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UNDERSTANDING THE IMPACT OF HISTORY ON INDIVIDUAL AND ORGANIZATIONAL INFORMATION TECHNOLOGY POST-ADOPTION BEHAVIORS: A PATH DEPENDENCE PERSPECTIVE

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COMPRENDRE L'IMPACT DE L'HISTOIRE SUR LES COMPORTEMENTS DE POST-ADOPTION RELIÉS AUX TECHNOLOGIES DE L'INFORMATION PAR LES INDIVIDUS ET LES ORGANISATIONS: UNE PERSPECTIVE SELON L'EFFET DE SENTIER

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SUMMARY

Information technology (IT) post-adoption behaviors are often labeled as being path dependent in nature. This label implies that history matters and that to fully comprehend IT post-adoption behaviors one must pay attention to the post-adopter's past actions. Unfortunately, past information systems (IS) research has yielded few insights to explain the role of history in such behaviors. In this regard, path dependency theory (PDT) may provide a sound theoretical anchor to fill this gap in the literature. PDT posits that history interplays with current and future behaviors because past actions trigger self-reinforcing mechanisms that can lock-in post-adopters on certain paths. PDT also suggests that mindful individuals may overcome lock-ins by initiating deviation from existing paths. The aim of this thesis is thus to bring PDT to the forefront in order to provide a sound rationale to the path dependent nature of IT post-adoption behaviors at both the individual and organizational levels. In addition to PDT, this thesis also draws insights from two other theories that also posit that history can influence IT post-adoption behaviors: imprinting and structural inertia (SIT). This dissertation comprises three articles. The first article aims to develop and empirically test a model that integrates PDT with the push-pull-mooring migration model of IT switching to explain how self-reinforcing mechanisms may increase users' switching costs and how mindful users may easily switch from one IT to another. The second article aims to conduct a congruence case study that evaluates PDT, imprinting and SIT to identify which of the three theories better explains why and how organizational IS changes unfold over time. The third article aims to determine what is the IS discipline domain of knowledge, what are the IS discipline research paradigms as well as how to bridge the different IS research paradigms in order to foster the development of indigenous theories in the IS discipline.

RÉSUMÉ

Les comportements de post-adoption reliés aux technologies de l'information (TI) sont souvent dépeints comme étant assujettis à l'effet de sentier. Ce portrait sous-entend que l'histoire est importante et que pour bien comprendre ces comportements il est essentiel de tenir compte des actions passées des post-adopteurs. Malheureusement, les recherches antérieures en système d'information (SI) offrent peu de réponses pour expliquer le rôle de l'histoire dans la post-adoption des TI. À cet effet, la théorie de l'effet de sentier (TES) fournit un ancrage théorique solide qui permettrait de combler cette importante lacune au sein de la littérature. La TES stipule que l'histoire intervient dans les comportements actuels et futurs parce que des mécanismes d'auto-renforcement déclenchés par des actions antérieures emprisonnent les post-adopteurs sur certains sentiers. La TES suggère également que des individus avisés peuvent surmonter ces emprisonnements en déviant des sentiers existants. L'objectif de cette thèse est donc de mettre de l'avant la TES afin de fournir une explication cohérente de l'effet de sentier sur ces comportements tant au niveau de l'individu que de l'organisation. En plus d'être ancrée sur la TES, cette thèse repose également sur deux autres théories stipulant que l'histoire peut influencer les comportements de post-adoption reliés aux TI : l'imprinting et l'inertie structurelle (SIT). Cette thèse comprend trois articles. Le premier article vise à développer et tester un modèle qui intègre la TES au « push pull mooring migration model of IT switching » afin d'expliquer comment les mécanismes d'auto-renforcement peuvent augmenter les coûts de substitution des utilisateurs et comment des utilisateurs avisés peuvent passer plus facilement d'une TI à une autre. Le deuxième article vise à mener une étude de cas par congruence qui compare la TES à deux autres théories : l'imprinting et l'inertie structurelle, afin de déterminer laquelle de ces trois théories explique le mieux pourquoi et comment les changements SI au sein des organisations se déroulent au fil le temps. Le troisième article vise à fournir une compréhension claire du domaine de connaissances de la discipline SI, de ses paradigmes de recherche ainsi que des ponts liants ces paradigmes les uns aux autres afin de favoriser le développement de théories indigènes à la discipline SI.

INTRODUCTION

Information technology (IT) post-adoption behaviors are often labeled as being path dependent in nature (Jasperson et al., 2005). In this regard, some authors have also made the argument, crystalized in the catch phrase "history matters", that one must pay attention to the impact of past actions or events to fully comprehend IT post-adoption behaviors (Kim, 2009). Unfortunately, despite evidence that suggests that history influences IT post-adoption behaviors at both the individual (Kim, 2009; Polites and Karahana, 2012) and organizational level (van Oosterhout et al. 2006), past information systems (IS) research has yielded few insights to explain why and how history influences IT post-adoption behaviors (Jasperson et al., 2005). As such, the objective of this thesis is to attempt to fill this gap in the literature. To do so, this thesis brings to the forefront the path dependency theory (PDT) as it provides a sound theoretical rationale to the path dependent nature of IT post-adoption behaviors. PDT posits that history interplays with current and future behaviors because of four self-reinforcing mechanisms (i.e., complementarity, coordination, learning and adaptive expectation effects), characterized by positive feedback loops, and tends to favor incumbent behaviors to the detriment of newer ones (Arthur, 1989). Over time, this predisposition is likely to lock-in individuals/organizations on certain post-adoption patterns that give to history it's meaning. In addition to PDT, this thesis draws insights from two other theories that also posit that history can influence IT post-adoption behaviors: imprinting theory and structural inertia theory (SIT).

This thesis comprises three articles. The objective of the first article is to develop and empirically test a model that integrates PDT with the push-pull-mooring migration model of IT switching to explain how self-reinforcing mechanisms may increase users'

switching costs and how mindful users may more easily switch from one IT to another. The objective of the second article is to conduct a congruence case study that evaluates PDT, imprinting and SIT in order to identify which of the three theories better explains why and how organizational IS changes unfold over time. The objective of the third article is to provide a clear understanding of the IS discipline's domain of knowledge, research paradigms and theoretical bridges that can be used to adapt and integrate diverse knowledge in order to foster the development of indigenous theories in the IS discipline. The paragraphs that follow detail each of these three articles as well as highlighting how they are linked to one another.

The first article builds upon the idea that IT switching can be subject to the influence of history. IT switching is defined as "users' partial reduction or full termination in usage of a specific technology product while substituting it with usage of an alternative product that satisfies identical needs (Ye and Potter, 2011; p. 587)". Past studies on this specific post-adoption behavior have provided a sound framework to study IT user switching (i.e., the push-pull-mooring (PPM) model of migration) and identified switching costs as the dominant factor in explaining IT user switching. However, these efforts have yielded little knowledge on the mechanisms that create these switching costs or on how mindfulness, defined as a trait-like characteristic that reflects a user's openness to novelty, alertness to distinction, awareness to multiple alternatives and presence in the moment (Butler and Gray, 2006; Thatcher, under review), may facilitate IT user switching. Recognizing these two important theoretical shortcomings, the objective of the first article is to develop and test a research model that extends the current PPM model of IT switching with path dependency theory (PDT) tenets in order to also take into account the mechanisms that create IT witching costs and the positive effect that mindfulness may have on IT user switching.

To validate our research model we collected data from users of social network sites (SNS) since, by being volitional, freely available, and having multiple equivalent

alternatives, SNS represent IT artifacts that comply with the underlying premises of both migration theory and PDT. Participants were students of a Canadian university enrolled in a compulsory undergraduate course in business administration. Partial least square analyses, as implemented in WarpPLS, were then used to validate the measurement and structural models of our study. Our results show that three of the four self-reinforcing mechanisms proposed by PDT were positively related to IT user switching costs (i.e., complementarity, learning and adaptive expectations effects), which suggests that increasing returns may lock-in users on certain SNS. Our results also indicate that user mindfulness was positively related to IT user switching costs.

Taken as a whole, this study contributes to the IT switching literature by showing that: (1) PDT's self-reinforcing mechanisms influence IT switching costs, and (2) user mindfulness is a likely antecedent of IT switching costs. Methodologically, this article provides several research measures to the IS discipline by being the first to clearly define and operationalize the set of four self-reinforcing mechanisms identified by PDT at the individual level. Lastly, from a practical perspective, this article helps IT users better understand the impact of their past actions, the possible lock-ins that may ensue from these actions, as well as the benefits of cultivating certain psychological dispositions to allow them to more easily switch from one software application to the next.

The second article focuses on the importance of history in the evolution of IS in organizations and its constraining effect on conducting organizational IS changes. Indeed, although most IS changes tend to initially provide benefits to organizations by enabling them to become more effective and efficient, some IS changes can also may later hinder organizational performance by becoming a barrier to future IS changes (Lu and Ramamurthy, 2011). Hence, "history matters" and we need to understand why and how organizational IS changes unfold over time. Within the IS literature, the importance of history in the evolution of IS in organizations and its constraining effect

on conducting organizational IS change is most often conveyed via the concept of path dependence. Unfortunately, this usage is more metaphorical than theoretical in nature, devoiding path dependence of its meaning and making it easily confused with other phenomena such as imprinting and structural inertia that convey very different understandings of history and its influence in the evolution of IS in organizations. Indeed, path dependence implies that history interplays with current and future actions because self-reinforcing mechanisms tend to favor incumbent organizational behaviors to the detriment of newer ones (Arthur, 1989). In turn, imprinting entails that history constrains current and future organizational behaviors because certain environmental conditions (i.e., technological, economical, institutional, and key individuals) mold organizations in a persistent manner during brief susceptible periods (Marquis and Tilcsik, 2013). Finally, structural inertia theory (SIT) infers that history interferes with present and future actions because reproducible structures, set up to ensure organizational survival, create strong pressures against change that reveal the constraining effect of history on ensuing organizational behaviors (Kelly and Amburgey, 1991). Accordingly, these three conceptualizations direct our attention to different phenomena (i.e., variables and processes) while the values embedded in their underlying theories lead change agents to experience different problems of organizational change as well as to take on different roles and initiate different strategies to cope with these problems (Dunphy, 1996; Markus, 1983).

Hence, considering the three conceptualizations used in the IS literature to portray the importance of history in the evolution of IS in organizations (i.e., path dependence, imprinting, and structural inertia), as well as the need to understand why and how organizational IS changes unfold over time, the objective of the second article is twofold. First, we rely on Van de Ven and Poole's (1995) typology for illustrating and distinguishing change theories, and to clarify the concept of path dependence from to similar conceptualizations, namely imprinting and structural inertia. Second, we conduct a congruence case study to elucidate and compare the explanatory merits of

these three theories in order to identify which one better explains why and how organizational IS changes unfold over time.

We selected a major university hospital located in Canada as our research case and its information system that supports the management of patient information (i.e., the MPI system) as our unit of analysis. Data was collected through interviews with active and retired employees of the hospital, as well as by consulting the hospital's annual reports. To analyze the data, we first coded meaningful excerpts of the interview transcripts and annual reports with the help of the ATLAS-ti 7 software. Then, four complementary process data analysis strategies were used to organize and make sense of the data collected: temporal bracketing, narrative, alternative template, and visual mapping. Lastly, a pattern matching strategy was used to evaluate the level of congruence between the tenets of each theory and our observations in the field.

Our results indicate that it would be ill advised to use the concept of path dependence, imprinting and structural inertia interchangeably since each of these concepts and their respective underlying theories rely on a different combination of cycle, motor, unit and mode of change to explain organizational IS change and the constraining effect of history that often accompanies it. Our results also indicate that no single concept or theory could account for the eight key IS changes identified in our study of the evolution of the MPI system at the hospital and thus that the evolution of information systems in organizations may be subject to multiple dynamics. In addition, our results show that PDT is better suited to explain changes made to the functionalities of the MPI system while SIT and imprinting theory best explain changes made to either the interface, hardware and/or the architecture of the MPI. Hence, our results seem to indicate that PDT better explains changes made to the deep structure of information systems while SIT and imprinting theory better explain changes made to the surface and physical structure of information systems. Furthermore, our results show that the number of IS changes made to the MPI system tend to diminish over time and thus that

increases in organizational size and age will lead to greater inertia and thus change less frequently since organizational resources become increasingly mobilized by the accumulation of both institutionalization and standardization efforts. Finally, our results indicate that organizational IS changes that follow a path dependent dynamic can lead to positive outcomes and thus that the constraining effect of history on organizational IS change may sometimes lead to positive outcomes. Overall, this study reveals the different cycle, motor, unit and mode of change that give to history its meaning and provides a sound theoretical and practical understanding of why and how organizational IS changes unfold over time.

The third article builds upon the idea that IS indigenous theories are essential in shaping the core of the IS discipline and/or key to the emergence/survival of the discipline (Benbasat and Weber, 1996; Grover, 2013; Markus and Saunders, 2007; Weber, 2003). However, despite the acknowledged significance that indigenous IS theories can shape the identity and legitimacy of the IS discipline as well as make enduring contributions to IS and other disciplines, to date, the discourse on theory and theory development within the IS discipline has been extremely limited and offers few insights to IS researchers as to how they may develop indigenous IS theories (Gregor 2006; Weber 2012). Indeed, IS research is predominantly anchored on theories from other disciplines while much more has been written on theory testing than theory building within the IS discipline (Weber, 2003). Hence, to attempt to fill these gaps in the litterature, the objective of the third article is to answer the following three research questions : (1) what is the IS discipline's domain of knowledge? (2) what are the IS discipline research paradigms? and (3) how to bridge the different IS research paradigms?. The answers to our three research questions are accompanied by six key theory development guidelines that can help IS researchers take advantage of the ideas put forth within this article (i.e., the IS discipline's domain of knowledge, paradigms and bridges) to develop their own IS indigenous theories. In addition, using insights from our previous theorizing efforts,

this study also provides two concrete examples as to how the set of six proposed guidelines may be operationalized in a single study.

In sum, by revealing the idiosyncrasies of indigenous theory development within the IS discipline, this article contributes to the IS literature on theory and theory development in three ways. First, by defining the IS discipline's domain of knowledge, this article helps IS researchers to identify pertinent phenomena of interest. Second, by identifying four IS research paradigms, it helps IS researchers to identify the content, development steps and evaluation criteria relevant for their particular theorizing efforts. Third, by identifying IS bridges, it provides sound theories and methods to facilitate the adaptation and integration of IS knowledge. This should also foster the accumulation of knowledge in the IS discipline by providing a cohesive view of different but related IS research endeavors. Lastly, by providing six clear guidelines and two concrete examples of how they can be operationalized in a single study, this article provides much needed guidance to IS researchers who wish to develop their own IS indigenous theories.

The three articles of the thesis are linked by our desire to theorize the influence of history on IT post-adoption behaviors. The first two articles provide theory-building findings, which are key to achieving this objective. The first article relies upon PDT tenets to assess the impact of history on IT user switching. The second article relies on PDT, imprinting theory and SIT to assess the impact of history on the evolution of IS in organizations and its constraining effect on conducting organizational IS changes. Hence, both articles are highly complementary as they provide insights on our phenomenon of interest from two different levels of analysis. The third article provides the canvas we used to frame our theoretical efforts in the first two articles. Indeed, it is by following the guidelines of the third article that we were able to develop an appropriate research design for both the first and second article of this thesis. The use

of these guidelines were essential since our IS indigenous theorizing efforts were anchored on theories borrowed from other disciplines.

CHAPTER I

UNDERSTANDING THE ANTECEDENTS AND IMPACT OF INCUMBENT SYSTEM LOCK-IN ON IT SWITCHING BEHAVIOR: A PATH DEPENDENCY PERSPECTIVE

1.1 Introduction

The increasing competition in the software application market over the last decade has yielded a wide range of competing yet similar software alternatives which information technology (IT) users can chose from to support their needs (Ye and Potter, 2011). Indeed, IT users now have a multitude of options to choose from when selecting a Web browser (e.g., Internet Explorer, Firefox, Chrome), a music media player (e.g., iTunes, VLC, Windows Media), an office productivity application (e.g., Microsoft Office, Open Office, Google docs), a social network site (e.g., Facebook, My Space, Instagram) or any other type of software application they may desire. The hypercompetitive software application market has also made it easy for IT users to switch from one software application to another as product/service alternatives are only a click away (Bhattacherjee et al., 2012; Ye and Potter, 2011). Microsoft's market share losses in the Web browser market best exemplifies this situation. Indeed, Microsoft's Internet Explorer market share dropped from more than 90 percent in 2004 to less than 60 percent in 2010 while the market shares of alternative browsers such as Mozilla Firefox and Google Chrome increased significantly during that same period (Net Applications, 2011).

Significant changes in software market shares such as those witnessed in the Web browser market, as well as researchers' interest in this particular form of post-adoption IT behavior have recently spurred the development of a new and promising research stream focused specifically on IT switching (Bhattacherjee and Park, 2014; Bhattacherjee et al., 2012; Ye and Potter, 2011; Zhang et al., 2009). IT switching is defined as "users' partial reduction or full termination in usage of a specific technology product while substituting it with usage of an alternative product that satisfies identical needs (Ye and Potter, 2011; p. 587)". Two important conclusions can be drawn from this nascent research stream. First, migration theory from human geography is a valuable lens to study IT switching (Bhattacherjee and Park, 2014; Ye and Potter, 2011; Zhang et al., 2009). Migration theory postulates that human migration is the result of three competitive forces: (1) negative factors at the originating location that encourage people to leave (i.e., push factors); (2) positive factors at the destination that attract people (i.e., pull factors); and, (3) 'intervening obstacles' constraining such movement (i.e., mooring factors) (Moon, 1995). Anchored on the push-pull-mooring migration model, research on IT switching has found that: (1) push and pull factors are positively related to switching intentions: (2) mooring effects are negatively related to switching intentions; and 3) mooring effects moderate the main effects of push and pull factors on switching intentions (Bhattacherjee and Park, 2014; Ye and Potter, 2011). Second, IT switching costs is a dominant factor in explaining IT switching since, in addition to negatively impacting switching intentions, it also negatively influences the positive effects of enablers (Bhattacherjee and Park, 2014; Ye and Potter, 2011). Switching costs can be defined as "the time, money, and psychological and physical effort required to ensure compatibility between a new purchase and earlier investments (Ray et al., 2012, p. 197)".

Despite these important advances, studies on IT switching have provided little knowledge on the mechanisms that actually create IT switching costs (for an exception, see Ray et al., 2012). This is an important gap to fill since IT users need to know what

these mechanisms are in order to minimize their negative effects. The first objective of this research is thus to extend the push-pull-mooring migration model in the context of IT switching by also taking into account the mechanisms that create IT switching costs.

Additionally, although migration theory asserts that there are both positive and negative mooring factors and that intervening obstacles also include psychological factors (Lee, 1966), the IT switching literature has focused on the IT switching costs construct as the de facto mooring factor. This over reliance on IT switching costs had the unexpected side effect of undermining our understanding of the psychological factors that may help IT users, even in situations of lock in, to switch from one software application to another. In this regard, mindfulness, defined as a trait-like characteristic that reflects a user's openness to novelty, alertness to distinction, awareness of multiple alternatives and presence in the moment (Butler and Gray, 2006; Thatcher, Under review), has been identified as a key psychological disposition that may entice an IT user to think outside the box and to be more likely to explore new or alternative solutions (Butler and Gray, 2006; Fichman, 2004). Unfortunately, to this day, the IT switching literature has yet to consider this important factor. This is an important void to fill since mindfulness can impact IT user behaviors. Indeed, mindfulness, which represents a key disposition that can be primed and learned (Butler and Gray, 2006; Langer, 1989; Thatcher, Under review), can help IT users switch from one software application to another. The second objective of this research is thus to further extend the push pull mooring migration model in the context of IT switching by also taking into account mindfulness, a key positive and psychological mooring factor that may facilitate IT user post-adoption switching.

