on an Organizational Routine*

According to Orlikowski (2002) IT systems as technological artifacts embody affordances and constraints to structure work, extend interactions, increase visibility of information and actions, enable and constrain the ability of actors, regulate access to resources, and facilitate knowledge sharing and accumulation. Affordances and constraints are inscribed into an IT system in the form of features and functions to encourage and impose certain patterns of actions and behaviours in the organization (Grint & Woolgar 2013). The notion of inscription indicates that an actor’s assumptions, intentions and working logic are embedded in the IT system (Latour 1992), which directly influence the organizational routines in which they are involved. This means that an organizational routine is not simply actor-embodied but instead distributed across actors and IT systems (Hutchins 1995). Hence, an IT system also acts as a model or a partial representation of organizational routines, containing selective and codified configurations of the ostensive aspects of routines as their artifactual representation (D’Adderio 2011). The concept of artifactual representation enables researchers to investigate change in the organization by unlocking the coevolution process of organizational routines and the newly implemented IT system. D’Adderio (2011) argues that uncovering the reciprocal interactions between both aspects of organizational routines and an IT system is key to understand how routines and an IT system coevolve with each other in IT-enabled OT. The interactions between ostensive aspects of routines and an IT system are critical to be investigated to understand how working logic and abstract patterns of actions are inscribed into an IT system (Pentland & Feldman 2005; D’Adderio 2008). This enhances the understanding of how change is occurring to the IT system in the coevolution process (Goh, Gao & Agarwal 2011). The interactions between the performative aspects of routines and an IT system are critical to understand how an IT system influences and shapes the performances of routines (Pentland & Feldman 2005; D’Adderio 2008). This enhances the understanding of how change is occurring to the organizational routines during the implementation and use of a new IT system.

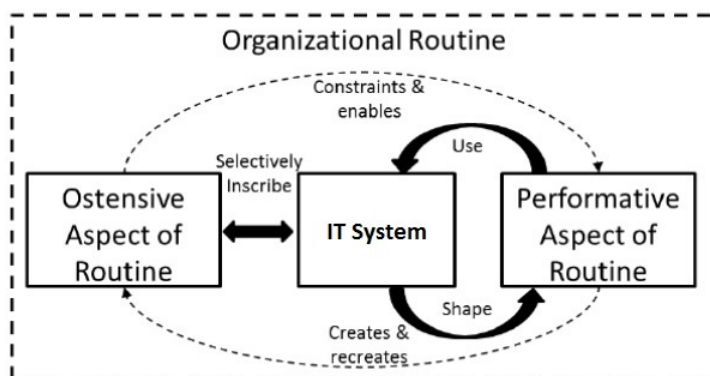


Figure 2: *Coevolution of Organizational Routines and a Newly Implemented IT system*

Figure 2 depicts the coevolution process of organizational routines and the newly implemented IT system; adopted from D’Adderio (2011) and Lehrig et al. (2015). It is a refinement of Pentland and Feldman’s (2008) model shown in figure 1. The coevolution process is triggered as the actors start using a new IT system. When actors do not get the desired performance from the use of the new IT system, they either change the organizational routines or the new IT system. The perception of the IT system’s

affordances triggers actors to alter their work routines where the perception of constraints leads the actors to go for the modification of the new IT system (Leonardi 2011). As resources and efforts are required to change the IT system while in operation (D’Adderio 2008) most of the time actors try to accommodate the new IT system in their work routines through appropriation and enactment (Leonardi 2011). In appropriation, the actors use the new IT system in a different way and choose its features for the purposes other than what were the designers’ intentions (Watson, DeSanctis & Poole 1988). In enactment, the new IT system is locally adopted through situated, planned as well as unplanned actions (Orlikowski 1996). The appropriation and enactment of the new IT system not only affect the individual routines but also shift the relationships between interconnected routines (Leonardi & Barley 2010; Goh et al. 2011).