We draw on path dependency theory to develop our model and hypotheses. Path dependency theory (PDT) suggests that lock-ins are caused by four self-reinforcing mechanisms: complementarity effects, coordination effects, learning effects, and adaptive expectation effects (Arthur, 1989; Sydow et al., 2009). These four self-

reinforcing mechanisms, each characterized by positive feedback loops, tend to favor incumbent behaviors to the detriment of newer ones (Arthur, 1989), which, over time, may lock-in individuals to certain behavioral patterns. Additionally, PDT has recently been complemented by the notion of path creation, which postulates that actors can initiate the development of a path, and hence overcome a lock-in, through mindful deviations from known procedures and rules (Garud and Karnøe, 2001). Our results provide broad support for our model and hypotheses. We contribute to the IT switching literature in two ways: (1) by demonstrating that the self-reinforcing mechanisms identified by PDT influence IT switching costs, and (2) by showing that mindfulness can play a significant role in facilitating IT switching. Methodologically, we also propose important research measures to the IS discipline by being the first to clearly define and operationalize PDT's set of four self reinforcing mechanisms at the individual level. From a practical perspective, this article helps IT users better understand the impact of their current actions, the possible lock-ins that may ensue, as well as the benefits of cultivating certain psychological dispositions to allow them to more easily switch from one software application to the next.

The rest of the paper is structured as follows. First, in the theoretical background section, we present the theoretical underpinnings of migration theory and explain why it is an appropriate theoretical lens to study IT switching. This section also presents the tenets of PDT, which provide a solid framework to understand the concepts of lock-in, self-reinforcing mechanisms and mindfulness in an IT context. Second, we present our research model and related hypotheses. Next, we present the sampling frame used for data collection and describe the operationalization of the research variables. Then, in the results section, we validate the measurement properties of the constructs and test the proposed research model. The paper concludes with a discussion of our research findings and directions for future research.

1.2 Theoretical background

1.2.1 Migration theory as a theoretical lens to explain IT switching

Migration can be broadly defined as a "permanent or semi-permanent change of residence (Lee, 1966)" which involves the "movement of a person (a migrant) between two places for a certain period of times (Boyle, et al., 1998, p. 34)". Although it is generally recognized that migration should have a sense of permanence (Lee, 1996) and that every act of migration involves an origin, a destination and a set of intervening obstacles (Lee, 1966), there is no restriction on the voluntary or involuntary nature of the act or the distance of the move.

The first attempt to theorize migration behaviors rests on the pioneering work of Ravenstein (1885) who, based on data from the British Census of 1881, presented a set of laws describing migration within the limits of the United Kingdom. The author further validated his set of migration laws four years later with data from more than twenty countries (Ravenstein, 1989). Subsequently, numerous migration studies, using or challenging the innovative work of Ravenstein (1885, 1889), were conducted. These studies focused, amongst other things, on demonstrating whether migration behaviors were influenced by age, gender and education of the person as well as the distance between the origin and destination (see Thomas (1938) for a complete memorandum on migration differentials). Then, Lee (1966) synthesized all previous findings in the field in a seminal paper entitled "A Theory of Migration", which presents the key tenets of migration theory (Bhattacherjee and Park, 2014). Lee (1966) recognized the importance of two types of factors in explaining human migration: factors associated with the area of origin, and factors associated with the area of destination. Factors associated with the area of origin, labeled as "push" factors by Herberle (1938), are

those that motivate people to leave an origin (Stimson and Minnery, 1998). They are "factors at the origin that are assumed to have a negative influence on the quality of life (Moon, 1995, p. 507)". Conversely, factors associated with the area of destination, labeled as "pull" factors by Herberle (1938), are those that draw prospective migrants to the destination (Moon, 1995). They are "attributes of distant places that make them appealing (Dorigo and Tobler, 1983, p. 1)". In addition to recognizing the importance of both "push" and "pull" factors in explaining human migration, Lee (1966) also argued that their effects must be strong enough to overcome natural inertial forces and other barriers (e.g., distance) that may discourage a migrant from moving. As such, the author identified two additional types of factors, intervening obstacles and personal factors, that may either facilitate or inhibit migration. Labeled as "mooring" factors by Longino (1992), these refer to all personal, social, and cultural variables that may also influence the decision to migrate or not (Bansal et al., 2005). Finally, Lee (1966) argued that objective measures were best suited to investigate migration at the population level while subjective measures, which capture an individual's perception of objective "push", "pull" and "mooring" factors, were best suited to study migration decisions at the individual level since individuals may perceive these factors differently due to their unique personalities (Lee, 1966).

More recently, Moon (1995) combined "push", "pull" and "mooring" factors to create a push-pull-mooring (PPM) model of migration, which integrates within a simple framework the key tenets of migration theory. Anchored on the similarities between migrating and other type of switching behaviors, the PPM model has been used extensively in marketing to study consumer switching. As noted, by Clark and Knapp (1996; p. 3): "Just as individuals shop for consumer goods, potential migrants compare the attributes of alternative locations and express those preferences by moving to the location that best satisfies them". Extensive research efforts on consumer switching then led Bansal et al., (2005) to develop a unifying framework of consumer switching behavior, which synthesized previous findings. This framework posits that all "push",

"pull" and "mooring" factors directly influence switching intention while "mooring" factors also moderate the main effect of "push" and "pull" factors on switching intention. In addition to validating the basic tenets of migration theory, results from Bansal et al. (2005) demonstrate, by identifying the key push (i.e., dissatisfaction), pull (i.e., alternative attractiveness) and mooring factors (i.e., switching costs), that mooring factors are the dominant factors in explaining consumer switching, followed by "pull" factors and then "push" factors.

Inspired by their colleagues in marketing, IS researchers have also used the PPM model to investigate IT switching from the vantage point of many different technologies including web browsers (Ye and Potter, 2011), social networking sites (SNS) (Chang et al., 2014), email services (Kim et al., 2006) and cloud-computing (Bhattacherjee and Park, 2014). In addition to validating the basic tenets of migration theory and demonstrating that "mooring" factors play a predominant role in explaining IT switching (Ye and Potter, 2011), results from these studies have also identified the key push (i.e., dissatisfaction), pull (i.e., relative advantage) and mooring factors (i.e., switching costs) that explain post adoption IT switching.

1.2.2 Path dependency theory to frame lock-in, self-reinforcing mechanisms and mindfulness

The explicit analysis of lock-in and subsequent theorization builds from the pioneering work of David (1985) and his telling of the QWERTY story, which aimed to show that "temporally remote events, including happenings dominated by chance elements rather than systematic forces (p. 322)" may lead a certain technology to gain dominance over its rival. Following the work of David (1985), Arthur (1989, 1994) developed the first formal theory about the creation of lock in, which he labeled Path Dependency theory

(PDT), and identified "increasing returns" or "positive feedbacks", whether in terms of a utility calculus or in terms of emotional reactions, cognitive biases, and political processes, as the major underlying cause of lock-in (Sydow et al., 2009). As such, according to PDT, lock-in may be of a predominantly cognitive, normative, or even resource-based nature (Giddens, 1984; Sydow et al., 2009). In turn, "increasing returns" or "positive feedbacks" refer to the notion of self-reinforcement (Sydow et al., 2009), which is at the heart of PDT (Saxenian, 1999; Sydow et al., 2012). Self-reinforcement is a property of certain phenomena where processes are repetitively pursued to reap incrementally increasing returns. Hence, an individual aiming to reap increasing benefits from a particular self-reinforced path tends to become locked-in over time due to the high switching costs that would be implied by deviating from that path. Conversely, a pattern of actions characterized by decreasing returns would fail, over time, to lock-in an individual since one would not lose any benefits if one decided to deviate from that path.

Within the PDT literature, several attempts have been made to identify and categorize the different causes or logics behind self-reinforced phenomena (Dobusch and Kapeller, 2013). For example, Beyer (2010) identified seven different mechanisms capable of producing path dependence while Dobusch and Schußler (2012) proposed a list of "typical" positive feedback mechanisms that operate at and between different levels of analysis. However, to date, Sydow et al's (2009) framework has received the most attention (Dobusch and Kapeller, 2013). This framework highlights four mechanisms with different self-reinforcing logic that are likely to contribute to the development of organizational path dependence: complementarity effects, coordination effects, learning effects, and adaptive expectation effects (Sydow et al., 2009).

Complementarity effects lie in the synergy resulting from the interaction of two or more separate but interrelated resources, rules, or practices (Schreyögg and Sydow, 2011;

Sydow et al., 2009). More precisely, the advantage of combining interrelated elements is that the benefits of the combination is greater then the sum of all elements alone (Schreyögg and Sydow, 2011; Sydow et al., 2009). As such, certain resources, rules or practices tend to be constantly combined together in order to reap greater benefits. As a result, certain combination patterns become predominant, which in turn slowly create a lock-in (Schreyögg and Sydow, 2011; Sydow et al., 2009). This self-reinforcing logic is often found in economies of scope, "where the cost of producing and selling (or buying) two or more goods or services together is lower than the cost of producing and selling (or buying) them separately (Sydow et al., 2009, p. 700)". Furthermore, it is also at the heart of indirect network externalities often found in certain product markets or regional clusters (Dobusch and Schußler, 2012).

Coordination effects build on the benefits of rule-guided behavior. That is, the more actors adopt and apply a specific organizational rule or routine, the more efficient the interaction among these actors will be. Indeed, when the behavior of actors is rule guided, it becomes easier to anticipate reactions and facilitate interactions, which in turn significantly reduce coordination costs[1] (Schreyögg and Sydow, 2011; Sydow et al., 2009). Hence coordination effects are found in economies of scale where increasing the number of participants results in decreased (coordination) costs per unit. As such, the attractiveness of adopting these rules or routines increases as the number of actors following these very same rules increases, creating the reinforcing nature of coordination effects (Schreyögg and Sydow, 2011; Sydow et al., 2009). The coordination self-reinforcing logic is also at the heart of direct network externalities or installed base advantages that favor certain products or regional clusters over their competitive alternatives (Dobusch and Schußler, 2012). A classic example of

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[1] Based on Malone and Crowston's (1994) definitoin of coordination, we define coordination costs as the costs tied to managing the dependencies between activities

coordination effects is the decision regarding right-hand versus left-hand traffic, which became fixed due to the obvious benefits of following it (e.g., less accidents, faster commutes) (Sydow et al., 2009).

Learning effects stem from the fact that the more often an operation is performed, the more efficiency will be gained in subsequent iterations (Sydow et al., 2009). For instance, by performing an operation repetitively, an actor will perform the operation faster, more reliably and with fewer errors, thus decreasing the average cost per unit of output (Jonhston et al., 2003). As such, certain solutions become more attractive than others because of accumulated skills and decreasing costs. In addition, departing from this particular solution becomes less attractive as it will require new learning that will increase costs (Sydow et al., 2009).

Adaptive expectation effects relate to the interactive building of preferences across actors (Schreyögg and Sydow, 2011; Sydow et al., 2009). More precisely, adaptive expectation emerges because individual preferences are not fixed, but rather assumed to vary in accordance with the expectations of others (Schreyögg and Sydow, 2011; Sydow et al., 2009). A classic example of this mechanism is the need for social belonging and the desire to end up on the winning side (Schreyögg and Sydow, 2011; Sydow et al., 2009). As explained by Sydow et al., (2009) "The more people are expected to prefer a particular product or service (and not another), the more attractive that product or service becomes (Leibenstein, 1950). Since actors are often uncertain about the right choice, they feel rewarded by the fact that others are likely to prefer the same (p. 700)". As such, a self-reinforcing dynamic is created, which entices the emergence of a dominant solution (Schreyögg and Sydow, 2011; Sydow et al., 2009). The adaptive expectation self-reinforcing logic, which often explains the occurrence of self-fulfilling prophecies regarding a product's success (Dobusch and Schußler, 2012), is also at the heart of phenomena such as herd behaviors and informational cascades.

As such, Sydow et al's (2009) framework governs a wide range of self-reinforced phenomena that have been deemed influential on organizational behaviors (e.g., direct and indirect network effects/externalities, dynamic capability development, and certain types of strategic co evolution) and distinguishes them based on four particular self-reinforcing logic (i.e., complementarity effects, coordination effects, learning effects, and adaptive expectation). Although the four self-reinforcing logic proposed by Sydow et al. (2009) were intended to explain various self reinforced phenomena that affect the behaviors of organizations and their subunits, a literature review on the behaviors of IT users suggests that they are also likely to operate at the IT user level (see Table 1.1).

Table 1.1 Evidence of self-reinforced phenomena at the IT user level

Logic	Corresponding phenomena	Description of the self-reinforcement process	Supporting literature
Complementarity effect	Indirect network externalities	"indirect network externalities are ancillary benefits accruing to network participants as a network grows, such as the development of complementary services, standards formation, and price reduction, but not directly from the number of network participants." (p. 87)	Lin and Bhattacherjee, 2008
	Indirect network externalities	"Indirect network externalities display an increased sense of user value from using a product or service, as the effect the user obtains from such product or service increases with the increase of related complementary products. The computer software spreadsheet is an example: consumers are willing to buy or use it to obtain network externalities rising from compatibility (Gandal, 1994)." (p. 1153)	Lin and Lu, 2011
	Complementary technology compatibility	"the value of products and services depends on the number of, or the variety of, the compatible complementary goods or services." (p. 377) "Complementary goods provide system benefits: the added value to users of the full system. The incremental benefits provided by the whole can be greater than the sum of the benefits of the individual components." (p. 377)	Pae et Hyun, 2002
Learning effects	Power law of practice	"According to the method selection explanation (Crossman 1959), when a task is repeated, less efficient methods of accomplishing the task are abandoned in favor of more efficient methods as more efficient methods are discovered. In effect, the person performing the task is learning by trial and error the most efficient combination of methods, which could be revealed more systematically by a time and motion analysis (e.g., Niebel 1972)." (p. 63) "The other explanation of practice law effects focuses on the cognitive processing of the input and output of the task rather than on the methods used in its performance. Rosenbloom and Newell (1987) explain log–log improvement as due to the "chunking" of patterns in the task environment, in much the same way that complex patterns can be memorized as a limited number of higher-order chunks (Miller 1958; Servan-Schreiber and Anderson 1990)." (p. 64)	Johnson et al., 2003

Coordination effect	Direct network externalities	"Direct network externalities are based on the number of participants in a given network. Typical examples include the number of buyers and sellers in an on-line auction network like eBay, the number of customers in a cellular phone network like AT&T or Verizon, and the number of gamers on an on-line gaming Web site like PartyPoker.com. As new participants enter these networks, existing users gain more choices for trading, communicating, or playing games, and thus gain network utility." (p. 87)	Lin and Bhattacherjee, 2008
	Direct network externalities	"Direct network externalities derive from the increase in users of a particular product or service, where user's benefits increase. Taking online auction sites as an example, the more users that buy and sell, the more chances to choose from there are, and the higher the transaction value is (Gupta & Mela, 2008). Many researchers (Gupta & Mela, 2008; Iimi, 2005; Kim, Park, & Oh, 2008; Pae & Hyun, 2002; Wu, Chen, & Lin, 2007; Yang & Mai, 2010) have claimed that utility for users is derived from market size, impacting the way that people use telecom facilities, computer software, and websites. For example in the marketplace, different kinds of people can use these products, thereby increasing utility for users. This in turn encourages them to continue using these products and services." (p. 1153)	Lin and Lu, 2011
	Network effects	"Network effects refer to the idea that a product becomes more valuable as its user base expands (Katz and Shapiro 1994). For example, the value of an electronic payment system to a commercial bank increases with the number of banks that adopt the same system (Gowrisankaran and Stavins 2004)." (p. 24)	Duan et al., 2009
	Network externalities	"It refers to the fact that the value of technology to a user increases with the number of its adopters. As email systems increased in popularity, for example, they became increasingly valuable, attracting more users to adopt the technology. Network externality is derived from Metcalfe's law, which states that the value of a network increases with the square of its number of users. This law looks at the Internet as a communication medium, as a network for exchanging information with other participants. Luo and Strong pointed out that the users may develop perceived critical mass through interaction with others. Perception of critical mass is rapidly strengthened as more people participate in network activities." (p. 857)	Hsu and Lu, 2004

Adaptive expectation effect	Technology preannouncement	"a preannouncement is a formal, deliberate communication issued before a firm actually undertakes a particular marketing action, such as a price change, a new advertising campaign, or the introduction of new product/versions … using preannouncement may stimulate the development and marketing of complementary products and provide access to distribution … Furthermore, preannouncements send strong signals of market commitment to potential consumers, and thus are associated with consumers' expectations for relationship continuity with the incumbent product/technology." (p. 378)	Pae et Hyun, 2002
	Informational cascades	"Informational cascades refer to the situation "when it is optimal for an individual, having observed the actions of those ahead of him, to follow the behavior of the preceding individual without regard to his own information" (Bikhchandani et al. 1992, p. 994). Such a situation arises when decision makers have imperfect knowledge of the true value of a product so they infer its utility from observing actions of their predecessors. The influence of others' behavior could be so substantial that it dominates the influence of decision makers' own information. In this case, decision makers would imitate their predecessors without regard to their own information. Informational cascades are largely informational in nature (Berndt et al. 2003). As a result, despite the availability of close substitutes, informational cascades may lead to the dominance of one product or technology over another and sometimes may lead to the rejection of more efficient technologies (Abrahamson 1991)." (p. 24)	Duan et al., 2009
	Herd behavior	"Herd behavior refers to the phenomenon that "everyone does what everyone else is doing, even when their private information suggests doing something quite different" (Banerjee 1992, p. 798). This may explain why people quickly converge on the same form of technology by imitating each other's choices." (p. 1014) "Prior research has identified two primary conditions under which herd behavior can occur: uncertainty about the decision and observation of others' actions. On the one hand, people are more likely to herd when they are uncertain about the decision to be made, as a result of having either incom- plete or asymmetric private information (Bikhchandani and Sharma 2000; Fiol and O'Connor 2003; Lieberman and Asaba 2006; Walden and Browne 2009). On the other hand, observing that many people have made the same decision is a necessary condition for herd behavior to occur. First, the number of previous adopters matters: "The adoption of one alternative becomes more likely the more others have made the same choice" (Rao et al. 2001, p. 504). Second, the identity of predecessors may also matter. People may follow members of the general public or of a specific group who are believed to have better information and who are more likely to have made the right decision such as that of successful others (Bandura 1986), reputational early adopters (Abraham- son 1991), and fashion leaders (Bikhchandani et al. 1992)." (p. 1015)	Sun, 2013

Recently, PDT has been complemented by the notion of path creation, which recognizes the agency of actors in the constitution of a path (Garud and Karnøe, 2001). Indeed, contrary to the basic tenets of PDT, which posits that only external shocks lead to deviation from existing lock ins, path creation stipulates that mindful actors can deviate from a path due to their ability to create or exercise option, even though they may not be proficient enough to initiate or control the deviation entirely (Garud and Karnøe, 2001). Specifically, actors may intentionally deviate from an existing lock-in situation by being fully aware that they may be creating inefficiencies in the short term but that such steps are required to create new futures. Furthermore, rather than "errors" and "mistakes", advocates of the path creation perspective use terms such as "experimentation" and "exploration" wherein any action deviates from the established pattern (Garud and Karnøe, 2001). As March (1971) suggests, we may need a "technology of foolishness" in order to make advances with technologies. Hence by bringing into play not only the social and institutional processes that are at play in path dependence, but also the socio-cognitive processes of enactment that are involved in the creation of new states (Garud and Karnøe, 2001; Garud and Rappa, 1994), the notion of path creation provides a way of understanding how mindful actors may escape lock-in (Garud and Karnøe, 2001; Garud et al., 2010; Sydow et al., 2009; Sydow et al., 2012).