Figure 2 can be further refined by incorporating the five social constructivist perspectives. Figure 3 represents our conceptual framework, depicting IT-enabled OT as a coevolution process of organizational routines and a new IT system. When a new IT system is introduced in an organization actors neither fully employ the newly implemented IT system in their work routines nor do they totally by-pass the new IT system. Boudreau and Robey (2005) found in a study of an ERP system implementation in a government organization in US that actors initially were not willing to break their old routines and were avoiding the new IT system as much as possible. Later, the ERP system was adopted after the organizational routines and the new IT system had passed through a process of coevolution. Unlocking the coevolution process of organizational routines and an IT system is key to understand how actors perceive, interpret, appropriate and enact the new IT system in their work routines (Pentland & Feldman 2008; Leonardi & Barley 2010; D’Adderio 2011). When actors are not able to achieve their expected results from the use of a new IT system, they have two options: either to change the manual part of their routines or to change the functions and features of the newly implemented IT system. The perception of the new IT system as a bundle of affordances triggers actors to alter their work routines to make fuller use of the new IT system (Leonardi 2011).

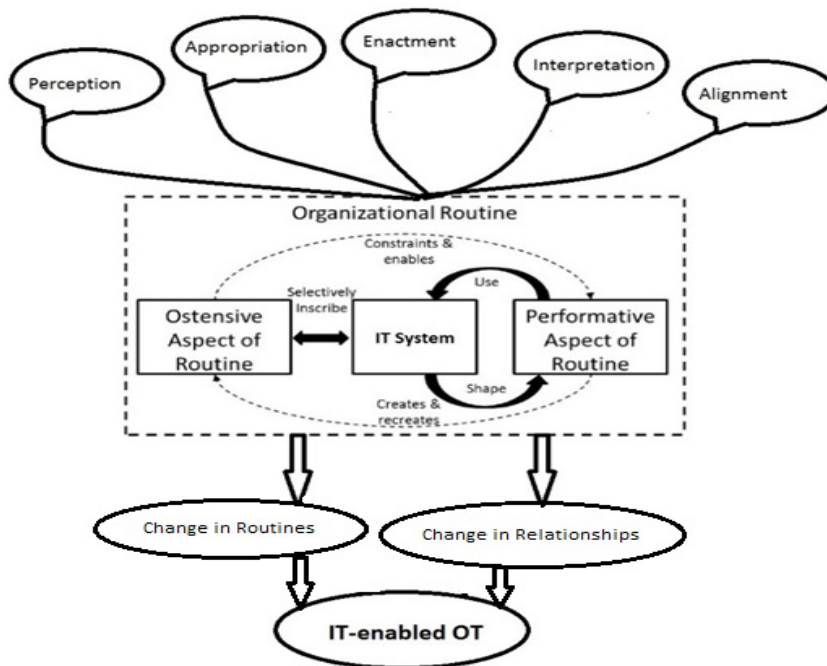


Figure 3: A Framework of IT-enabled Organizational Transformation

The perception of the new IT system as a bundle of constraints leads the actors to ask for changes to be made to the technical features and functions of the new IT system (Leonardi 2011). Goh et al. (2011) argue that the healthcare staff in their case study perceived the new IT system, a Computerized Documentation System, to afford their work further by providing new possibilities of actions. This perception caused the healthcare staff to adjust their work routines to accommodate the features and functions of the new IT system. On the other hand, the physicians perceived that the new IT system constrained their work routines and asked for the development of new features and functions to be included in the IT system. The perception of affordances and constraints leads actors to either change organizational routines or the IT system, but research suggests that most of the time organizational routines are changed (Leonardi 2011). This is due to the inflexibility of the IT system to be changed at run-time and also because resources and efforts are required to modify, test and deploy the new IT