To conclude, it is important to note, as for the case of the QWERTY story, that lock-ins are not always undesirable (Schreyögg and Sydow, 2010; 2011; Vergne and Durand, 2011). Instead, it is their efficiency or lack thereof that will make them desirable or not. Indeed, an individual locked-in into an efficient pattern should embrace the phenomenon since he is likely to derive significant benefits from that path (Schreyögg and Sydow, 2010; Vergne and Durand, 2011). In contrast, an individual constrained by an inefficient lock-in would do well to attempt to move away from this path since accrued benefits are highly unlikely (Schreyögg and Sydow, 2010; Vergne and Durand, 2011). Thus, a lock-in only becomes undesirable when an individual is

confronted with a new, more efficient alternative or when changed internal or external circumstances call for a new solution. As such, establishing the desirability of a lock-in always implies a base of reference, a comparison with another standard (Sydow et al., 2009). It is thus at this specific point in time that a lock-in will become manifest since the desire to move away from a certain path will only emerge in the face of inefficiencies made evident by certain comparisons.

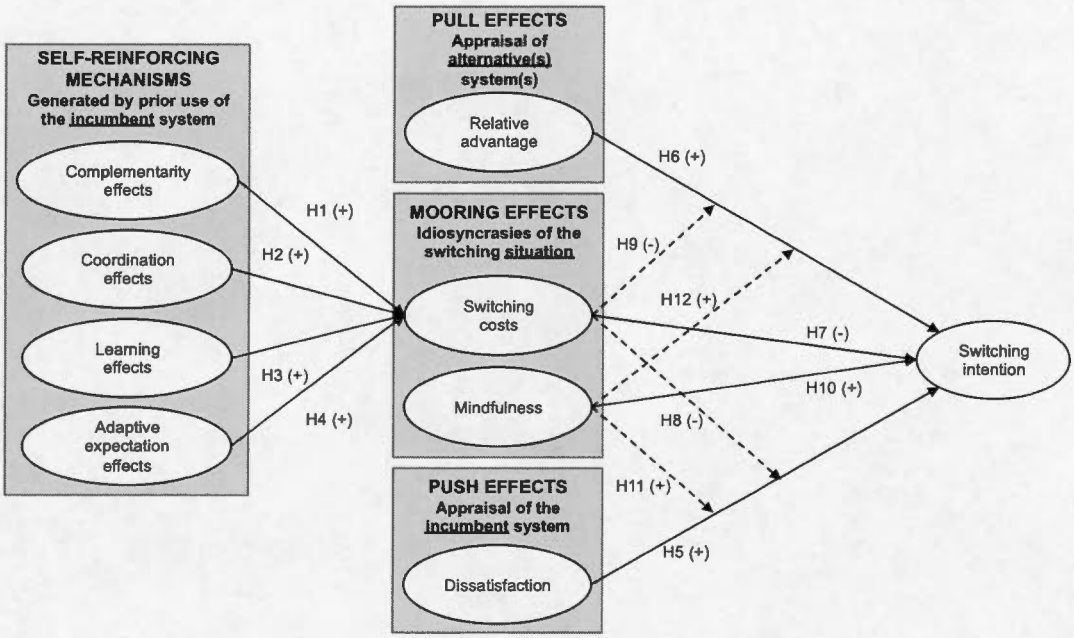
1.3 Research model and hypotheses

IT switching is analogous to the process of human migration since IT users, just like migrants, are subject to three key forces: (1) negative factors related to their incumbent application software that encourage them to leave (i.e., push factors), (2) positive factors tied to alternative application software that attract them (i.e., pull factors), and (3) 'intervening obstacles' that may either impede or facilitate their move (i.e. mooring factors) (Bhattacherjee and Park, 2014; Moon, 1995; Ye and Potter, 2012). For instance, IT users may switch because they are dissatisfied with their current application software (i.e., push factor) or because another alternative application software is superior in some ways (i.e., pull factor). Also, IT users may not universally switch from one application software to another due to specific inhibiting or facilitating conditions such as switching costs (i.e., mooring factor).

While migration theory and the PPM model propose a solid framework for the study of IT switching, they do not specify which push, pull, or mooring factors are salient to

application software switching. Indeed, migration theory asserts that specific push, pull, and mooring factors must be elicited from the context under study since each decision to migrate is unique (Lee, 1966). In the context of our study, IT switching may be seen as a combination of discontinuing the use of an incumbent application software (a post-adoptive behavior) and adopting an alternative software (an adoptive behavior) (Bhattacherjee and Park, 2014). Indeed, IT switching push factors are similar to the forces that drive IT continuance while pull factors are akin to the forces that motivate IT acceptance (Bhattacherjee and Park, 2014). As such, the use of migration theory to study IT switching may serve as a theoretical bridge that links IT adoption and post-adoption research, which have traditionally been studied separately in the IS literature (Bhattacherjee and Park, 2014). Based on this premise, we rely on the IT acceptance and continuance literatures to identify the salient push and pull factors of our model. Specifically, from the IT continuance literature we identify dissatisfaction with the incumbent application software as the most salient push factor, while the study of the acceptance literature enables us to identify the relative advantage of alternative application software as the most salient pull factor. In addition, we rely on the IT switching literature and PDT to identify switching costs and IT mindfulness as the most salient mooring factors. Lastly, based on the tenets of PDT, we identify four key self-reinforcing mechanisms that influence IT switching costs: complementarity effects, coordination effects, learning effects and adaptive expectation effects. Our overall research model is illustrated in Figure 1.1. The following paragraphs detail each of the research hypotheses.

Figure 1.1 The research model



1.3.1 Self-reinforcing mechanisms: the creation of application software switching costs

1.3.1.1 The reinforcing effect of complementarity

As mentioned above, complementarity effects stem from the synergies resulting from the interaction of two or more separate but interrelated resources, rules, or practices (Sydow et al., 2009). According to PDT, synergies increase switching cost and can lead to a lock-in since it becomes even more attractive to reap the incrementally increasing benefits resulting from these synergies than the costs caused by the misfit that may ensue when deviating from this optimal pattern of complementarity (Sydow et al., 2009). For example, complementarity effects are clearly noticeable in the telecommunication industry where companies tend to bundle their services (e.g., TV, internet access, fixed and mobile telephony) into a single package to increase switching costs and lock-in customers (Henten and Godoe, 2010). This approach, which is often labeled "multi-play" as it rests on a combination of products/services where the benefits of the combination are greater than the sum of all elements alone, tends to lock-in customers because deviating from such a bundle would imply losing important "positive feedbacks", whether in terms of convenience, enhanced utility or lower prices (Henten and Godoe, 2010).

In the particular context of IS, complementarity or synergy effects resulting from complementary application software are known to increase switching costs and create lock-ins. For example, Microsoft successfully used complementarity effects to drive out the competition and lock-in consumers with its productivity suite: Office. Indeed, when Microsoft first introduced Office, which combines, amongst other software applications, a word processor, a spreadsheet and a presentation program into a single

package, most of its competitors only offered these software applications separately. Users realizing that they could reap substantial benefits by purchasing these programs as a package from a single source rapidly adopted Microsoft Office. However, these very same users also became locked-in since switching to an alternative product would imply important switching costs.

The synergy effects resulting from the complementarity between operating system and application software are also known to increase switching costs and create lock-ins. For example, the current war between Google and Apple to encourage programmers to develop apps for their Android or mobile iOS operating systems indicates the strong impact of indirect network effects on switching costs and lock-in. Indeed, realizing that their mobile operating systems are fairly similar to one another, both companies adopted a strategy that consisted of increasing the number of complementary apps to lock-in users on their respective mobile operating systems. However, by being able to augment its offering through better apps, Apple ended up wining the battle of indirect network effects by significantly increasing switching costs and thus locking-in an important amount of users on its mobile iOS operating system (Linde et al., 2012).

Finally, the synergy effects resulting from the complementarity between hardware, operating system and application software are also known to increase switching costs and create lock-ins. Nintendo's dominance of the U.S. video game market in the early nineties is an example of such complementarity effects (Pae and Hyun, 2002). Indeed, spurred by the synergies resulting form the availability of a wide range of game cartridges for its game console and operating system (i.e., indirect network externalities), Nintendo dominated the market due to the increasing benefits its users could derive from owning its console and the important switching costs that would ensue if they were to switch to another product (Pae and Hyun, 2002). The introduction of the Macintosh computer is another example that demonstrates that complementarity effects are essential to increase switching costs and eventually lock-in users on a

platform (Pae and Hyun, 2002). Indeed, the dearth of compatible application software for the Macintosh computer and its operating system upon its introduction, combined with the slow progression of these software following its launch, nearly prevented the establishment of the Macintosh as a viable platform since its users couldn't reap substantial benefits from its use (Pae and Hyun, 2002). It was only when Apple and its application development partners were able to offer a significant number of complementary applications that the Macintosh computer became a viable platform that could eventually lock-in users due to high switching costs (Pae and Hyun, 2002). The above arguments lead to the first hypothesis:

Hypothesis 1: Incumbent application software complementarity effects positively impact a user's switching costs

1.3.1.2 The reinforcing effect of coordination

Coordination effects accrue when increasing the number of participants increases the benefits of each participant. According to PDT, coordination effects create switching costs and lock-in because it becomes more attractive for an individual to follow a certain path as the number of other individuals who also follow it increases. For instance, the benefits that a consumer derives from purchasing a fax machine depend on the number of other consumers that have made the same purchase. Hence, as more consumers own a fax machine, its utilitarian value increases, which tends to lock-in fax

users on this particular product since switching to an alternative would imply losing access to an important installed base. Katz and Shapiro (1985, 1986) label this phenomenon "direct network externalities".

In the particular context of IS, coordination effects can increase switching costs and lock users into a particular application software. For example, the benefits that a user derives from a social network site depend on the number of other users who have also joined the same social network site (Lin and Lu, 2011). As such, a user becomes locked-in to a certain social network site because switching to another social network site would mean losing the benefits accruing from the connections already established with other users. Although evident for communication application software, Gandal (1994) showed that other types of application software, such as spreadsheets, are also subject to coordination effects. Indeed, according to the same author, most application software are subject to direct network externalities because users want to transfer files amongst themselves. Hence, the value of a specific software application increases as the number of its users also increases because they have access to a wider installed base with whom to transfer files. The above arguments lead to the second hypothesis:

Hypothesis 2: Incumbent application software coordination effects positively impact a user's switching costs

1.3.1.3 The reinforcing effect of learning

As mentioned above, learning effects rest on the efficiency gained when the same operation is performed repetitively. According to PDT, these gains create switching costs and a lock-in because sticking with a chosen solution promises continued returns due to the accumulation of skills (Sydow et al., 2009). According to the power law of practice, two explanations justify this self-reinforcing logic. First, when an operation is repeated, less efficient methods of accomplishing the same operation are abandoned in favor of more efficient methods as more efficient methods are discovered (Johnson et al., 2003). For instance, on a first visit to a new supermarket, some learning takes place (i.e., the aisle location of some product classes, the shelf location of some various brands and the choice of a preferred shopping pattern). This knowledge of the layout of the physical store, which increases with subsequent visits, makes the supermarket more attractive relative to competitive stores and eventually locks-in the individual due to his high level of shopping efficiency. Second, when an operation is repeated, an individual focuses more on the input and output of the operation rather than on the methods used to perform the operation (Johnson et al., 2003). For instance, while going to a new supermarket for the first time represents an infinite number of small operations (e.g., finding a parking space, getting a cart, finding key products, payment), through repetition, an individual will memorize these multiple small operations as a single high-order operation: grocery shopping. Hence, an individual will become more efficient in his/her shopping experience since he/she will be able to integrate grocery shopping more efficiently in his/her weekly shopping routine. As such, multiple visits to a new supermarket makes the supermarket more attractive relative to competition and eventually locks-in the individual due to efficiency gains.

In the particular context of IS, learning effects can increase switching costs and lock-in users onto a particular application software. For instance, a user will become,

through time, much more efficient for searching within a favorite website because he/she will have learned the layout of the site (Johnson et al., 2003). As such, due to the lower cognitive effort required to navigate within the website, the user will become locked-in and use this particular site rather than alternative websites (Johnson et al., 2003). Shapiro and Varian (1999) have shown that these learning effects can also lock-in users in to other types of application software. Indeed, the authors highlight that the experience gained with a particular word processor increases the cost of switching to another, which explains, for example, certain users' slow conversion from WordPerfect to Word. The above arguments lead to the third hypothesis:

Hypothesis 3: Incumbent application software learning effects positively impact a user's switching costs

1.3.1.4 The reinforcing effect of adaptive expectation

Adaptive expectation effects rest on the interactive building of an individual's preferences and the general desire to end-up on the "winning side". According to PDT, two reasons explain why adaptive expectation effects increase switching costs and can create a lock-in. First, the more people are expected to prefer a particular product, the more attractive that product becomes. Second, people uncertain about the right choice feel rewarded by the fact that others are likely to prefer the same product (Sydow et al., 2009).

One of the best examples of adaptive expectations in the IS context is the emergence and popularity of the iPhone. Indeed, when Apple first introduced the iPhone in 2007, it instantly became one of the most-talked about consumer products ever. Every newspaper and magazine wrote about it while consumer interest rose exponentially. Consequently, as the iPhone became more attractive, consumers tended to follow the choice of others since they felt rewarded by the fact that it was better and cooler to have a new iPhone. As more consumers bought a new iPhone, more future consumers got interested in the device and eventually bought it, which in turn further increased the attractiveness of the iPhone and the satisficing benefits of iPhone users. Consequently, Apple's sales grew exponentially during several years to a point where, in 2012, despite the fact that the iPhone was inferior to other smartphones in terms of battery life, hardware and price, it accounted for 25 percent of the entire Smartphone market (appleinsider.com, 2012). In addition, evidence from the IS literature suggests that this self reinforcing logic is also at play in the application software market. For instance, Sun (2013) demonstrated that this logic, which is at the heart of herd behavior, influences the adoption patterns of wiki application software. The above arguments lead to the third hypothesis:

Hypothesis 4: Incumbent application software adaptive expectation effects positively impact a user's switching costs

1.3.2 Push Factors: the impact of dissatisfaction on user switching Intention

An IT user's satisfaction or dissatisfaction with an incumbent system is based on his/her direct, first-hand experience with using the system (Bhattacherjee et al., 2012) and can be defined as "the summary psychological state resulting when the emotion surrounding disconfirmed expectations is coupled with the customer's prior feelings about the consumption experience (Oliver, 1981, p. 29)". In post-adoption studies, especially those based on the expectation disconfirmation model (EDM), satisfaction is found to be positively associated with IT continuance intention (Bhattacherjee, 2001). As such, satisfied users tend to continue using their current software application and are unlikely to switch, even if alternative software applications are better. In contrast, dissatisfied users are likely to abandon their current software application and to switch to an alternative (Ye and Potter, 2011). For example, Bhattacherjee and Park (2014) found that users dissatisfied with client-hosted computing were more likely to switch to cloud computing while Bhattacherjee et al. (2012) and Ye and Potter (2011) observed that satisfied web browser users were less likely to switch to an alternative. Chang et al. (2014) also found that users dissatisfied with a social networking site (SNS) were more likely to switch to another SNS. The above arguments lead to the fifth hypothesis:

Hypothesis 5: Incumbent software application dissatisfaction positively impacts a user's intention to switch to another software.

1.3.3 Pull Factors: the Impact of relative advantage on user switching Intention

In Diffusion of Innovations theory, the relative advantage of an innovation is identified as one of the key perceived characteristics that influences its adoption (Rogers, 2003). Relative advantage can be interpreted as the degree to which a technology is perceived as being more beneficial than its substituted technologies (Ye et al., 2008). In the IS literature, the relative advantage concept has been found to be related to user decisions regarding IT adoption and usage (Moore and Benbasat 1991; Taylor and Todd, 1995). More precisely, if a user perceives that the software application he/she is using offers more advantages over another, he/she is unlikely to switch unless the new one offers incremental benefits over the old one (Bhattacherjee et al., 2102). Numerous empirical studies in the IS literature have shown that the presence of comparatively superior software positively influences a user's intentions to switch. For example, Bhattacherjee and Park (2014) Bhattacherjee et al. (2012), Kim et al. (2006) and Zhang et al. (2009) have demonstrated that this argument holds true for social client-host computing users, web browser users, email users and blog users, respectively. The above arguments lead to the sixth hypothesis:

Hypothesis 6: The relative advantage of alternative software positively impacts a user's intention to switch to another software application.

1.3.4 Mooring factors: the impact of switching costs and IT mindfulness on user switching intention

1.3.4.1 Switching costs

Switching costs act as a constraint on IT switching since they represent obstacles that a user must overcome to successfully switch to another software application. Within the particular context of this study, these costs may include the time and effort the IT user has to spend on evaluating, setting up, and learning the substitute software (Bhattacherjee and Park, 2014) as well as the irrecoverable investments in time and effort that he/she will have made in regards to the incumbent software (Chang et al., 2014). Several empirical studies within the IS literature have found that switching costs negatively influenced IT users intentions to switch. For example, Chang et al. (2014), Kim et al. (2006) Ye and Potter (2011) and Zhang et al. (2009) have observed that this argument holds true for social network site users, email users, web browser users and blog users, respectively. The above arguments lead to the seventh hypothesis:

Hypothesis 7: Switching costs negatively impact a user's intention to switch to another software application.

In addition to their direct effects, some IS researchers have also found that switching costs moderated the relationship between satisfaction and user switching intention, as well as the relation between relative advantage and user switching intention. Indeed, when an IT user perceives high levels of switching costs, even if he/she is dissatisfied

with its incumbent software or finds a better substitute, he/she may still be reluctant to switch (Ye and Potter, 2011). Such a behavior may be explained by an IT user's perception that switching costs outweigh switching benefits even when push and pull factors are strong (Chang et al., 2014). Several empirical studies within the IS literature have supported this argument. For example, Kim et al. (2006) found that switching costs negatively moderated the influence of email users' dissatisfaction on their intention to switch to an alternative email service provider, while Chang et al. (2014) observed a similar effect on web browser users. In addition, Bhattacherjee and Park (2014) showed that switching costs also negatively moderated the impact of relative advantage of cloud computing on client-host user's intention to switch. These findings are consistent with the basic tenets of migration theory, which explicitly states that mooring factors moderate the main effects of push and pull factors on switching intentions. The above arguments lead to the eight and ninth hypotheses:

Hypothesis 8: A user's switching costs will moderate the relationship between dissatisfaction and User switching intention such that the relationship will be weaker in the presence of high switching costs.

Hypothesis 9: A user's switching costs will moderate the relationship between relative advantage and User switching intention such that the relationship will be weaker in the presence of high switching costs.

1.3.4.2 Mindfulness

Mindfulness can be seen as a "relatively enduring disposition to respond to stimuli within a specific situation that may be changed through training or other experience (Thatcher and Perrewe, 2002, p. 383)". Individual mindfulness is "the ability to continuously create and use new categories in perception and interpretation of the world (Langer 1997, p. 4)". Correspondingly, a mindful individual engaged in a task is likely to be more motivated and able to explore a wider variety of perspectives (Butler and Gray, 2006). In addition, a mindful individual can also make more relevant and precise distinctions about phenomena in its environments, enabling him/her to adapt and to shift more easily in those environments (Fiol and O'Connor, 2003). Finally, a mindful individual is more likely to be willing and able to apply processed information in new ways and in alternative contexts (Chanowitz and Langer, 1980; Langer, 1989). Hence, a mindful individual is more likely to consider different perspectives (Langer et al., 1975), to be apt to create innovative solutions to problems and to alter his/her actions to take advantage of the changing environment (Langer, 1989). In the particular case of this study, where IT switching is a risky behavior whose outcome is unknown, a mindful user is more likely to change his/her behavior and to switch to an alternative software application. The above arguments lead to the tenth hypothesis:

Hypothesis 10: A User's mindfulness positively impacts a user's intention to switch to another software application.