system (D'Adderio 2008). As stated above actors commonly employ two interrelated approaches to modify their existing organizational routines (Leonardi 2011) a) appropriation, and b) enactment. In appropriation, the actors chose whether to use the new IT system as designed or to deviate from the IT system by using its features and functions for the purposes other than the designers intended (Watson, DeSanctis & Poole 1988). In enactment, the new IT system is actually employed in the routines of the organization (Orlikowski 1996). The actors change and adjust the sequence and actions patterns of the existing routines to accommodate the new IT system (Pentland & Feldman 2008). The working logic of the new IT system is locally adopted through situated planned actions and improvisations (Orlikowski 1996). Leonardi (2007) studied a group of technicians for the first five months during the use of a new IT system, an Information Technology Service Management tool, in a large government organization in US. The case study revealed that the technicians carried out three rounds of technology appropriations to accommodate the new IT system in their work routines. In the first round of appropriation, the technicians used the minimum features of the new IT system to record the initiation and resolution of the service tickets. In the second round, the IT system was not just used for recording tickets but also for assigning tickets to the experienced technicians across different departments. In the third round, the technicians realized the need to write problem resolution outline before closing a ticket. The technicians noticed that the IT system was lacking documentation functionality. This was overcome by utilizing an unused field in the data entry form, where technicians add a short paragraph about the steps, they have taken to solve a user problem. Making the above appropriation did not require any change to the IT system but to use the same IT system in a different way. Orlikowski (1996) showed in her case study that organizational transformation occurred as a result of planned as well as unplanned enactment of the new IT system for support staff. She argues that staff enacted the new IT system by adding new actions to their work routines to fully accommodate the newly implemented IT system. For instance, the support staff included new actions in their work routines to electronically record customer complaints in the IT system while on the phone with the customers. She also noted that emergent situations appeared during the enactment of planned changes. For instance, a data entry screen was incompatible with the way the customers reported complaints. The actors further adjusted their work routines to enact the changed reporting process. They wrote some information on paper while simultaneously talking to the customers and recording their complaints in the on-line system. Such unanticipated events, breakdowns and contingencies provided opportunities for learning, which enabled the actors to innovate and improve their work routines. The series of deliberate as well as emergent changes over a period of two years caused a significant change of the work routines of the organization. Similarly, Goh et al. (2011) showed that the healthcare staff in their study enacted the new IT system by adding new actions to their work routines. For instance, healthcare staff included a new template for taking notes during the examination of the patients. During the appropriation and enactment of organizational routines, actors pass through a process of trial-and-error learning (Rerup & Feldman 2011), where unseen problems emerge, and solutions are devised to fix them accordingly. The actors make sense of and interpret the new IT system in their daily work routines (Leonardi & Barley 2010). Actors attempt to situate their thoughts about actions in terms of familiar routines or familiar IT systems that they have worked with in the past (Orlikowski & Gash 1994). It is important to include experienced actors in the implementation process because they can quickly resolve emerging issues through their knowledge as they may have encountered similar of technical problems in comparable settings (Aime et al. 2010). These actors are instrumental in spreading relevant knowledge in the user community through informal means such as sharing tips and ad hoc documentations (Boudreau & Robey 2005). Such type of learning is called situated learning, which helps the user community to smoothly enact the new IT system (Lave & Wenger 1991; Brown & Duguid 2000). Boudreau and Robey (2005) in their study of the implementation of an ERP system found that actors initially chose to avoid using the new IT system. Later on, through situated learning, actors increased their understanding about the new IT system and eventually progressed toward the appropriation and enactment of the new IT system. The appropriation and enactment of the new IT system also affect the relationships between inter-connected routines. New relationships emerge when the organizational routines and the new IT system coevolve and adjust to each other (Leonard-Barton 1988; Sabherwal, Hirschheim & Goles 2001; Leonardi & Barley 2010). Berente et al. (2016) showed in a case study that substantial changes happened to the control mechanisms across different departments in NASA through the coevolution of organizational routines and the newly implemented enterprise information system. Goh et al. (2011) showed that new relationships between inter-connected routines emerged during the implementation and use of the new computerized documentation system. Davidson and Chismar (2007) found that the implementation of a new IT system in a health organization brought significant changes to the relationships among the routines of different clinical departments. The coevolution process of organizational routines and a new IT system is a complex and emergent process, and organizations often fail to manage it in an effective manner (Gao & Agarwal 2011). Our proposed conceptual framework describes the coevolution process in a systematic manner by explaining how