In contrast to individual mindfulness, individual mindlessness is a state of reduced attention resulting from premature commitment to beliefs that may not accurately

reflect the phenomena at hand (Chanowitz and Langer, 1980). According to Butler and Gray (2006) individual mindlessness also involves routine use of preexisting categorization schemes and tends to lead to "mechanically employing cognitively and emotionally rigid, rule-based behaviors" (Fiol and O'Connor, 2003, p. 58). Correspondingly, a mindless individual is likely to focus on one perspective and a single way of doing things when he/she encounters a variety of problems (Butler and Gray, 2006). In addition, a mindless individual is likely to process information and data in a way that gives rise to a perception of certainty, which can create premature commitment to a solution (Langer and Piper, 1987). Finally, a mindless individual is likely to favor short term efficiency at the expense of adaptability which can lead to overlearning where he/she loses the ability to critically evaluate, explain, and adapt his/her behavior (Langer, 1989; Langer and Weinman 1981).

The differences between a mindful and a mindless individual suggest that the former is more likely to consider the alternatives present in his/her environment as well as his/her own evaluation of current behavior. In the context of this particular study, this implies that the relationship between relative advantage and IT intention to switch, as well as the relationship between dissatisfaction and IT intention to switch will be stronger when the user is mindful than when he/she is mindless. The above arguments lead to the eleventh and twelfth hypotheses:

Hypothesis 11: A user's mindfulness will moderate the relationship between dissatisfaction and User switching intention such that the relationship is stronger in the presence of high mindfulness

Hypothesis 12: A user's mindfulness will moderate the relationship between relative advantage and User switching intention such that the relationship will be stronger in the presence of high mindfulness

1.4 Methodology

1.4.1 Research setting

An important part of the research design was selecting an activity that was likely to be supported by more than one application software. Also, both an incumbent and a new application software needed to be available for use (i.e., situations in which the use of an incumbent and a new application software are not mandated, and in which the incumbent application software cannot/will not be discontinued). One example of such activities came to our attention: the sharing of information with significant others. Indeed, multiple social network sites (SNS) defined as "web based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system (Boyd an Ellison, 2013, p. 211)" – such as Facebook and MySpace support information sharing amongst users. In addition, given the ubiquity of this activity in our daily lives, it is most likely to be influenced by past behaviors. Thus, the SNS used to perform this activity is likely to be subject to self-reinforcing mechanisms and lock in. Accordingly,

by being volitional, freely available, and having multiple equivalent alternatives, SNS represent IT artifacts that comply with the underlying premises of both migration theory and PDT. Consequently, we attempted to test our model with data collected from actual users of SNS.

1.4.2 Data collection

Data was collected by means of a field survey. The participants were students enrolled in one compulsory undergraduate course in business administration at a large Canadian public university during the 2015 fall semester. Students were considered to be appropriate respondents since they are often used as surrogates for Internet users (Limayem et al. 2007) and almost all 18 to 44 years old Internet users (97.5%) make at least one SNS related activity on the Internet (NET Tendances, 2014). One of the authors visited numerous classrooms during a two-week period to administer the questionnaire. None of the participants were enrolled in classes that were taught by the authors of this paper. In addition, since student participation was voluntary, their contribution was not rewarded in any way. In total, 454 students, spread over ten classes completed the questionnaire. After reviewing our research sample, 38 questionnaires were removed because of missing data (35 questionnaires) and non-use of SNS (3 questionnaires). This resulted in a total of 416 usable questionnaires.

1.4.3 Survey instrument and pilot test

Scales for the four self-reinforcing mechanisms related to PDT were not available in the literature. Hence, we developed appropriate scales for each of the four constructs by first generating a pool of items by identifying items from existing scales and by creating additional items that appeared to fit the construct definitions. Next, we presented these preliminary scales to a group of four university professors. Their insightful comments over three rounds of reviews helped us refine the scales. Besides item identification and item wording, the most important finding stemming from these exchanges was our understanding that the use of SNS to support the sharing of information with significant others could be subject to three different types of complementarity effects. First, there are complementarity effects related to the devices used to connect to the SNS. Indeed, the reinforcing effect of complementarity should increase as the number of devices used to connect to the SNS (e.g., laptop computer, desktop computer, smartphone) increases. Second, there are potential complementarity effects that pertain to the integration of the SNS to other software applications. Indeed, the reinforcing effect of complementarity should increase as the number of software applications with which the SNS is integrated (e.g., web browsers, electronic games, mail clients) increases. Third, there are complementarity effects related to the number of functionalities provided by the SNS. Indeed, the reinforcing effect of complementarity would likely increase as the number of functionalities provided by an SNS (e.g., content management, relationship management, privacy settings) increases. Based on this important finding, we developed a scale for each type of complementarity effects: incumbent system device complementarity effects, incumbent system software complementarity effects, and incumbent system functionality complementarity effects. Together, six reflective constructs were used to assess the four different types of self-

reinforcing mechanisms: one for each type of complementarity effect, one for coordination effects, one for learning effects and one for adaptive expectation effects.

Scales for the remaining constructs (those related to mindfulness and the push pull mooring migration model of IT switching) were adapted from the literature. More precisely, the scales for the second-order reflective mindfulness construct were drawn from Langer (2004), the relative advantage scale was adapted from Ye and Potter (2011), the scale for User switching costs was adapted from Bansal et al. (2005), the dissatisfaction scale was drawn from Battacherjee (2001) and the scale for User switching intention was drawn from Ye and Potter (2011).

Once the survey instrument was completed, we conducted a pilot test with respondents drawn from a similar sample frame to the one used for our main survey. As such, respondents were enrolled in the same compulsory undergraduate course in business administration during the 2014 summer semester. In total 47 respondents accross two classes participated in the pilot test. Comments from these 47 respondents indicated that our questionnaire was too long, that certain questions lacked clarity and that it was visually too dense. These important shortcomings resulted in a high number of incomplete questionnaires.

Following these poor initial results, we then asked a survey expert to review our questionnaire. Based on his feedback and the feedbacks from the pilot study participants, several modifications were made to the questionnaire. More precisely, we modified the wording of certain items to more appropriately adapt the borrowed measures, toned down instructions to respondents in order to make the questionnaire easier to answer, as well as to make the questionnaire visually more appealing. We conducted a second pilot test to see if our modifications addressed the previously identified shortcomings. With the help of the survey expert, an online version of the questionnaire was developed and uploaded on the Survey Monkey platform. Then, an electronic link to the survey was sent via e-mail to one of the author's acquaintances

and friends with a brief text explaining the purpose of the study and a request for their participation. A total of 79 respondents answered the online survey over a three week period. Comments from these 79 respondents suggested that a list of popular SNS be added to the questionnaire as illustrative examples only and that minor spelling and punctuation mistakes be corrected. As suggested by Moore and Benbasat (1991) for developing new constructs, we also used the data collected from these 79 respondents to test the convergent and discriminant validities, as well as the unidimensionality of the six reflective constructs used to assess the four different types of self-reinforcing mechanisms. As expected, all items loaded onto their respective constructs, providing support to the validity of the developed scale (see Appendix A).

Table 1.2 lists all the scales tha were used and their respective sources, and the final version of the questionnaire is available in Appendix B.

Table 1.2 Constructs, measures and sources

Constructs	Items	Items description	Scales	Sources
Incumbent system device complementarity effects		Accéder à mon réseau social principal via les appareils identifiés précédemment me permet …	7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	n/a
	DECOM1	… de retirer plus de bénéfices que si j'y accédais via un nombre moins élevé d'appareils		
	DECOM2	… de gagner plus de temps que si j'y accédais via un nombre moins élevé d'appareils		
	DECOM3	… de déployer moins d'effort que si j'y accédais via un nombre moins élevé d'appareils		
	DECOM4	… d'avoir une expérience plus agréable que si j'y accédais via un nombre moins élevé d'appareils		
Incumbent system software complementarity effects		L'intégration de mon réseau social principal aux applications identifiées précédemment me permet …	7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	n/a
	SOCOM1	… de retirer plus de bénéfices que si ce dernier était intégré à un nombre moins élevé d'applications		
	SOCOM2	… de gagner plus de temps que si ce dernier était intégré à un nombre moins élevé d'applications		
	SOCOM3	… de déployer moins d'efforts que si ce dernier était intégré à un nombre moins élevé d'applications		
	SOCOM4	… d'avoir une expérience plus agréable que si ce dernier était intégré à un nombre moins élevé d'applications		
Incumbent system functional complementarity effects		Parce qu'il me permet d'avoir accès aux fonctionnalités identifiées précédemment à un même endroit, mon réseau social principal me permet de …	7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	n/a
	FUCOM1	… retirer plus de bénéfices que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités		
	FUCOM2	… gagner plus de temps que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités		
	FUCOM3	… déployer moins d'efforts que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités		
	FUCOM4	… d'avoir une expérience plus agréable que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités		
Incumbent system coordination effects		Le nombre de relation que j'ai établi sur mon réseau social principal me permet …	7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	n/a
	COOR1	… de retirer plus de bénéfices que si j'avais établi un nombre moins élevé de relations		
	COOR2	… de gagner plus de temps que si j'avais établi un nombre moins élevé de relations		
	COOR3	… de déployer moins d'efforts que si j'avais établi un nombre moins élevé de relations		
	COOR4	… d'avoir une expérience plus agréable que si j'avais établi un nombre moins élevé de relations		

Incumbent system learning effects		Les habiletés que j'ai acquises en utilisant mon réseau social principal…	7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	n/a
	LEARN1	… m'offrent aujourd'hui des bénéfices que je n'étais pas en mesure d'obtenir lorsque j'ai commencé à l'utiliser		
	LEARN2	… m'offrent aujourd'hui des gains en temps que je n'étais pas en mesure d'obtenir lorsque j'ai commencé à l'utiliser		
	LEARN3	… me permettent aujourd'hui d'utiliser ce dernier en faisant moins d'efforts que lorsque j'ai commencé à l'utiliser		
	LEARN4	… rendent mon utilisation plus agréable que lorsque j'ai commencé à l'utiliser		
Incumbent system adaptive expectations effects		À mes yeux, mon réseau social principal a une plus grande valeur que tout autre réseau social car…	7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	n/a
	ADAPEX1	… il est le plus populaire		
	ADAPEX2	… il est le plus en vogue		
	ADAPEX3	… il génère le plus d'engouement		
	ADAPEX4	… il est attendu qu'il aura le plus grand nombre d'utilisateur dans le futur		
User Mindfulness	Openess to Novelty		7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	Langer, 2004
	MION1	J'aime faire enquête		
	MION2	Je cherche activement à apprendre de nouvelles choses (Not Reverse)		
	MION3	J'évite les conversations qui portent à réfléchir (Reverse)		
	MION4	Je suis très curieux		
	MION5	J'aime les défis intellectuels		
	MION6	J'aime découvrir comment les choses fonctionnent		
	Alertness to Disctintion		7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	Langer, 2004
	MIAD1	Je génère peu de nouvelles idées (Reverse)		
	MIAD2	Je fais de nombreuses nouvelles contributions		
	MIAD3	Je suis très créatif		
	MIAD4	J'essaie de penser à de nouvelles façons de faire les choses		
	MIAD5	Je trouve cela facile de créer des idées nouvelles et efficaces		
	MIAD6	Je suis un penseur original (Not reverse)		
	Awareness of Multiple Perspective		7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	Langer, 2004
	MIAMP1	Je suis toujours ouvert aux nouvelles façons de faire		
	MIAMP2	Je préfère les vraies bonnes vielles façon de faire les choses (Reverse)		
	MIAMP3	Je peux agir de différentes façons dans une situation donnée		
	MIAMP4	J'ai un esprit ouvert à propos de tout, même envers les choses qui remettent en question mes valeurs fondamentales		
	Orientation in the Present		7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	Langer, 2004
	MIOP1	Je m'implique dans presque tout ce que je fais		
	MIOP2	Je remarque rarement ce que les autres font (Reverse)		
	MIOP3	Je porte attention à la vue d'ensemble (« big picture »)		
	MIOP4	Je suis rarement au courant des changements autour de moi (Reverse)		
	MIOP5	Je suis rarement alerte aux nouveaux développements (Reverse)		

Alternative system relative advantage		Utiliser mon réseau social alternatif pour réaliser les mêmes activités que je réalise sur mon réseau social principal…								7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	Ye and Potter, 2011
	RELAV1	… me permettrait de gagner du temps									
	RELAV2	… améliorerait la qualité de mes interactions sociales									
	RELAV3	… me permettrait de soutenir mes interactions sociales plus facilement									
	RELAV4	… me permettrait de soutenir mes interactions sociales plus efficacement									
	RELAV5	… me permettrait de soutenir mes interactions sociales de façon plus productive									
	RELAV6	… rendrait mes interactions sociales plus agréable									
User switching costs	SWICO1	Dans l'ensemble, je prendrais beaucoup de temps et mettrais beaucoup d'efforts à substituer/remplacer mon réseau social principal par un autre réseau social								7-point Likert scale where 1 = "strongly disagree" and 7 = "strongly agree"	Bansal et al., 2005
	SWICO2	De façon générale, le temps et les efforts nécessaires pour passer de mon réseau social principal à un autre seraient élevés									
	SWICO3	Tout considéré, le temps et les efforts nécessaires pour arrêter d'utiliser mon réseau social principal et démarrer avec un autre réseau social seraient élevés									
	SWICO4	Dans l'ensemble, j'investirais et perdrais beaucoup, si je substituais/remplaçais mon réseau social principal									
	SWICO1	De façon générale, je trouverais cela désagréable de passer de mon réseau social principal à un autre									
Incumbent system dissatisfaction		Pour chacune des paires de mots proposées ci-dessous, indiquez le pointage qui décrit le mieux votre expérience globale d'utilisation de votre réseau social principal.								7-point semantic differential scale	Battacherjee, 2001
	DISSA1	Très insatisfait	1	2	3	4	5	6	7	Très satisfait	
	DISSA2	Très malheureux	1	2	3	4	5	6	7	Très heureux	
	DISSA3	Très frustré	1	2	3	4	5	6	7	Très content	
	DISSA4	Très ennuyé	1	2	3	4	5	6	7	Très enchanté	
User switching intention		Pour chacune des paires de mots énoncées ci-dessous, indiquez le pointage qui décrit le mieux votre intention de substituer/remplacer votre réseau social principal par votre réseau social alternatif afin d'effectuer les mêmes activités.								7-point semantic differential scale	Ye and Potter, 2011
	SWINT1	Pas du tout plausible	1	2	3	4	5	6	7	Très plausible	
	SWINT2	Très improbable	1	2	3	4	5	6	7	Très probable	
	SWINT3	Aucune chance	1	2	3	4	5	6	7	Chance absolue	

1.4.4 Descriptive statistics

51.7 percent of the respondents in the final data set were female while the median age of respondents was 30 years. On average, respondents had used their primary SNS for 6 years (6.0893 years) while using it almost two hours a day (1.94472 hours). Lastly, Facebook was the most used SNS followed by Instagram and Twitter while Instagram was the most likely alternative SNS to be considered by respondents if they were to switch followed by Twitter and LinkedIn. Descriptive statistics of our research sample are presented in Table 1.3.

Table 1.3 Sample characteristics

Variable	Category	Frequency	Proportion
Gender	Female	215	51.7%
	Male	201	48.3%
Age	< 20 years	36	8.65%
	20-29 years	350	84.13%
	30-39 years	42	10.09%
	40-49 years	4	0.96%
	50+ years	1	0.24%
Education	Primary	4	0.96%
	Secondary	22	5.28%
	College	335	80.52%
	Bachelor	50	12.01%
	Master	3	0.72%
Primary SNS	Facebook	359	86.29%
	Instagram	38	9.13%
	Twitter	6	1.44%
	Google +	3	0.72%
	Pinterest	3	0.72%
	Others	7	1.68%
Alternative SNS	Instagram	158	37.98%
	Twitter	93	22.35%
	LinkedIn	52	12.5%
	Google +	49	11.77%
	Facebook	32	7.69%
	Others	32	7.69%

1.5 Data analyses and results

The confirmatory phase of our study included measurement validation, common method bias assessment and hypothesis testing. Because of the complexity of the research model, we used partial least squares (PLS), as implemented in WarpPLS 3.0, to validate the psychometric properties of the scales used to measure the constructs and test our research hypotheses (Polites and Karahanna, 2012).

1.5.1 Measurement validation

We tested the measurement model by first examining the convergent validity of the constructs as well as each of the first dimensions of the Mindfulness second order reflective construct. Convergent validity of scale items was assessed using the three criteria recommended by Fornell and Larcker (1981): (1) all item weights should be significant and exceed 0.70, (2) composite construct reliability should be greater than 0.80, and (3) average variance extracted (AVE) should exceed the variance attributable to measurement error (i.e., AVE = 0.50). The first PLS model showed that several items had low factor loading scores. The items that appeared to be problematic (DECOM1, DECOM4, RELAV1, SWICO1, MION1, MION3, MION5, MIAD1, MIAD2, MIAD4, MIAMP2, MIAMP3, MIOP1, MIOP2 and MIOP3) were removed and the model parameters were re-estimated. As shown in Table 1.4, all remaining items were significant at $p \leq 0.001$ and exceeded the minimum loading criterion of 0.70, while

composite reliabilities (ρc) and AVE of the constructs and the four dimensions of Mindfulness exceeded the minimums recommended.

Next, we examined the convergent validity of the second order reflective construct of Mindfulness. To do so, we ran the PLS model again, this time including the Mindfulness second order reflective construct with each of its dimensions as an item. This model showed that the Orientation in the Present dimension had a low factor loading. Hence, this item was removed and the model parameters were re-estimated. As shown in Table 1.4, each of the three items of Mindfulness was significant at $p \leq 0.001$ and exceeded the minimum loading criterion of 0.70, while the composite reliabilities (ρc) and the AVE of the second-order construct exceeded the minimums recommended.

After examining the convergent validity of the constructs, discriminant validity between constructs was examined using Fornell and Larcker's recommendation that the square root of AVE for each construct should exceed all correlations between that and other constructs. From the data presented in Table 1.5, we can see that the highest correlation between any pair of constructs was 0.476 (between Alternative system relative advantage and User switching intention) while the lowest square root of AVE was 0.756 (Mindfulness). These results suggested that our measures exhibited satisfactory discriminant validity.