actors perceive, interpret, appropriate and enact the new IT system in their work routines. It also explains how relationships between interconnected routines evolve during the implementation and use of a new IT system. It allows us to capture the interplay of social and technical dynamics that causes change in the organization. Our framework depicted in figure 3 provides a new perspective to investigate how change happens in an organization during the implementation and use of a new IT system.

6 CONCLUSION

We are proposing an, integrated conceptual framework that understands IT-enabled OT as a coevolution process of organizational routines and a new IT system. The conceptual framework provides a new perspective to study the phenomenon of IT-enabled OT in a holistic and integrated manner. It combines five constructivist perspectives on the social construction of IT system implementation by explaining how actors perceive, interpret, appropriate, enact, and align the new IT system in their work routines. It enables us to investigate how the IT system shapes organizational routines as well as how the evolution of routines shapes the features and functions of the new IT system. It allows to explore the reciprocal interactions between different aspects of organizational routines and a new IT system to understand how change is occurring to the structure and work practices of an organization. Unravelling the interactions between performative aspects of routines and an IT system will deepen our understanding of how change is occurring to the routines in an organization. Unravelling the interactions between the ostensive aspects of routines and an IT system will deepen our understanding of how change is occurring to the features and functions of the new IT system. Our proposed conceptual framework acts as an initial theory development framework and will have to be tested and further refined through in-depth case studies, which will enable us to capture the social and technical dynamics that cause change to the structure and work practices of the case organizations. Such case studies will provide valuable insights to further understand how change unfolds in organizations during the implementation and use of a new IT system. These findings will be helpful for practitioners to understand and manage the coevolution process of routines and a new IT system in an effective manner. The conceptualization of IT-enabled OT as a coevolution process of organizational routines and a new IT system will be a theoretical contribution to the existing IS literature.

7 REFERENCES

- Aime, F., Johnson, S., Ridge, J.W. and Hill, A.D., 2010. The routine may be stable but the advantage is not: Competitive implications of key employee mobility. *Strategic Management Journal*, 31(1), pp.75-87.
- Barley, S.R., 1986. Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative science quarterly*, pp.78-108.
- Barley, S.R., 1990. The alignment of technology and structure through roles and networks. *Administrative science quarterly*, pp.61-103.
- Boell, S.K. and Cecez-Kecmanovic, D., 2014. A hermeneutic approach for conducting literature reviews and literature searches. *CAIS*, 34, p.12.
- Berente, N., Lyytinen, K., Yoo, Y. and King, J.L., 2016. Routines as shock absorbers during organizational transformation: Integration, control, and NASA's enterprise information system. *Organization Science*, 27(3), pp.551-572.
- Berente, N., Yoo, Y. and Lyytinen, K., 2008. Alignment or drift? Loose coupling over time in NASA's ERP implementation. *ICIS 2008 Proceedings*, p.180
- Besson, P. and Rowe, F., 2012. Strategizing information systems-enabled organizational transformation: A transdisciplinary review and new directions. *The Journal of Strategic Information Systems*, 21(2), pp.103-124.
- Bourdieu, P., 1990. *The logic of practice*. Stanford University Press.
- Boudreau, M.C. and Robey, D., 2005. Enacting integrated information technology: A human agency perspective. *Organization science*, 16(1), pp.3-18.
- Brown, J. and Duguid, P., 2000. Organizational learning and communities of practice: Toward a unified view of working, learning, and innovation. In *Knowledge and communities* (pp. 99-121).
- Collins, R., 1981. On the microfoundations of macrosociology. *American journal of sociology*, 86(5), pp.984-1014.