Table 1.4 Convergent validity of the reflective constructs

	Threshold guidelines	Incumbent system device complementarity effects		Incumbent system software complementarity effects		Incumbent system functional complementarity effects		Incumbent system coordination effects		Incumbent system learning effects	
	Above 0.7	Items	Loadings[1]	Items	Loadings	Items	Loadings	Items	Loadings	Items	Loadings
		DECOM2	0.904	SOCOM1	0.845	FUCOM1	0.841	COOR1	0.808	LEARN1	0.824
		DECOM3	0.904	SOCOM2	0.888	FUCOM2	0.871	COOR2	0.862	LEARN2	0.805
				SOCOM3	0.870	FUCOM3	0.862	COOR3	0.855	LEARN3	0.854
				SOCOM4	0.831	FUCOM4	0.778	COOR4	0.791	LEARN4	0.802
Composite reliability	Above 0.8	0.900		0.918		0.904		0.898		0.893	
Cronbach's alpha	Above 0.7	0.778		0.881		0.859		0.849		0.839	
AVE	Above 0.5	0.818		0.737		0.703		0.688		0.675	

		Incumbent system adaptive expectations effects		Alternative system relative advantage		User switching costs		Incumbent system dissatisfaction		User switching intention	
		Items	Loadings	Items	Loadings	Items	Loadings	Items	Loadings	Items	Loadings
		ADAPEX1	0.825	RELAV2	0.842	SWICO2	0.825	DISSA1	0.734	SWINT1	0.954
		ADAPEX2	0.899	RELAV3	0.885	SWICO3	0.848	DISSA2	0.863	SWINT2	0.959
		ADAPEX3	0.860	RELAV4	0.900	SWICO4	0.833	DISSA3	0.891	SWINT3	0.950
		ADAPEX4	0.777	RELAV5	0.879	SWICO1	0.756	DISSA4	0.856		
				RELAV6	0.812						
Composite reliability	Above 0.8	0.906		0.936		0.889		0.904		0.968	
Cronbach's alpha	Above 0.7	0.861		0.915		0.832		0.857		0.951	
AVE	Above 0.5	0.708		0.747		0.666		0.703		0.911	

		Openness to novelty		Alertness to distinction		Awareness of multiple perspectives		Orientation in the present		User mindfulness	
		Items	Loadings	Items	Loadings	Items	Loadings	Items	Loadings	Items	Loadings
		MION2	0.778	MIAD3	0.802	MIAMP1	0.802	MIOP4	0.861	MION	0.786
		MION4	0.741	MIAD5	0.734	MIAMP4	0.802	MIOP5	0.861	MIAD	0.721
		MION6	0.735	MIAD6	0.829					MIAMP	0.760
Composite reliability	Above 0.8	0.796		0.832		0.783		0.851		0.800	
Cronbach's alpha	Above 0.7	0.615		0.696		0.446		0.650		0.624	
AVE	Above 0.5	0.565		0.623		0.643		0.740		0.571	

[1]All loadings are significant at $p < .001$

Table 1.5 Inter-construct correlations

			Inter-construct correlations [1]										
Variable	Mean	Std. Dev.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Incumbent system device complementarity effects	5.1514	1.724	(0.904)	0.241	0.226	0.240	0.303	0.247	0.090	0.267	-0.156	-0.015	0.083
(2) Incumbent system software complementarity effects	4.634	1.43365	0.241	(0.859)	0.285	0.243	0.300	0.233	0.174	0.164	-0.133	0.109	0.017
(3) Incumbent system functional complementarity effects	5.0998	1.32979	0.226	0.285	(0.839)	0.233	0.398	0.371	0.053	0.243	-0.292	-0.077	0.081
(4) Incumbent system coordination effects	4.2061	1.55124	0.240	0.243	0.233	(0.830)	0.355	0.377	0.011	0.183	-0.089	-0.046	0.078
(5) Incumbent system learning effects	5.1424	1.42567	0.303	0.300	0.398	0.355	(0.822)	0.305	0.054	0.289	-0.341	-0.038	0.149
(6) Incumbent system adaptive expectations effects	4.5270	1.63094	0.247	0.233	0.371	0.377	0.305	(0.841)	0.068	0.283	-0.279	-0.106	0.059
(7) Alternative system relative advantage	3.4120	1.46928	0.090	0.174	0.053	0.011	0.054	0.068	(0.864)	-0.013	-0.064	0.476	0.094
(8) User switching costs	4.3516	1.53965	0.267	0.164	0.243	0.183	0.289	0.283	-0.013	(0.816)	-0.150	-0.288	-0.060
(9) Incumbent system dissatisfaction	2.7885	.98484	-0.156	-0.133	-0.292	-0.089	-0.341	-0.279	-0.064	-0.150	(0.838)	0.119	-0.164
(10) User switching intention	3.0857	1.49747	-0.015	0.109	-0.077	-0.046	-0.038	-0.106	0.476	-0.288	0.119	(0.954)	0.069
(11) User mindfulness	5.3695	0.77392	0.083	0.017	0.081	0.078	0.149	0.059	0.094	-0.060	-0.164	0.069	(0.756)

Diagonal elements represent the square root of AVE for that construct
[1] * $p < .05$, ** $p < .01$, *** $p < .001$

1.5.2 Common method bias assessment

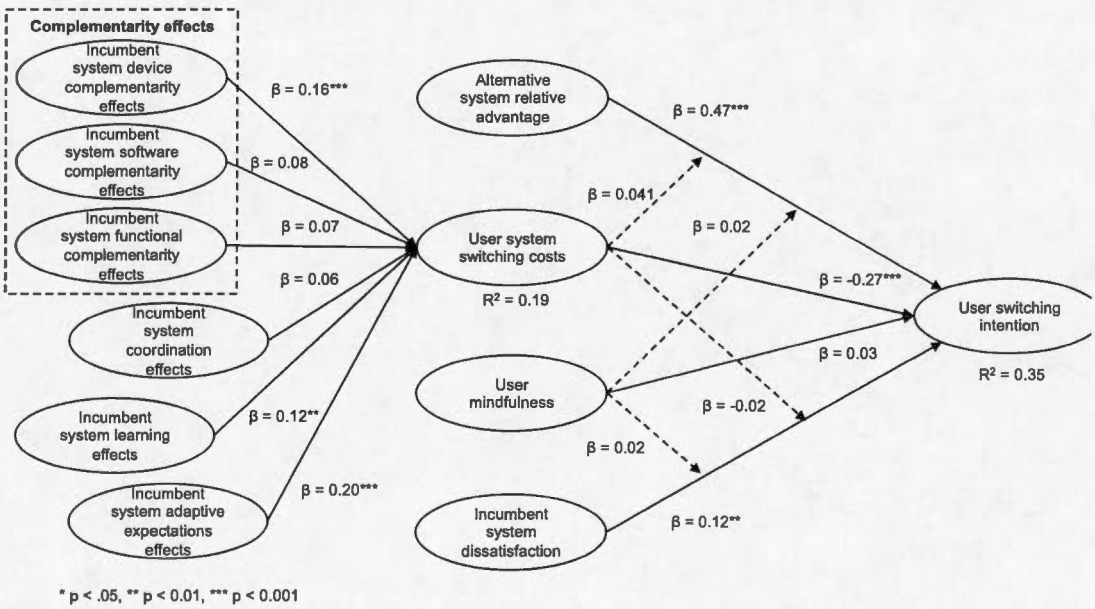
Because both independent and dependent variables of the research model were measured by self-report methods, the measures may have suffered from common method bias, which can inflate observed relationships between the variables. Two strategies were therefore adopted to safeguard against the presence of common method bias. First, we developed concise and clear items (Podsakoff et al., 2003). Second, by guaranteeing the respondents' anonymity, assuring them that there were no right or wrong answers, and requesting that each question be answered as honestly as possible we reduced the likelihood of bias caused by social desirability or respondent acquiescence (Podsakoff et al., 2003).

Two tests were also conducted once the data were collected to evaluate the presence of common method variance (CMV). First, we performed Harmon's single factor test (Podsakoff et al., 2003) by including all items in an exploratory factor analysis. As expected, the results revealed that no single factor accounted for a majority of variance, suggesting that there was no substantial CMV among the scales. Second, we used Lindell and Whitney's (2001) marker-variable technique, which provides a quantitative estimate of the magnitude of CMV. To apply this technique, "Education" was designated as the marker variable. No high correlations among any items of the study's principal constructs and "Education" were found. These findings, combined with the first test described above, suggest that there was no CMV bias in our data sample.

1.5.3 Hypotheses testing

Assessment of the structural model involves estimating the path coefficients, which assess the strengths of the relationships between the variables of the model. Figure 1.2 summarizes the results.

Figure 1.2 The estimated model



Hypothesis 1 tested for a positive relationship between Incumbent application software complementarity effects and User switching costs. Results show that Incumbent system device complementary effects were indeed significantly related to user's switching costs (ß = 0.16***) while Incumbent system software complementary effects and Incumbent system functional complementary effects were not (ß = 0.08 and ß = 0.07 respectively). Hence, Hypothesis 1 was only partially supported. Hypothesis 2 tested for a positive relationship between Incumbent system coordination effects and User switching costs, ans was not supported (ß = 0.06). Hypothesis 3 tested for a positive relationship between Incumbent system learning effects and User switching costs, and was supported (ß = 0.12**). Hypothesis 4 tested for a positive relationship between Incumbent system adaptive expectations effects and User switching costs, and was supported (ß = 0.20***). Hypothesis 5 tested for a positive relationship between Incumbent system dissatisfaction and User switching intention, and was supported (ß = 0.12**). Hypothesis 6 tested for a positive relationship between Alternative system relative advantage and User switching intention, and was supported (ß = 0.47***). Hypothesis 7 tested for a negative relationship between User switching costs and User switching intention, and was supported (ß = -0.27***). Hypothesis 8 tested whether the relationship between Incumbent system dissatisfaction and User switching intention was weaker when User switching costs are high than when they are low, and was not supported (ß = –0.02). Hypothesis 9 tested whether the relationship between Alternative system relative advantage and User switching intention was weaker when User switching costs are high than when they are low, and was not supported (ß = 0.041). Hypothesis 10 tested for a positive relationship between a User mindfulness and User switching intention, and was not supported (ß = 0.03). Hypothesis 11 tested whether the relationship between Incumbent system dissatisfaction and User switching intention was stronger when User mindfulness is high than when it is low, and was not supported (ß = 0.02). Finally, Hypothesis 12 tested whether the relationship between Alternative system relative advantage and User switching intention was stronger when User mindfulness is high than when it is low, and was not supported (ß = 0.02).

1.6 Discussion

The objective of this study is to develop and test a research model that extends the PPM migration model of IT switching with path dependency theory (PDT) tenets to also take into consideration the mechanisms that create IT switching costs and Mindfulness, a key positive and psychological mooring factor, that may facilitate IT user post-adoption switching. Before discussing our results and their theoretical and practical implications some limitations of the study should be noted. First, the selection of SNS as the focal technology puts into question how much our conclusions apply to other technologies such as cell phones and enterprise software that are hardware-centered and/or more productivity-oriented. In addition, at the time of data collection, the SNS market was dominated by a single major SNS that was well acquainted to many users. Hence, our model needs to be confirmed under different market settings, for example, in a market where the multiple competing alternatives have similar market shares. Second, our research sample is composed of university students who represent SNS users that are well-versed in SNS technology. As such, our results may not apply to more novice or casual users. Third, the cross-sectional research design used in this study limits our ability to empirically verify the causal relationships between the indepedent and dependent variables composing our research model. Fourth, the stastical tool used to test the structural models of the study (i.e., WarpPLS 3.0) relies on a "component-based" structural equation modeling technique which has been known to be more permissive than the "covariance structured-based" strucutral equation modeling technique offered in alternative statistical tools (e.g., EQS, Listrel, Amos). As such, considering that some of the coeficients of the structural model are lower than the recommended threshold of 0.2 (Chin, 1998), caution is required when interpreting our results.

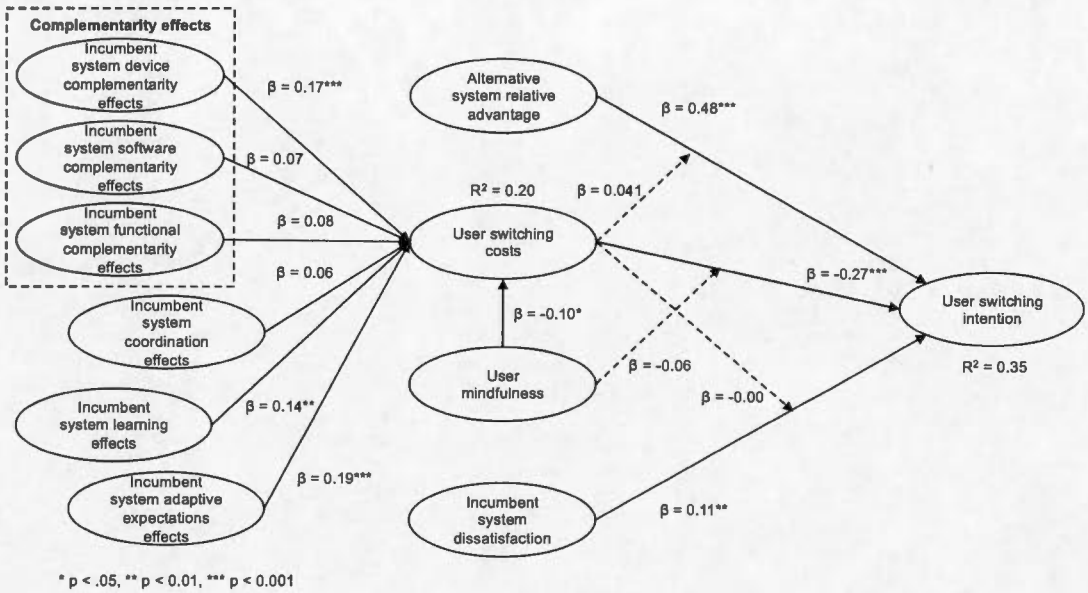
Our findings show that 3 out of the 6 self-reinforcing mechanisms (i.e., Incumbent system device complementarity effects, learning effects and adaptive expectation effects) did in fact increase User switching costs. These results are in line with the tenets of PDT and suggest that increasing returns may in fact lock-in users on certain SNS. However, the limited variance explained for the User switching costs variable (19%) seems to indicate that: (1) more research is needed to refine the scales; (2) PDT self-reinforcing mechanisms are not the only factors to influence User switching costs; and (3) much is still to be learned on the antecedents of IT switching.

Our findings also show that Incumbent system dissatisfaction (i.e., push factor) and Alternative system relative advantage (i.e., pull factor) positively influenced User switching intention while User switching costs (i.e., mooring factor) negatively influenced User switching intention. These findings corroborate the basic premises of migration theory and show that IT switching is analogous to the process of human migration. However, contrary to what was expected, we did not find support for the moderating effects of User switching costs on the relationship between Incumbent system dissatisfaction and User switching intention and on the relationship between Alternative system relative advantage and User switching costs. This unexpected result, which also occurred in other IT switching studies testing the PPM migration model of IT switching (Kim et al., 2006; Ye and Potter, 2011; Zhang et al., 2009), suggests that there might be an incongruence between the theoretical tenets of migration theory and the observed empirical results. Keeping in mind that the study of IT user switching is a nascent research stream, future research on this particular post-adoptive behavior should clarify this important incongruity and proceed carefully when making such a hypothesis.

Lastly, our results do not support the use of PDT to identify positive psychological factors that may facilitate IT user switching. Indeed, to our surprise, User mindfulness was not related to User switching intention nor did it moderate the relationship between

Incumbent system dissatisfaction and User switching intention and between Alternative system relative advantage and User switching costs. Considering that PDT studies clearly position mindfulness as a key construct to alleviate lock-ins and that IT switching studies have yet to include any positive psychological factor in the PPM migration model of IT switching, we conducted a post hoc analysis to see if conceptualizing User mindfulness according to PDT tenets better reflects reality than when the construct is conceptualized as prescribed by migration theory. As such, instead of conceptualizing User mindfulness as a mooring factor as prescribed by migration theory, we returned to the literature to conceptualize the construct according to PDT tenets. Indeed, within the PDT literature, proponents of path creation clearly stipulate that mindful actors may prevent the creation of a lock-in or enable a deviation from an existing lock-in (Garud and Karnøe, 2001). As such, we elected to test a model that conceptualizes User mindfulness as both an antecedent of User switching costs and as a construct moderating the relationship between User switching costs and User switching intention. Figure 1.3 shows that such a conceptualization of User Mindfulness better fits our data as the relationship between User mindfulness and User switching costs is significant (ß = -0.10*). However, User mindfulness did not moderate the relationship between User switching costs and User switching intention (ß = -0.06). Taken as a whole, these results indicate that User mindfulness should not be seen as a mooring factor but rather as an antecedent of User switching costs. Considering that we were the first to operationalize PDT at the IT user level and also the first to combine PDT to the PPM migration model of IT switching, these findings shed light on the difficulties of integrating the tenets of two complementary theories into a single framework. Furthermore, these findings also highlight that much is still be learned on the key positive psychological mooring factors that may facilitate IT user switching.

Figure 1.3 The estimated model (post hoc analysis)



1.6.1 Theoretical implications

By linking the theory of path dependence to the PPM model of IT switching, which compares the characteristics of an alternative system (pull factors) with those of an incumbent system (push factors), this study not only fosters our understanding of IT switching but also offers one of the few settings to adequately appraise the manifestation of lock ins and empirically validate the tenets of PDT. However, while our findings extend the PPM model of IT switching and provide sound explanations

for the creation of IT switching costs, a key mooring factor, it would be premature to label IT user switching as a path dependent behavior. According to PDT, a path dependent phenomenon must posses three different characteristics. First, the phenomenon must have been triggered by a contingent event. That is, the outcome of the phenomenon was not automatically determined from the onset and multiple outcomes were possible (Sydow et al., 2009; 2012). Second, the phenomenon must be subject to at least one self-reinforcing mechanism that produces "positive feedbacks" or "increasing returns". Third, the phenomenon must present a form of rigidity or lock-in, which gives predominance to a single solution and renders subsequent actions predictable. While theoretically easy to comprehend, obtaining empirical evidence of these three characteristics in a single study is difficult. Indeed, proving or obtaining evidence of contingency requires an idiographic approach that relies on a narrative description of events while confirming the presence of a self-reinforcing mechanism and a lock-in requires a nomothetic approach that relies on testing theoretical propositions (Dobusch and Kapeller, 2013). In the context of this study, we only tested for characteristics #2 and #3. As such, much research is still needed to show that IT user switching is path dependent. Nonetheless, despite this limitation, as well as the limited variance explained for the User switching costs variable and the fact that only three of the six self-reinforcing mechanisms had a significant impact, we hope that our first attempt to empirically test this important theory at the IT user level will encourage others to study the phenomenon and that the concept of path dependence will be used less metaphorically within the IS literature as it applies only to a selected group of phenomena that posses very specific characteristics.

1.6.2 Practical implications

For SNS users and IT users in general, our findings indicate that their past behaviors will significantly influence their present and future behaviors. As such, they should be careful when selecting and adopting a technology since their initial choice may trigger self-reinforcing mechanisms that will have long-lasting effects on their post-adoption behaviors. Also, they should not be afraid to cultivate a mindful mindset as it may help them to switch more easily from one IT to the other when time comes.

1.7 Conclusion

We set out to develop and test a research model that extends the PPM migration model of IT switching with path dependency theory (PDT) tenets to also take into consideration the mechanisms that create IT witching costs and Mindfulness, a key positive and psychological mooring factor that may facilitate IT user post-adoption switching. As a result, we contribute to the IT switching literature in two ways: 1) by demonstrating that the self-reinforcing mechanisms identified by PDT cause IT switching costs, and 2) by demonstrating that mindfulness may better be understood as an antecedent of IT switching costs rather than as a mooring factor. In addition, by being the first to clearly define and operationalize the set of four self reinforcing mechanisms identified by PDT at the IT user level, we have developed and tested new research measures that should be useful to other IS researchers. From a practical

perspective, this article helps IT users better understand the impact of their past actions, the possible lock-ins that may ensue as well as the benefits of cultivating certain psychological dispositions to allow them to more easily switch from one software application to the next.

1.8 Appendix A: Exploratory factor analysis (pilot test)

The purpose of this pilot test is was to validate our instruments for measuring the 6 self-reinforcing mechanisms that may affect SNS post-adopters. An online version of the questionnaire was developed and uploaded on the Survey Monkey platform. Then, an electronic link to the survey was sent via e-mail to one of the author's acquaintances and friends with a brief text explaining the purpose of the study and a request for their participation. A total of 251 invitations were sent and 79 respondents answered the online survey over a three-week period. After reviewing our sample, 22 of the responses were deleted because of missing data (15 responses) and non-use of SNS (7 responses). This resulted in a total of 57 usable responses and an effective response rate of 22.70 percent. Then, we ran a principal component analysis (PCA) using SPSS 23 to assess dimensionality. Results confirmed that the 24 items loaded on their respective self-reinforcing mechanism (see Table 1.6).

Table 1.6 Factor analysis of self-reinforcing mechanisms items [1]

Items	Incumbent system device complementarity effects	Incumbent system software complementarity effects	Incumbent system functionality complementarity effects	Incumbent system coordination effects	Incumbent system learning effects	Incumbent system adaptive expectations effects
DECOM1	.774	.223	.041	.069	.061	.057
DECOM2	.744	-.009	-.021	.265	.236	-.002
DECOM3	.820	.195	-.119	-.042	.044	.053
DECOM4	.826	-.083	-.006	.170	.099	-.042
SOCOM1	.191	.906	.174	.056	.073	.070
SOCOM2	.057	.900	.170	.171	.071	.070
SOCOM3	.046	.924	.136	.058	.089	.121
SOCOM4	.065	.915	.159	.149	.113	.116
FUCOM1	-.062	.177	.858	.142	.195	.022
FUCOM2	.025	.195	.863	.221	.194	.134
FUCOM3	-.038	.122	.823	.013	.152	.167
FUCOM4	-.042	.156	.884	.154	.134	.060
COOR1	.113	.254	.059	.810	.090	.006
COOR2	.219	.173	.108	.823	.136	.062
COOR3	.092	.078	.180	.831	.283	.147
COOR4	.061	-.052	.173	.830	.165	.127
LEARN1	.012	.119	.129	.400	.740	.144
LEARN2	.151	.116	.289	.084	.775	.048
LEARN3	.139	.079	.080	.160	.727	.368
LEARN4	.236	.074	.295	.203	.770	.112
ADAPEX1	-.078	-.029	.214	.011	.093	.783
ADAPEX2	.120	.158	-.096	.015	.278	.812
ADAPEX3	-.010	.260	-.010	.150	.309	.811
ADAPEX4	.058	.056	.340	.211	-.118	.676
Percent of variance	7.205	32.685	12.631	11.438	9.106	5.306

[1] Principal components with Varimax rotation

1.9 Appendix B: Survey instrument

ESG UQÀM
École des sciences de la gestion
Université du Québec à Montréal

QUESTIONNAIRE

« Comprendre les antécédents et l'impact d'un emprisonnement technologique sur le comportement de substitution d'un utilisateur: la perspective de l'effet de sentier »

CONSENTEMENT

En acceptant de remplir ce questionnaire, je consens volontairement à participer à ce projet de recherche. Je reconnais aussi que le responsable du projet a répondu à mes questions de manière satisfaisante et que j'ai disposé de suffisamment de temps pour réfléchir avant de prendre ma décision de participer à ce projet. Afin que vous vous sentiez libre de répondre de façon franche aux questions qui vous seront posées, il est entendu que les renseignements recueillis à l'aide de ce questionnaire seront confidentiels. Vous pouvez également mettre fin à votre participation en tout temps, sans pénalité d'aucune forme et sans aucune justification. Il suffit d'en informer le responsable du projet.

De plus, le projet auquel vous allez participer a été approuvé par le comité d'éthique de la recherche pour les projets étudiants impliquant des êtres humains (CÉRPÉ) de l'ESG-UQAM. Pour toutes questions ou commentaires ne pouvant être adressées directement à l'équipe de recherche composée de M. Philippe Marchildon et de son directeur M. Pierre Hadaya, vous pouvez contacter le coordonnateur du CÉRPÉ de l'ESG-UQAM, par l'intermédiaire de son secrétariat au numéro (514)-987-3000 #3237 ou par courriel à : prohet.alexandra@uqam.ca.

Votre collaboration est essentielle à la réalisation de ce projet et nous tenons à vous en remercier.

CONSIGNES

Afin d'établir un portrait réaliste de votre comportement de substitution des réseaux sociaux, il est important que vous partagiez votre expérience en remplissant le questionnaire qui suit. S.V.P., répondez à chacune des questions au meilleur de vos connaissances. Il n'y pas de bonne ou de mauvaise réponse. Même s'il s'avérait que certaines questions vous paraissent ambigües, répondez à chacune des questions sans hésitation puisque votre première impression représente généralement le mieux votre état d'esprit. À titre indicatif seulement, voici une liste des principaux réseaux sociaux disponibles sur le marché :

Google +	*Myspace*	*Pinterest*	*Ning*
Facebook	*Tumblr*	*Orkut*	*LinkedIn*
Twitter	*Flickr*	*Friendster*	*Viadeo*
Instagram	*Bebo*	*Myspace*	*CouchSurfing*

Le questionnaire comprend en tout 9 pages et 5 sous-sections. À la dernière page figure l'indication **FIN DU QUESTIONNAIRE**. Bien qu'il n'y ait pas de limite de temps établie pour compléter le questionnaire, nous estimons que cela devrait vous prendre un maximum de 15 minutes.

SECTION #1 – VOTRE UTILISATION DES RÉSEAUX SOCIAUX

Votre utilisation des réseaux sociaux

Utilisez-vous un ou plusieurs des réseaux sociaux disponibles sur le marché? ☐ **Oui** ☐ **Non**

L'utilisation de votre réseau social principal

Parmi l'ensemble des réseaux sociaux disponibles sur le marché, lequel considérez-vous comme votre réseau social principal (celui que vous utilisez le plus)? _____ (nom de votre réseau social principal).

Depuis combien d'années utilisez-vous votre réseau social principal? _____ (nbre d'années)

En moyenne combien d'heures par jour utilisez-vous votre réseau social principal ?_____ (nbre d'heures par jour).

SECTION #2 - LES MÉCANISMES D'AUTO-RENFORCEMENT

L'effet de complémentarité matérielle lié à votre réseau social principal

J'utilise …

	Pas du tout						*Dans une grande mesure*
… un **ordinateur de bureau** pour accéder à mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… un **ordinateur portable** pour accéder à mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… un **téléphone intelligent** pour accéder à mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… une **tablette numérique** pour accéder à mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… un **assistant personnel numérique** pour accéder à mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Accéder à mon réseau social principal via les appareils identifiés précédemment me permet …

	Fortement en désaccord						*Fortement en accord*
… de retirer **plus de bénéfices** que si j'y accédais via un nombre moins élevé d'appareils	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de gagner **plus de temps** que si j'y accédais via un nombre moins élevé d'appareils	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de déployer **moins d'effort** que si j'y accédais via un nombre moins élevé d'appareils	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… d'avoir une expérience **plus agréable** que si j'y accédais via un nombre moins élevé d'appareils	*1*	*2*	*3*	*4*	*5*	*6*	*7*

L'effet de complémentarité applicative lié à votre réseau social principal

Mon réseau social principal est intégré aux…

	Pas du tout						*Dans une grande mesure*
… **jeux** que j'utilise	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… **sites web** que j'utilise *(ex., les boutons Facebook* Partager *et Twitter* Tweeter *sur le site web de La Presse, authentification sur un site web à l'aide de votre compte (usager et mot de passe) de votre réseau social principal, etc.)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… **logiciels** que j'utilise *(partage des contacts entre votre réseau social et votre courriel ou un logiciel de type Skype, inclusion d'une barre d'outil spécifique à votre réseau social principal dans votre navigateur web, etc.)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*

L'intégration de mon réseau social principal aux applications identifiées précédemment me permet …

	Fortement en désaccord						*Fortement en accord*
… de retirer **plus de bénéfices** que si ce dernier était intégré à un nombre moins élevé d'applications	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de gagner **plus de temps** que si ce dernier était intégré à un nombre moins élevé d'applications	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de déployer **moins d'efforts** que si ce dernier était intégré à un nombre moins élevé d'applications	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… d'avoir une expérience **plus agréable** que si ce dernier était intégré à un nombre moins élevé d'applications	*1*	*2*	*3*	*4*	*5*	*6*	*7*

L'effet de complémentarité fonctionnelle lié à votre réseau social principal

J'utilise mon réseau social principal afin…

	Pas du tout						*Dans une grande mesure*
… d'**éditer mon profil personnel**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de **communiquer** avec les autres utilisateurs	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de **publier** et/ou **consulter** du contenu	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de **signaler ma localisation physique** et de **repérer celle des autres** utilisateurs	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de **signaler ma présence en ligne** et de **repérer celle des autres** utilisateurs	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de **différencier les types de relations que j'établis** avec les autres utilisateurs	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… d'**évaluer ma popularité et celle des autres** utilisateurs	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de **former des groupes et/ou des sous-groupes** avec les autres utilisateurs	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Parce qu'il me permet d'avoir accès aux fonctionnalités identifiées précédemment à un même endroit, mon réseau social principal me permet de …

	Fortement en désaccord						*Fortement en accord*
… retirer **plus de bénéfices** que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… gagner **plus de temps** que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… déployer **moins d'efforts** que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… d'avoir une expérience **plus agréable** que si je devais utiliser plusieurs réseaux sociaux pour avoir accès aux mêmes fonctionnalités	*1*	*2*	*3*	*4*	*5*	*6*	*7*

L'effet de coordination lié à votre réseau social principal

J'utilise mon réseau social principal pour rejoindre …

	Pas du tout						*Dans une grande mesure*
… mes **amis**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… mes **collègues de classe**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… mes **collègues de travail**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… mes **contacts professionnels**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… les **membres de ma famille**	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Le nombre de relation que j'ai établi sur mon réseau social principal me permet …

	Fortement en désaccord						*Fortement en accord*
… de retirer **plus de bénéfices** que si j'avais établi un nombre moins élevé de relations	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de gagner **plus de temps** que si j'avais établi un nombre moins élevé de relations	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… de déployer **moins d'efforts** que si j'avais établi un nombre moins élevé de relations	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… d'avoir une expérience **plus agréable** que si j'avais établi un nombre moins élevé de relations	*1*	*2*	*3*	*4*	*5*	*6*	*7*

L'effet d'apprentissage lié à votre réseau social principal

Évaluer votre niveau d'habilité à utiliser les fonctionnalités suivantes :

	Faible niveau d'habileté						*Grand niveau d'habileté*
Éditer mon profil personnel sur mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Communiquer avec les autres utilisateurs de mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Publier du contenu sur mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Signaler ma localisation physique et **repérer celle des autres** utilisateurs de mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Signaler ma présence en ligne et **repérer celle des autres** utilisateurs de mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Différencier les types de relations que j'établis avec les autres utilisateurs de mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Évaluer ma popularité et celle des autres utilisateurs de mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Former des groupes et/ou des sous-groupes avec les autres utilisateurs de mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Les habiletés que j'ai acquises en utilisant mon réseau social principal…

	Fortement en désaccord						*Fortement en accord*
… m'offrent aujourd'hui des **bénéfices** que je n'étais pas en mesure d'obtenir lorsque j'ai commencé à l'utiliser	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… m'offrent aujourd'hui des **gains en temps** que je n'étais pas en mesure d'obtenir lorsque j'ai commencé à l'utiliser	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… me permettent aujourd'hui d'utiliser ce dernier en faisant **moins d'efforts** que lorsque j'ai commencé à l'utiliser	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… rendent mon utilisation **plus agréable** que lorsque j'ai commencé à l'utiliser	*1*	*2*	*3*	*4*	*5*	*6*	*7*

L'effet d'attentes adaptives lié à votre réseau social principal

À mes yeux, mon réseau social principal a une plus grande valeur que tout autre réseau social car…

	Fortement en désaccord						*Fortement en accord*
… il est le **plus populaire**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… il est le **plus en vogue**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… il génère le plus **d'engouement**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… il est attendu qu'il aura le **plus grand nombre d'utilisateur** dans le futur	*1*	*2*	*3*	*4*	*5*	*6*	*7*

SECTION #3 - LES FACTEURS DE SUBSTITUTION

Niveau de satisfaction de votre réseau social principal

Pour chacune des paires de mots proposées ci-dessous, indiquez le pointage qui décrit le mieux votre expérience globale d'utilisation de votre réseau social principal.

Très insatisfait	1	2	3	4	5	6	7	**Très satisfait**
Très malheureux	1	2	3	4	5	6	7	**Très heureux**
Très frustré	1	2	3	4	5	6	7	**Très content**
Très ennuyé	1	2	3	4	5	6	7	**Très enchanté**

Coûts de substitution de votre réseau social principal

Indiquez le pointage qui décrit le mieux votre accord avec les énoncés suivants :

	Fortement en désaccord						*Fortement en accord*
Dans l'ensemble, je prendrais beaucoup de temps et mettrais beaucoup d'efforts à substituer/remplacer mon réseau social principal par un autre réseau social	*1*	*2*	*3*	*4*	*5*	*6*	*7*
De façon générale, le temps et les efforts nécessaires pour passer de mon réseau social principal à un autre seraient élevés	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Tout considéré, le temps et les efforts nécessaires pour arrêter d'utiliser mon réseau social principal et démarrer avec un autre réseau social seraient élevés	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Dans l'ensemble, j'investirais et perdrais beaucoup, si je substituais/remplaçais mon réseau social principal	*1*	*2*	*3*	*4*	*5*	*6*	*7*
De façon générale, je trouverais cela désagréable de passer de mon réseau social principal à un autre	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Identification de votre réseau social alternatif

Si vous aviez à substituer/remplacer votre réseau social principal, lequel des autres réseaux sociaux disponibles sur le marché considèreriez-vous d'avantage afin de réaliser les mêmes activités (c.-à-d., avoir accès aux mêmes fonctionnalités et aux mêmes personnes)? _____ (nom de votre réseau social alternatif).

À titre indicatif seulement, voici une liste des principaux réseaux sociaux disponibles sur le marché :

Google +	*Myspace*	*Pinterest*	*Ning*
Facebook	*Tumblr*	*Orkut*	*LinkedIn*
Twitter	*Flickr*	*Friendster*	*Viadeo*
Instagram	*Bebo*	*Myspace*	*CouchSurfing*

Attrait de votre réseau social alternatif

Utiliser mon réseau social alternatif pour réaliser les mêmes activités que je réalise sur mon réseau social principal…

	Fortement en désaccord						*Fortement en accord*
… me permettrait de **gagner du temps**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… améliorerait la **qualité** de mes interactions sociales	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… me permettrait de soutenir mes interactions sociales **plus facilement**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… me permettrait de soutenir mes interactions sociales **plus efficacement**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… me permettrait de soutenir mes interactions sociales de façon **plus productive**	*1*	*2*	*3*	*4*	*5*	*6*	*7*
… rendrait mes interactions sociales **plus agréable**	*1*	*2*	*3*	*4*	*5*	*6*	*7*

SECTION #4 – VOTRE COMPORTEMENT DE SUBSTITUTION

Intention du substituer votre réseau social principal

Pour chacune des paires de mots énoncées ci-dessous, indiquez le pointage qui décrit le mieux votre intention de substituer/remplacer votre réseau social principal par votre réseau social alternatif afin d'effectuer les mêmes activités.

Pas du tout plausible	*1*	*2*	*3*	*4*	*5*	*6*	*7*	**Très plausible**
Très improbable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	**Très probable**
Aucune chance	*1*	*2*	*3*	*4*	*5*	*6*	*7*	**Chance absolue**

SECTION #5 – TRAITS DE PERSONNALITÉ

Vos traits de personnalité

Ci-dessous, se trouvent un certain nombre d'énoncés faisant référence à votre vision personnelle. S.V.P., indiquez dans quelle mesure vous êtes en accord avec chacun de ces énoncés. Si vous êtes confus par la formulation d'un item, n'avez pas opinion, ou êtes ni en accord ou en désaccord utilisez le pointage « 4 ».

	Fortement en désaccord						*Fortement en accord*
J'aime faire enquête	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Je génère peu de nouvelles idées	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Je suis toujours ouvert aux nouvelles façons de faire	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Je m'implique dans presque tout ce que je fais	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Je cherche activement à apprendre de nouvelles choses	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Je fais de nombreuses nouvelles contributions	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Je préfère les vraies bonnes vielles façon de faire les choses	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Je remarque rarement ce que les autres font	*1*	*2*	*3*	*4*	*5*	*6*	*7*

J'évite les conversations qui portent à réfléchir	*1 2 3 4 5 6 7*
Je suis très créatif	*1 2 3 4 5 6 7*
Je peux agir de différentes façons dans une situation donnée	*1 2 3 4 5 6 7*
Je porte attention à la vue d'ensemble (« big picture »)	*1 2 3 4 5 6 7*
Je suis très curieux	*1 2 3 4 5 6 7*
J'essaie de penser à de nouvelles façons de faire les choses	*1 2 3 4 5 6 7*
Je suis rarement au courant des changements autour de moi	*1 2 3 4 5 6 7*
J'ai un esprit ouvert à propos de tout, même envers les choses qui remettent en question mes valeurs fondamentales	*1 2 3 4 5 6 7*
J'aime les défis intellectuels	*1 2 3 4 5 6 7*
Je trouve cela facile de créer des idées nouvelles et efficaces	*1 2 3 4 5 6 7*
Je suis rarement alerte aux nouveaux développements	*1 2 3 4 5 6 7*
J'aime découvrir comment les choses fonctionnent	*1 2 3 4 5 6 7*
Je suis un penseur original	*1 2 3 4 5 6 7*

SECTION #6 – INFORMATION DÉMOGRAPHIQUE

Votre âge : _____ Ans

Votre sexe : _____ M/F

Quel est votre plus haut niveau d'étude complété?

Primaire	☐	Secondaire	☐	Collégial	☐
Baccalauréat	☐	Maitrise	☐	Doctorat	☐

SECTION #7 – CONSENTEMENT POUR UNE CONSULTATION ULTÉRIEURE

Afin d'approfondir certains résultats de l'étude, nous aimerions vous contacter à nouveau. Dans la mesure où vous acceptez notre invitation à participer à la seconde phase de notre étude, veuillez inscrire votre nom ainsi que les coordonnées qui nous permettront de communiquer avec vous.

Je consens à participer à la deuxième phase de cette étude : ☐ Oui ☐ Non

Nom et prénom	
Courriel UQÀM	
Autre courriel (facultatif)	

FIN DU QUESTIONNAIRE

1.10 References

Appleinsider.com (2013) "Apple's iPhone grew to 25.1% global market share in 2012", http://appleinsider.com/articles/13/01/25/apples-iphone-grew-to-251-global-market-share-in-2012.

Arthur, W.B. (1989) "Competing Technologies, Increasing Returns, and Lock-in by Historical Events", Economic Journal, 99(394), pp. 116-131.

Arthur, W.B. (1994) "Increasing Returns and Path Dependence in the Economy", University of Michigan Press, Ann Arbor, MI.

Bansal, H.S., Taylor, S.F. and St. James, Y. (2005) " "Migrating" to New Service Providers: Toward a Unifying Framework of Consumers' Switching Behaviors", Journal of the Academy of Marketing Science, 33(1), pp. 96-115.

Beyer, J. (2010) " The Same or Not the Same – On the Variety of Mechanisms of Path Dependence", International Journal of Social Science, 5(1), pp. 1-11.

Bhattacherjee, A. (2001) "Understanding Information Systems Continuance: An Expectation-Confirmation Model", MIS Quarterly, 25(3), pp. 351-370.

Bhattacherjee, A., Limayem, M. and Cheung, C.M.K. (2012) "User Switching of Information Technology: A Theoretical Synthesis and Empirical Test", Information & Management, 49(7-8), pp. 327-333.

Bhattacherjee, A. and Park, S.C. (2014) "Why End-Users Move to the Cloud: A Migration-Theoric Analysis", European Journal of Information Systems, 23(3), pp. 357-372.

Boyd, D.M. and Ellison, N.B. (2008) "Social Network Sites: Definition, History, and Scholarship", Journal of Computer-Mediated Communication, 13(1), pp. 210–230.

Boyle, P. Halfacree, K. and Robinson, V. (1998) "Exploring Contemporary Migration, Longman, New-York, NY.

Butler, B.S. and Gray, P.H. (2006) "Reliability, Mindfulness, and Information Systems", MIS Quarterly, 30(2), pp. 211-224.

Clark, D.E. and Hedge, R. (2001) "Personal and Location-Specific Characteristics and Elderly Interstate Migration", Growth and Change, 27(3), pp. 193-218.

Chang, I.C., Lui, C.-C. and Chen, K. (2014) "The Push, Pull and Mooring Effects in Virtual Migration for Social Network Sites", Information Systems Journal, 24(4), pp. 323-346.

Chanowitz, B. and Langer, E. J. (1980) "Knowing More (or Less) Than You Can Show: Understanding Control Through the Mindlessness/Mindfulness Distinction", In Seligman, M.E. and Garber, J. (Eds.), Human Helplessness, Academic Press, New York, NY, pp. 97-129.

Chin, W.W. (1998) "The Partial Least Squares Approach for Structural Equation Modeling" In Marcoulides, G.A. (Eds), Modern Methods for Business Research, Lawrence Erlbaum Associates, HillsDale, New York, NY, pp. 296-336.