- Cooper, R.B. and Zmud, R.W., 1990. Information technology implementation research: a technological diffusion approach. *Management science*, 36(2), pp.123-139.
- Davidson, E.J. and Chismar, W.G., 2007. The interaction of institutionally triggered and technology-triggered social structure change: An investigation of computerized physician order entry. *MIS quarterly*, pp.739-758.
- D'Adderio, L., 2008. The performativity of routines: Theorising the influence of artefacts and distributed agencies on routines dynamics. *Research Policy*, 37(5), pp.769-789.
- D'Adderio, L., 2011. Artifacts at the centre of routines: Performing the material turn in routines theory. *Journal of Institutional Economics*, 7(2), pp.197-230.
- Doherty, N.F., Ashurst, C. and Peppard, J., 2012. Factors affecting the successful realisation of benefits from systems development projects: findings from three case studies. *Journal of Information Technology*, 27(1), pp.1-16.
- Dosi, G., Faillo, M. and Marengo, L., 2008. Organizational Capabilities, Patterns of Knowledge Accumulation and Governance Structures in Business Firms: An Introduction. *Organization Studies*, 29(8-9), 1165-1185.
- Dunphy, D.C. and Stace, D.A., 1988. Transformational and coercive strategies for planned organizational change: Beyond the OD model. *Organization studies*, 9(3), pp.317-334.
- Feldman, M.S., 2000. Organizational routines as a source of continuous change. *Organization science*, 11(6), pp.611-629.
- Feldman, M.S., 2003. A performative perspective on stability and change in organizational routines. *Industrial and Corporate Change*, 12(4), 727-752
- Feldman, M.S. and Pentland, B.T., 2003. Reconceptualizing organizational routines as a source of flexibility and change. *Administrative science quarterly*, 48(1), pp.94-118.
- Feldman, M.S. and Orlikowski, W.J., 2011. Theorizing practice and practicing theory. *Organization science*, 22(5), pp.1240-1253.
- Felin, T., Foss, N.J., Heimeriks, K.H. and Madsen, T.L., 2012. Microfoundations of routines and capabilities: Individuals, processes, and structure. *Journal of Management Studies*, 49(8), pp.1351-1374.
- Gersick, C. J. G., 1991. Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm, *Acad. Management Review*, 16, 1 (1991), 10-36.
- Goh, J.M., Gao, G. and Agarwal, R., 2011. Evolving work routines: Adaptive routinization of information technology in healthcare. *Information Systems Research*, 22(3), pp.565-585.
- Grint, K. and Woolgar, S., 2013. *The machine at work: Technology, work, and organization*. John Wiley & Sons.
- Hsiao, R.L., Wu, S.H. and Hou, S.T., 2008. Sensitive cabbies: Ongoing sense-making within technology structuring. *Information and Organization*, 18(4), pp.251-279.
- Huber, G.P., 1990. A theory of the effects of advanced information technologies on organizational design, intelligence, and decision making. In *Knowledge, Academy of Management Review*, 15(1), 47-71
- Hutchins, E., 1995. *Cognition in the Wild*, Cambridge, MA: MIT Press.
- Kwon, T.H. and Zmud, R.W., 1987, April. Unifying the fragmented models of information systems implementation. In *Critical issues in information systems research* (pp. 227-251). John Wiley & Sons, Inc..
- Latour, B., 1992. Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts, in W. E. Bijker and J. Law (eds.), *Shaping Technology/Building Society: Studies in Sociotechnical Change*, Cambridge, MA: MIT Press, pp. 225-258.
- Lave, J. and Wenger, E., 1991. *Situated learning: Legitimate peripheral participation* (Vol. 521423740). Cambridge: Cambridge university press.
- Lehrig, T., Krancher, O. and Dibbern, J., 2015, May. The Evolution of Routines under Flexible Information Technology. In *ECIS*.
- Leonard-Barton, D., 1988. (1988). Implementation and mutual adaptation of technology and organization. *Research Policy*, 17 (5), 1-17.
- Leonardi, P.M., 2007. Activating the informational capabilities of information technology for organizational change. *Organization science*, 18(5), pp.813-831.