David, P.A. (1985) "Clio and the Economics of Qwerty", The American Economic Review, 75(2), pp. 332-337.

Dobusch, L. and Kapeller, J. (2013) "Breaking New Paths: Theory and Method in Path Dependence Research", Schmalenbach Business Review, 65, pp. 288-311.

Dobusch, L. and Schußler, E. (2012) "Theorizing Path Dependence: A Review of Positive Feedback Mechanisms in Technology Markets, Regional Clusters, and Organizations", Industrial and Corporate Change, 22(3), pp. 617-647.

Dorigo, G. and Tobler, W. (1983) "Push-Pull Migration Laws", Annals of the Association of American Geographers, 73(1), pp. 1-17.

Duan, W., Gu, B. and Whiston, A.B. (2009) "Informational Cascades and Software Adoption on the Internet: An Empirical Investigation", MIS Quarterly, 33(1), pp. 23-48.

Fichman, R.G. (2004) "Going Beyond the Dominant Paradigm for Information Technology Innovation Research: Emerging Concepts and Methods", Journal of the Association for Information Systems, 5(8), pp. 314-355.

Fiol, C.M., and O'Connor, E.J. (2003) "Waking Up! Mindfulness in the Face of Bandwagon", Academy of Management Review, 28(1), pp. 54-70.

Fornell, C. and Larcker, D. (1981) "Structural Equation Models with Unobservable Variables and Measurement Error", Journal of Marketing Research, 18(1), pp. 39–50.

Gandal, N. (1994) "Hedonic Price Indexes for Spreadsheets and an Empirical Test for Network Externalities", RAND Journal of Economics, 25(1), pp. 160-170.

Garud, R. and Karnøe, P. (2001) "Path Creation as a Process of Mindful Deviation", In Garud, R and Karnøe, P. (Eds.), Path Dependence and Creation, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 1-38.

Garud, R. and Rappa, M. (1994) "A Socio-Cognitive Model of Technology Evolution", Organization Science, 5(3), pp. 344-362.

Garud, R., Kumaraswamy, A. and Karnoe, P. (2010) "Path Dependence or Path creation?", Journal of Management Studies, 47(4), pp. 760-774.

Giddens, A, (1984) "The Constitution of Society: Outline of a Theory of Structuration", Polity press, Cambridge.

Henten, A. and Godoe, H. (2010) "Demand Side Economies of Scope in Bundled Communication Services", INFO, 12(1), pp. 26-38.

Herberle, R. (1938) "The Causes of Urban-Rural Migration: A Survey of German Theories", American Journal of Sociology, 43(6), pp. 932-950.

Hsu, C.-L. and Lu, H.-S. (2004) "Why Do People Play On-Line Video Games? An Extended TAM with Social Influences and Flow Experience", Information & Management, 41(7). Pp. 853-868.

Johnson, E.J., Bellman, S. and Lohse, G. (2003) "Cognitive Lock-in and the Power Law of Practice", Journal of Marketing, 67(2), pp. 62-75.

Katz, M.L. and Shapiro, C. (1985) "Network Externalities, Competition, and Compatibility", The American Economic Review, 75(3), pp. 424-440.

Katz, M.L. and Shapiro, C. (1986) "Technology Adoption in the Presence of Network Externalites", Journal of Political Economy, 94(4), pp. 822-841.

Kim, G., Shin, B. and Lee, H.G. (2006) "A Study of Factors that Affect User Intentions Towards Email Services Switching", Information & Management, 43(7), pp. 884-893.

Langer, E.J. (1989) "Mindfulness", Addison-Wesley, Reading, MA.

Langer, E.J. (1997) "The Power of Mindful Learning", Addison-Wesley, Reading, MA.

Langer, E.J. (2004) "Langer Mindfulness Scale User Guide and Technical Manual", IDS Publishing Corporation, Worthington, OH.

Langer, E.J. and Piper, A. (1987) "The Prevention of Mindlessness", Journal of Personality and Social Psychology, 53(2), pp. 280-287.

Langer, E.J. and Weinman, C. (1981) "When Thinking Disrupts Intellectual Performance: Mindlessness on an Overlearned Task", Personality and Social Psychology Bulletin, 7(2), pp. 240-243.

Langer, E.J., Janis, I. and Wolfer, J. (1975) "Reduction of Psychological Stress in Surgical Patients", Journal of Experimental Social Psychology, 11(2), pp. 155-165.

Lee, E.S. (1966) "A Theory of Migration", Demography, 3(1), pp. 47-57.

Lin, C.-P. and Bhattacherjee, A. (2008) "Elucidating Individual Intention to Use Interactive Information Technologies: The Role of Network Externalities", International Journal of Electronic Commerce, 13(1), pp. 85-108.

Lin, K.-Y. and Lu, H.-P. (2011) "Why People Use Social Networking Sites: An Empirical Study Integrating Network Externalities and Motivation Theory", Computers in Human Behavior, 27(3), pp. 1152-1161.

Linde, F., Kock, M. and Gorges, A. (2012) "Network effects of digital information goods: a proposal for the operationalization of ditect and indirect network effects", International Journal of Business Research, 12(3), pp. 1-13.

Lindell, M.K. and Whitney, D.J. (2001) "Accounting for Common Method Variance in Cross- Sectional Research Designs", Journal of Applied Psychology, 86(1), pp. 114–121.

Longino, C.F., Jr (1992) "The Forest and the Trees: Micro-Level Considerations in the Study of Geographic Mobility in Old Age", In Rogers, A. (Ed.), Elderly Migration and Population Redistribution, Bellhaven, London, pp. 22-34.

Limayem, M., Hirt, S.G. and Cheung, C.M.K. (2007) "How Habit Limits the Predictive Power of Intention: The Case of Information Systems Continuance", MIS Quarterly, 31(4), pp. 705-737.

Malone, T.W. and Crowston, K. (1994) "The Interdisciplinary Study of Coordination" ACM Computing Surveys, 26(1), pp. 87-119.

March, J.G. (1971) "The technology of Foolishness", Civilokonomen, 18(4), pp. 4-12.

Moon, B. (1995) "Paradigms in Migration Research: Exploring "Moorings" as a Schema", Progress in Human Geography, 19(4), pp. 504-524.

Moore, G.C. and Benbasat, I. (1991) "Development of an Instrument to Measure Perceptions of Adopting an Information Technology Innovation", Information Systems Research, 2(3), pp. 192-222.

Net Applications (2011) "Browser Market Share", http://marketshare.hitslink.com/report.aspx?qprid=0.

NETendances (2014) "Les Médias Sociaux, Au Cœur du Quotidien des Québécois", Vol. 5, No. 1, pp. 1-10.

Oliver, R.L. (1981) "Measurement and Evaluation of Satisfaction Processes in Retail Setting", Journal of Retailing, 57(3), pp. 25-48.

Pae, J.H. and Hyun, J.S. (2002) "The Impact of Technology Advancement Strategies on Consumers' Patronage Decisions", The Journal of Product Innovation Management, 19(5), pp. 375-383.

Podsakoff, P.M., Mackenzie, S.B., Lee, J.Y. and Podsakoff, N.P. (2003) "Common Method Biases in Behavioural Research: A Critical Review of the Literature and Recommended Remedies", Journal of Applied Psychology, 88(5), pp. 879–903.

Polites, G.L. and Karahanna, E. (2012) "Shackled to the Status Quo: The Inhibitting Effects of Incumbent System Habit, Switching Costs, and Inertia on New System Acceptance", MIS Quarterly, 36(1), pp. 21-42.

Raveinstein, E.G. (1885) "The Laws of Migration", Journal of the Royal Statistical Society, 48(2), pp. 167-235.

Raveinstein, E.G. (1889) "The Laws of Migration", Journal of the Royal Statistical Society, 52(2), pp. 241-305.

Ray, S., Kim, S.S. and Morris, J.G. (2012) "Research Note—Online Users' Switching Costs: Their Nature and Formation", Information Systems Research, 23(1), pp. 197-213.

Rogers, E.M. (2003) "The Diffusion of Innovations: Fifth Edition", Free Press, New-York, NY.

Saxenian, A. (1999) "Comment on Kenney and von Burg, "Technology, Entrepreneurship and Path Dependence: Industrial Clustering in Silicon Valley and Route 128", Industrial Corporate Change, 8(1), pp. 105-110.

Schreyögg, G. and Sydow, J. (2011) "Organizational Path Dependence: A Process View", Organization Studies, 32(3), pp. 321-335.

Shapiro, C. and Varian, H.R. (1999) "Information Rules: A Strategic Guide to the Network Economy", Harvard Business School Press, Boston, MA.

Stimson, R.J. and Minnery, J. (1998) " Why People Move to the "Sun-Belt": A Case Study of Long-Distance Migration to the Gold Coast, Australia", Urban Studies, 35(2), 193-214.

Sun, H. (2013) "A Longitudinal Study of Herd Behavior in the Adoption and Continued Use of Technology" MIS Quarterly, 37(4), pp. 1013-1041.

Sydow, J. and Schreyögg, G. and Koch, J. (2009) "Organizational Path Dependence: Opening the Black Box", Academy of Management Review, 34(4), pp. 689-709.

Sydow, J., Windeler, A., Müller-Seitz, G. and Lange K. (2012) "Path Constitution Analysis: A Methodology for Understanding Path Dependence and Path Creation", Business Research, 5(2), pp. 155-176.

Taylor, S. and Todd, P.A. (1995) "Understanding Information technology Usage: A Test of Competing Models", Information Systems Research, 6(2), pp. 144-176.

Thatcher, J.B. (under review) "Mindfulness in Information Technology Use: A Conceptual and Operational Definition".

Thatcher, J. B. and Perrewe, P. L. (2002) "An Empirical Examination of Individual Traits as Antecedents to Computer Anxiety and Computer Self-Efficacy", MIS Quarterly, 26(4), pp. 381-396.

Thomas, D.S. (1938) "Memorandum on Migration Differentials" New-York: Social Science Research Concil, Bulletin 43.

Vergne, J.-P. and Durand, R. (2011) "The Path of Most Persistence: An Evolutionary Perspective on Path Dependence and Dynamic Capabilities", Organization Studies, 32(3), pp. 365-382.

Ye, C. and Potter, R. (2011) "The Role of Habit in Post-Adoption Switching of Personal Information Technologies: An Empirical Investigation", Communications of the Association for Information Systems, 28(35), pp. 585-610.

Ye, C., Seo, D., Desouza, K.C., Sangareddy, S.P. and Jha, S. (2008) "Influences of IT Substitutes and User Experience on Post-Adoption User Switching: An Empirical Investigation", Journal of the American Society for Information Science and Technology, 59(13), pp. 2115-2132.

Zhang, K.Z.K., Lee, M. K.O., Cheung, C.M.K. and Chen, H. (2009) "Understanding the Role of Gender in Bloggers' Switching Behavior", Decision Support Systems, 47(4), pp. 540-546.

CHAPTER II

UNDERSTANDING WHY AND HOW ORGANIZATIONAL IS CHANGES UNFOLD OVER TIME: A COMPARISON OF PATH DEPENDENCY, IMPRINTING AND STRUCTURAL INERTIA THEORIES

2.1 Introduction

In today's digital economy, organizations must constantly adapt and improve their information systems (IS) in order to remain competitive in their markets (Sambamurthy et al., 2003). Yet, making IS changes in the hope of maintaining the strategic alignment of information systems can be a double-edged sword. Indeed, although most IS changes tend to initially provide benefits to organizations by enabling them to become more effective and efficient, some IS changes can also have negative effects by latter hindering organizational performance and becoming a barrier to future IS changes (Lu and Ramamurthy, 2011). For example, organizations are often constrained by the limitations of their inflexible legacy IS, rigid information technology architectures, or complex nests of disparate technology silos so much so that their IS can paralyze them and hence hinder organizational IS change (van Oosterhout et al. 2006). In other words, because an IS change can influence subsequent IS changes in organizations, "history matters". Hence, it is important to understand why and how organizational IS changes unfold over time.

Within the IS literature, the importance of history in the evolution of IS in organizations is most often conveyed via the concept of path dependence. Unfortunately, this usage is more metaphorical than theoretical, devoiding path dependence of its meaning and making it easily confused with other phenomena such as imprinting and structural inertia which convey very different understandings of history and its influence on the evolution of IS in organizations. Indeed, path dependence implies that history interplays with current and future actions because self-reinforcing mechanisms tend to favor incumbent organizational behaviors to the detriment of newer ones (Arthur, 1989). In turn, imprinting entails that history constrains current and future organizational behaviors because certain environmental conditions (i.e., technological, economical, institutional, and key individuals) mold organizations in a persistent manner during brief susceptible periods (Marquis and Tilcsik, 2013). Finally, structural inertia infers that history interferes with present and future actions because reproducible structures, set up to ensure organizational survival, create strong pressures against change that reveal the constraining effect of history on ensuing organizational behaviors (Kelly and Amburgey, 1991). Accordingly, these three conceptualizations direct our attention to different phenomena (i.e., variables and processes) while the values embedded in their underlying theories lead change agents to experience different problems of organizational change, as well as to take on different roles and initiate different strategies to cope with these problems (Dunphy, 1996; Markus, 1983). Since, "a way of seeing is a way of not seeing (Poggie, 1965, p. 284)", it is important to clarify the confusion surrounding these three conceptualizations in order to properly guide change agents who are responsible for the evolution of IS in organizations. This suggests the need to examine these commonly used conceptualizations, as well as their respective theoretical rationale to comprehend the full impacts of history in the evolution of IS in organizations.

Considering the three conceptualizations used in the IS literature to portray the importance of history in the evolution of IS in organizations, as well as the need to

understand why and how organizational IS changes unfold over time, the objective of this study is twofold. First, we rely on Van de Ven and Poole's (1995) typology for illustrating and distinguishing change theories, to clarify the concept of path dependence with similar conceptualizations, namely imprinting and structural inertia. Second, we conduct a congruence case study to elucidate and compare the explanatory merits of these three theories in order to identify the one that better explains why and how organizational IS changes unfold over time.

This research contributes to the literature in three ways. First, by theoretically exposing the distinctive nature of path dependence, imprinting and structural inertia, this study clears the confusion that exists between these conceptualizations. Second, by empirically validating each conceptualization's underlying theory, this study highlights their relative predictive power and their complementarities in explaining the evolution of an information system and the constraining effect of history that often accompanies it. In addition, by revealing several cycles, motors, units and modes of change that give to history it's meaning, this study identifies different change dynamics and their respective barriers to change that need to be managed by IS change agents responsible for the evolution of IS in their organization.

This article is structured as follows. First, we present Van De Ven and Poole's (1995) typology for illustrating and distinguishing change theories in order to establish a set of four key theoretical characteristics upon which to compare and differentiate the theories of path dependence, imprinting, and structural inertia. Second, based on these four characteristics, we discuss the tenets of path dependency, imprinting and structural inertia theories in order to develop an initial understating of each theory's assumptions about organizational change, as well as the constraining effect of history that often accompanies it. Third, we explain the congruence case study methodology used to empirically elucidate and compare the explanatory merits of these theories to explain why and how organizational IS changes unfold over time. Fourth and fifth, we present

and discuss our results. Finally, the paper discusses the limitation of this study as well as its theoretical and practical implications.

2.2 Theoretical background: explaining organizational change and the constraining effect of history

2.2.1 Illustrating and Distinguishing Organizational Change Theories

Anchored on an interdisciplinary literature review, Van de Ven and Poole (1995) inductively identified that process theories explaining organizational change could be grouped into four basic archetypes, namely life-cycle, evolutionary, dialectical, and teleological theories. According to the authors, each of these four archetypes are anchored on a specific metaphor and a particular logic, and hence, the archetypes explain how and why an organizational change unfolds through fundamentally different cycles and motors of change (see Table 2.1 for a description of each archetype). An organizational change theory's cycle of change refers to its depiction of the temporal sequence of events as a change unfolds while an organizational change theory's motor of change refers to its depiction of the generative mechanisms that cause/govern the change process, as well as the particular circumstances or contingencies behind these causal mechanisms (Van De Ven and Poole, 1995).

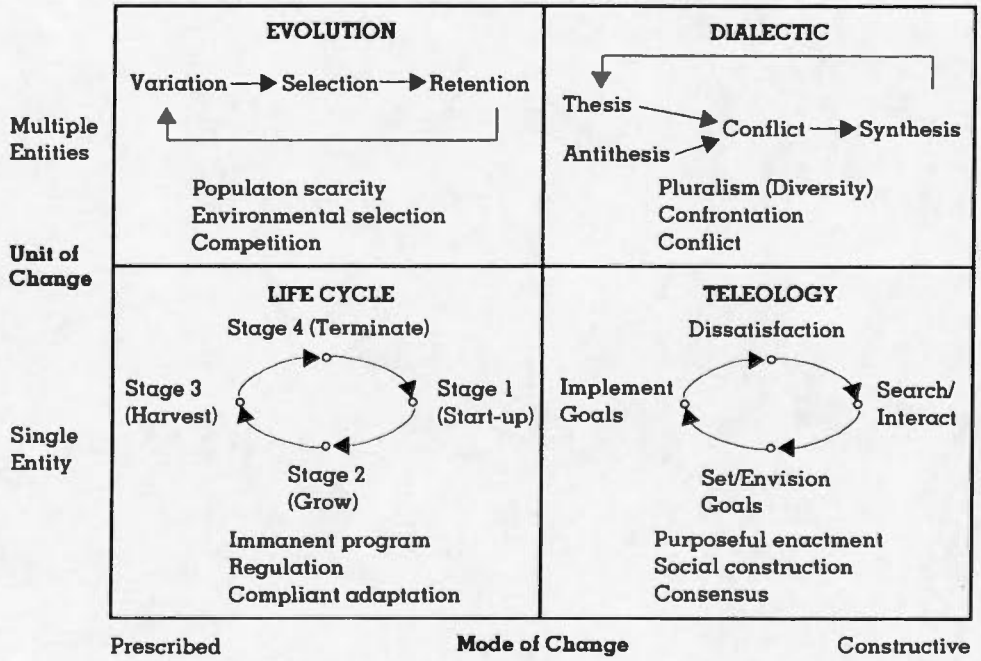
Table 2.1 A description of Van de Ven and Poole's (1995) ideal-type theories of change

Archetype	Life-cycle	Evolutionary	Dialectical	Teleological
Key metaphor	Organic growth	Competitive survival	Opposition, conflict	Purposeful cooperation
Underlying logic	▪ Imminent program ▪ Prefigured sequence ▪ Compliant adaptation	▪ Natural selection among competitors in a population	▪ Contradictory forces ▪ Thesis, antithesis, synthesis	▪ Envisioned end state ▪ Social construction ▪ Equifinality
Cycle of change	Linear and irreversible sequence of prescribed stages in unfolding of imminent potentials present at the beginning	Recurrent, cumulative, and probabilistic sequence of variation, selection, and retention events	Recurrent, discontinuous sequence of confrontation, conflict and synthesis between contradictory values or events	Recurrent, discontinuous sequence of goal setting, implementation, and adaptation of means to reach desired end state
Motor of change	Prefigured program/rule regulated by nature, logic, or institutions	▪ Population scarcity ▪ Competition	Conflict and confrontation between opposing forces, interests, or classes	Goal enactment consensus on means cooperation/symbiosis

Furthermore, the authors arrange these four ideal-type theories into a typology, a simple 2 x 2 matrix, anchored on two dimensions: single-multiple entity and prescribed constructed change (see Figure 2.1). The first dimension, labeled unit of change, differentiates between theories that explain change by focusing on a single entity or by focusing on interactions between two or more entities (Van de Ven and Poole, 1995; Weick and Quinn, 1999). The second dimension, labeled mode of change, differentiates between theories that see change as being prescribed a priori by either deterministic or probabilistic laws or as being constructed as the change process unfolds (Van De Ven and Poole, 1995; Weick and Quinn, 1999). Taken as a whole, according to Van de Ven and Poole's (1995) typology, theories of change can be illustrated and distinguished along four key theoretical characteristics: (1) the cycle of

change events within the change process, (2) the motor of change that governs the change process, (3) the unit of change at which it operates and (4) the different mode of change it implies.