- Leonardi, P.M., 2009. Crossing the implementation line: The mutual constitution of technology and organizing across development and use activities. *Communication Theory*, 19(3), pp.278-310.
- Leonardi, P.M. and Barley, S.R., 2010. What's under construction here? Social action, materiality, and power in constructivist studies of technology and organizing. *Academy of Management Annals*, 4(1), pp.1-51.
- Leonardi, P.M., 2011. When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. *MIS quarterly*, pp.147-167.
- Malone, T. 1994. Commentary on Suchman article and Winograd response. *Computer Supported Cooperative Work (CSCW)*, 3(1), 37-38.
- Misa, T.J. 1994. Retrieving sociotechnical change from technological determinism. In M.R. Smith & L. Marx (Eds.), *Does technology drive history? The dilemma of technological determinism* (pp. 115-141). Cambridge, MA: MIT Press.
- Nelson, R.R. and Winter, S. 1982. *An evolutionary theory of economic change*. Cambridge, MA: Belknap Press/Harvard University Press.
- Orlikowski, W.J. and Gash, D.C., 1994. Technological frames: making sense of information technology in organizations. *ACM Transactions on Information Systems (TOIS)*, 12(2), pp.174-207.
- Orlikowski, W.J., 1996. Improvising organizational transformation over time: A situated change perspective. *Information systems research*, 7(1), pp.63-92.
- Orlikowski, W. J., 2000. Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science*, 11 (4), 404-428.
- Orlikowski, W.J., 2002. Knowing in practice: Enacting a collective capability in distributed organizing. *Organization science*, 13(3), pp.249-273.
- Parmigiani, A. and Howard-Grenville, J., 2011. Routines revisited: Exploring the capabilities and practice perspectives. *Academy of Management Annals*, 5(1), pp.413-453.
- Pentland, B.T. and Feldman, M.S., 2005. Organizational routines as a unit of analysis. *Industrial and corporate change*, 14(5), pp.793-815.
- Pentland, B.T. and Feldman, M.S., 2008. Designing routines: On the folly of designing artifacts, while hoping for patterns of action. *Information and organization*, 18(4), pp.235-250.
- Poole, M.S. and De Sanctis, D., 1990. Understanding the use of Group Decision Support Systems: The Theory of Adaptive Structuration. *Organizations and communication technology*, p.173.
- Rerup, C. and Feldman, M.S., 2011. Routines as a source of change in organizational schemata: The role of trial-and-error learning. *Academy of Management Journal*, 54(3), pp.577-610.
- Romanelli, E. and Tushman, M.L., 1994. Organizational transformation as punctuated equilibrium: An empirical test. *Academy of Management journal*, 37(5), pp.1141-1166.
- Sabherwal, R., Hirschheim, R. and Goles, T., 2001. The dynamics of alignment: Insights from a punctuated equilibrium model. *Organization science*, 12(2), pp.179-197.
- Vaast, E. and Walsham, G., 2005. Representations and actions: the transformation of work practices with IT use. *Information and Organization*, 15(1), pp.65-89.
- Vishwanath, A., 2006. The effect of the number of opinion seekers and leaders on technology attitudes and choices. *Human Communication Research*, 32(3), pp.322-350.
- Verhulst, M. and Rutkowski, A.F., 2017, January. Catch Me If You Can: Technological Constraints/Affordances and Mindfulness during Collaborative Police Emergency Response. In *Proceedings of the 50th Hawaii International Conference on System Sciences*.
- Watson, R.T., DeSanctis, G. and Poole, M.S. (1988). Using a GDSS to facilitate group consensus: Some intended and unintended consequences. *MIS Quarterly*, 12, 463-468.
- Weick, K.E. 1979. *The social psychology of organizing* (2nd ed.). New York: McGraw-Hill.

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