Figure 2.1 Van de Ven and Poole's (1995) typology



[a] Arrows on lines represent likely sequences among events, not causation between events.

Overall, Van de Ven and Poole's (1995) typology offers a parsimonious explanation of a wide variety of organizational change theories by revealing similarities in seemingly different theories while also highlighting the "differences that make a difference" in explanations. Also, by identifying a set of theoretical "primitives" (i.e., cycle of change, motor of change) and the conditions in which they operate (i.e., unit of change, and mode of change), their typology helps us to see the complexities of organizational change theories as well as to analyze them as a composite of these four characteristics. Van de Ven and Poole's (1995) typology thus helps researchers see the interplay amongst these four characteristics, which makes it possible for them to discern commonalities and differences among a broad range of specific organizational change theories that might have been otherwise overlooked (Van de Ven and Poole, 1995).

2.2.2 Three theories to explain organizational change and the constraining effect of history

We build upon Van de Ven and Poole's (1995) typology to explore different theories (i.e., path dependence, imprinting, and structural inertia theories) that explain organizational change, as well as the constraining effect of history that often accompanies it. Specifically, anchored on these authors' four key theoretical characteristics that differentiate organizational change theories (i.e., cycle of change, motors of change, unit of change, and mode of change), we emphasize not only the theoretical difference between path dependence, imprinting, and structural inertia

theories, but also their implication for agents responsible for managing organizational change (see Table 2.2).

Table 2.2 A comparison of three organizational change theories according to Van de Ven and Poole's (1995) typology

Theories	Path dependence	Imprinting	Structural inertia
Archetype	Life-cycle	Evolutionary	Evolutionary
Cycle of change	A self-reinforced cycle that comprises three distinct phases: pre-formation, formation, and lock-in	An isomorphic cycle that comprises two distinct periods: sensitive and non-sensitive	A selection cycle that comprises three distinct stages: variation, selection and retention
Motor of change	Self-reinforcing mechanisms: complementarity effects, coordination effects, learning effects, and adaptive expectation effects	Isomorphism and environmental factors: economic and technological conditions, institutional factors, and particular individuals	Environmental selection based on the reliability of performance and the accountability of organizations
Unit of change	Focuses mainly on a single organization and its historical processes of change, adaptation, and replication	Focuses on a single organization and its surrounding environment	Focuses on multiple organizations that compose a population ecology
Mode of change	Prescribed by deterministic laws and partly constructed by mindful organizational change agents	Prescribed by deterministic laws	Prescribed by deterministic laws and partly constructed by organizational change agents
Constraining effect of history	The result of self-reinforcing mechanisms	The result of environmental factors and isomorphic tendencies	The by-product of environmental selection

2.2.2.1 Path dependency theory

The analysis of path dependence and subsequent theorization began with the pioneering work of David (1985) and his telling of the QWERTY story, which aimed to show that "it is sometimes not possible to uncover the logic (or illogic) of the world around us except by understanding how it got that way (p. 332)". Later, Arthur (1989, 1994) developed the first formal theory of path dependence and identified "increasing returns" or "positive feedbacks" whether in terms of a utility calculus or in terms of emotional reactions, cognitive biases, and political processes as the major underlying cause of path dependence (Sydow et al., 2009).

Early works on path dependence were mainly conducted by researchers from the field of historical and institutional economies, which focused on phenomena such as the evolution of technology, technological standardization, and regional clusters (Koch, 2011). In essence, these studies, by paying attention to the impacts of past events, which is often captured in the catch phrase "history matters", started out as critiques of neoclassical economists, which assumed the primacy of optimal solutions in terms of efficiency to explain development and change (Sydow et al., 2012).

However, the concept of path dependence goes far beyond mere "past-dependence", by acknowledging the importance of "increasing returns" or "positive feedbacks" in the development of an organizational path (Sydow et al., 2012). More specifically, "increasing returns" or "positive feedbacks" refer to the notion of self-reinforcement (Sydow et al., 2009). Self-reinforcement is a property of certain phenomena where processes are repetitively pursued to reap incremental increasing rents. It is this logic of self-reinforcement that represents the core of PDT (Saxenian, 1999; Sydow et al., 2012). Thus, PDT is different from other type of conceptualizations that also explain change and the related constraining effect of history (e.g., imprinting, escalating,

commitment, sunk cost, inertia, reactive sequencing, institutionalizing) since it emphasizes the importance of "positive feedbacks" and self-reinforcement, as the key generative mechanisms of both organizational change and the constraining effect of history.

Correspondingly, several attempts have been made within the PDT literature to identify and categorize the different causes or logic behind self-reinforced phenomena (Dobusch and Kapeller, 2013). For example, Beyer (2010) identified seven different mechanisms capable of producing path dependent continuity while Dobusch and Schüßler (2012) proposed a list of "typical" positive feedback mechanisms that operate at and between different levels of analysis. However, to date, the categorization proposed by Sydow et al. (2009), which lists complementarity, coordination, learning and adaptive expectation effects as the main logic causing self-reinforcement, is certainly the one that has received the most attention (Dobusch and Kapeller, 2013). Specifically, the authors' framework was developed to distinguish various self-reinforced phenomena that affect the behaviors of organizations and their subunits. As such, their framework federates and distinguishes, based on their respective underlying self-reinforcing logic, a wide range of self-reinforced phenomena that were previously observed in the path dependence literature and deemed influential to organizational behaviors: direct and indirect network effects/externalities (Katz and Shapiro, 1985; Liebowitz and Margolis, 1994; Shapiro and Varian, 1999), dynamic capability development (Leonard-Barton, 1992; Teece et al., 1997; Schreyögg and Kliesch-Eberl, 2007), and certain types of strategic co-evolution (Burgelman, 2002, 2009; Koch, 2008).

Complementarity effects lie in the synergy resulting from the interaction of two or more separate but interrelated resources, rules, or practices (Sydow et al., 2009). The advantage of combining interrelated elements is that the benefits of the combination is greater then the sum of each element alone. As such, certain resources, rules or practice

tend to constantly be combined together in order to reap greater benefits (Sydow et al., 2009). As a result, distinct sets of activity patterns become dominant which in turn create path dependencies over time. For example, complementarities can be found in economies of scope, "where the cost of producing and selling two or more goods or services together is lower than the cost of producing and selling them separately (Sydow et al., 2009, p. 700)".

Coordination effects build on the benefits of rule-guided behaviors (Sydow et al., 2009). That is, the more actors adopt and apply a specific rule or routine, the more efficient the interaction among these actors. Indeed, when the behavior of actors is rule guided it becomes easier to anticipate reactions, which simplify actors' interactions and thus reduce coordination costs (Sydow et al., 2009). As such, it becomes more attractive to adopt these rules or routines when more actors adopt these very same rules or routines, which creates the reinforcing nature of coordination effects (Sydow et al., 2009). A classic example of coordination effects is the decision regarding right-hand versus left-hand traffic, which became fixed due to the obvious benefits that accompanied it (e.g., less accidents, faster commuting).

Learning effects reside in the fact that the more often an operation is performed, the more efficiency will be gained with subsequent iterations (Sydow et al., 2009). For instance, performing an operation repetitively will allow actors to perform the operation faster, more reliably and with less errors, thus decreasing the average costs per unit of output (Sydow et al., 2009). As such, certain solutions become more attractive because accumulated skills decrease their costs. Furthermore, departing from these solutions becomes less and less attractive over time as it requires new learning (Sydow et al., 2009).

Adaptive expectation effects relate to the interactive building of preferences across actors (Sydow et al., 2009). They emerge because individual preferences are not fixed but rather assumed to vary in accordance with the expectations of others (Sydow et al.,

2009). A classic example of this mechanism is the need for social belonging and the desire to end up on the "winning side" (Sydow et al., 2009). As explained by Sydow et al., (2009 p. 700) "The more people are expected to prefer a particular product or service (and not another), the more attractive that product or service becomes (Leibenstein, 1950). Since users are often uncertain about the right choice, they feel rewarded by the fact that others are likely to prefer the same".

Based on these four different self-reinforcing logic, path dependence and the constraining effect of history should be understood as the outcome of a self-reinforced process that favors a specific pattern of reflection and action (Koch, 2011). For example, in the context of strategic decision making, an actor's decision process is perceived to be, at first, free of constraints whereas it becomes increasingly restricted through time to attain a state where few or even only one strategic decision is available. Accordingly, path dependence follows a cycle of change that comprises three distinctive phases: a preformation phase, a formation phase and a locked-in phase (Koch, 2011, Schreyögg and Sydow, 2011; Sydow et al., 2009).

The preformation phase is characterized as an open situation with a broad scope of action and choices (Schreyögg and Sydow, 2011; Sydow et al., 2009). However, one has to keep in mind that total freedom of choice or action, even in the preformation phase where actors are believed to be unconstrained, is impossible (Schreyögg and Sydow, 2011; Sydow et al., 2009). Indeed, the development of a specific path is inevitably linked or embedded with other developments and thus cannot be seen as completely separated from the past (Schreyögg and Sydow, 2011; Sydow et al., 2009). For example, new path developments are likely to be influenced by an organization's routines, practices or culture and thus are subject to the history of the firm. In other words, history is not intermittent and it always plays a role in action (Schreyögg and Sydow, 2011; Sydow et al., 2009). As such, this relative but incomplete freedom should be seen as a large scope of choices. In addition, the outcomes of an actor's choice or

action cannot be predicted during this phase. In the path dependence literature, this uncertainty regarding the outcomes of an actor's choices or actions is taken into account by defining an actor's choices or actions as contingent and varying on a continuum ranging from "small events" (i.e., unpredictable, non-purposive and seemingly random) to "big event" (i.e., logical, reflexive and not so random). Both small and big events may unintentionally set off a self-reinforcing process (Schreyögg and Sydow, 2011; Sydow et al., 2009). Entering into the dynamics of a self-reinforcing process represents a "critical juncture" (Collier and Collier, 1991) that indicates the end of the preformation phase and the beginning of the formation phase (Schreyögg and Sydow, 2011; Sydow et al., 2009).

The formation phase is characterized by a regime of self-reinforcing mechanisms (Arthur, 1994). These mechanisms entice the emergence of a dominant action pattern narrowing the range of choices, which renders the whole decision process more and more irreversible. Nonetheless, decisions made at this stage are still contingent (i.e., uncertain in outcomes), since multiple alternatives are still available (David, 1985). Hence, PDT, by focusing on self-reinforcing mechanisms, adopts a single unit of change perspective in explaining organizational change. That is, it focuses on the internal development of a single organizational entity by examining its historical process of change, adaptation, and replication (Van de Ven and Poole, 1995).

Finally, the lock-in phase begins once decisions are constrained to the point of creating a lock-in effect (Schreyögg and Sydow, 2011; Sydow et al., 2009). Specifically, a lock-in can be defined as a situation in which an actor is dependent on a specific solution such that he or she cannot switch to an alternative option without suffering substantial costs (Zhu and Zhou, 2012). A lock-in can also be defined as a strong binding to a pattern that is sometimes self-imposed, a fixed state that the organization cannot or will not be able to leave (Harrison et al., 2012). As such, this phase is characterized by the presence of a dominant decision pattern that is fixed and deterministic in character

(Schreyögg and Sydow, 2011; Sydow et al., 2009). It is at this point that an organization's flexibility in decision-making is lost. As such, decision processes and established practices continue to reproduce this and only this particular outcome even in the face of better alternatives. Therefore, the occurrence of a lock-in may potentially impede an organization's performance as it weakens its capability to change (Schreyögg and Sydow, 2011; Sydow et al., 2009).

It is important to note here that locked-in patterns are not always undesirable (Schreyögg and Sydow, 2011; Vergne and Durand, 2011). Indeed, as observed by Vergne and Durand (2011), it is the characteristics of the locked-in pattern, such as its value, rareness or inimitability, that establishes whether it is desirable or not. Put differently, an organization locked into a valuable, rare, and difficult to imitate pattern should embrace the phenomenon, as it is likely to yield significant benefits to the firm (Vergne and Durand, 2011). In turn, an organization constrained by a common, invaluable and easy to imitate pattern should certainly attempt to move away from this locked-in pattern, as benefits are highly unlikely to stem from this pattern (Vergne and Durand, 2011). For instance, a firm like Microsoft has certainly developed key programming capabilities that are sustained by self-reinforcing mechanisms (i.e., complementarity effects, learning effects) (Vergne and Durand, 2011). While the rarereness of these capabilities have historistically provided Microsoft with a significant competitive advantage, recent changes favorizing open-source developement in the software industry have undermined their strategic value (Vergne and Durand, 2011). Indeed, open-source development now allows expert user communities to contribute to the development of software and thus commoditized Microsoft's programming capabilities. As a result, some would argue that Microsoft's programming capabilities are no longer a key source of competitive advantage for the organization, which would render the path dependence sustained by the self-reinforcing mechanisms identified above valueless (Vergne and Durand, 2011).

Recently, the theory of path dependence has been complemented by the notion of path creation (Garud and Karnøe, 2001). Contrary to the basic tenets of PDT which posit that only external shocks lead to deviations from existing technological, institutional or organizational lock-ins, path creation stipulates that collectivities of actors can also mindfully deviate from a path even though they may not be proficient enough to initiate or control the deviation entirely (Garud and Karnøe 2001). Furthermore, in support of the notion of path creation, Kock (2011) observed that a specific lock-in may not affect an organization in its entirety, and thus that unaffected elements of the organization in which this specific lock-in is inscribed may act as counterweights (Kock, 2011). In addition, these findings also suggest that multiple lock-ins can exist within the same organization and that they may reinforce or counterbalance each other (Vergne and Durand, 2011). Consequently, it appears that path dependence is not as deterministic as previously thought and that the constraining effect of history might be partly mastered by mindful change agents in organizations.

In summary, previous explanations depict path dependence as an organizational change process that is initially shaped by contingent choices, labeled "small" or "big" events, that eventually lead to the emergence of one or more self-reinforcing mechanisms, which in turn foster the adoption and application of a specific pattern of actions, rendering potential alternatives uninteresting. Finally, a full state of path dependence is attained when these mechanisms create a locked-in state characterized by the presence of a fixed and deterministic organizational pattern. Hence, PDT explains the constraining effect of history as a result of self-reinforcing mechanisms. Based on Van de Ven and Poole's (1995) typology, PDT can thus be understood as a life-cycle theory that explains organizational change as a three-phase cycle (i.e., pre-formation, formation, lock-in), caused/governed by different self-reinforcing mechanisms (i.e., complementarity effects, coordination effects, learning effects, and adaptive expectation effects). Furthermore, by focusing on mechanisms that are endogenous to the organization, PDT explains the development of a single organizational entity and

thus adopts a single entity unit of change. Lastly, the notion of path creation suggests that PDT adopts an intermediate mode of change where organizational change is partly prescribed by deterministic laws and partly constructed by mindful organizational change agents.

2.2.2.2 Imprinting theory

The concept of imprinting and its subsequent theorization emerged form the pioneering work of amateur biologist Douglas Spalding and his observations that domestic birds have a tendency to follow the first-seen moving object, a behavior that was "stamped in their nature" as a result of early experience (Spalding, 1873, p. 134). Later, based on thorough analyses, Heiroth (1911) and Lorenz (1937) made similar observations and defined imprinting by insisting that this phenomenon – in which early experience determines subsequent behaviors – was distinct from other learning processes (Marquis and Tilcsik, 2013). More recently, the use of the term imprinting was introduced in the field of organizational studies with Sinchcombe's (1965) classic essay on "Social Structure and Organizations". Throughout his essay, Sinchcombe (1965) argued that "organizations are "imprinted" by the conditions existing in the industry to which they belong at the time the industry is "born" (Miles et al., 1974, p. 259)". The author also suggested that "environmental conditions at any point in time not only specify the needs for particular goods and services but also determine many characteristics of the organizations created to provide them (Miles et al., 1974, p. 259)". Based on this understanding as well as earlier works from biologists, Marquis and Tilcsik (2013) state that "imprinting has three essential features:

1) The existence of a temporally restricted sensitive period characterized by high susceptibility to environmental influence;

2) The powerful impact of the environment during the sensitive period such that the focal entity comes to reflect elements of the environment at that time; and

3) The persistence of the characteristics developed during the sensitive period even in the face of subsequent environmental changes (p. 199)".

Hence, the concept of imprinting goes well beyond the general notion that "history matters", by acknowledging environmental influences and isomorphism as the key generative mechanisms of organizational change, whereas susceptible periods can be seen as a window during which a change can occur. Thus, imprinting is different from other similar conceptualizations (e.g., path dependence, escalating, cohort effects, sunk cost, reactive sequencing, institutionalizing) since it views the constraining effect of history as the result of environmental conditions and isomorphic tendencies.

Furthermore, based on its three essential features, imprinting can be defined as "a process whereby, during a brief period of susceptibility, a focal entity develops characteristics that reflect prominent features of the environment, and these characteristics continue to persist despite significant environmental changes in subsequent periods (Marquis and Tilcsik, 2013, p. 199). This depicted co-occurrence of periods of susceptibility and stability imply that imprinting is characterized by a cycle of change that comprises two distinctive periods: a brief transition period and a longer persistent period where stamped-in features remain stable (Marquis and Tilcsik, 2013).

The brief sensitive periods are characterized by uncertainty and great turmoil inside the organization. As such, the organization is significantly more malleable by environmental conditions during these short periods than in normal times. Hence, the window of "imprintability" or change is only open during restricted periods of time, and when it is shut, the environment is less likely to have a lasting impact (Immelmann, 1975; Stinchcombe, 1965). As an entity might experience multiple sensitive periods over time, these sensible periods should be conceptualized as periods of transition that

represent key operating conditions for imprinting to occur. It is during these periods of transition that core features of the environment exert significant influence on organizational change. Amongst these features, the imprinting literature identifies three different sources of imprint: economic and technological conditions, institutional factors, and particular individuals. In turn, these sources of imprint will mold the organization during periods of transitions because organizational uncertainty inclines the organization to mirror the characteristics of its environment due to isomorphic or alignment tendencies. Hence, the organization tends to be structured to fit its surrounding environment. As such, an organization is believed to follow a deterministic mode of change that directs its development according to pre-specified conditions set up by the environment. In addition, by emphasizing the importance of the environment as a key source of change, imprinting theory implicitly views organizational change as the results of interactions between two or more entities (Van de Ven and Poole, 1995). As such, imprinting theory adopts a multiple entity unit of change in explaining organizational change.

The long persistent periods are characterized by the presence of a stable and stamped organizational behavior that is congruent with past environmental conditions even tough better alternatives are available and/or current environmental conditions differ. In addition, imprinting theory recognizes that imprints may accumulate over time. As such, an organization may carry several imprinted behaviors acquired during similar or different transition periods.

In summary, the previous explanations depict imprinting as an organizational process that is shaped by environmental conditions. In turn, because of isomorphic tendencies, organizations tend to mirror their surrounding environments. However, while being constantly subject to environmental pressure, organizational imprinting only happens during brief transition periods where the organization is subject to a high level of uncertainty and turmoil. Finally, a state of imprinting is achieved when an

organizational behavior is congruent with past environmental conditions even though better alternatives are available and/or current environmental conditions differ. Hence, imprinting theory explains the constraining effect of history as the result of environmental conditions and isomorphic tendencies. Based on Van de Ven and Poole's (1995) typology, imprinting theory can thus be understood as an evolutionary theory that explains organizational change as a two-period cycle (i.e., transition periods, persistent periods), caused/governed by environmental factors and isomorphism tendencies (see Table 2.2). In addition, by focusing on forces internal and external to the organization, imprinting theory adopts a multiple entity unit of change in explaining organizational change. Lastly, imprinting theory adopts a prescribed mode of change since pre-specified conditions embedded in the environment are believed to determine organizational change.

2.2.2.3 Structural inertia theory

Hannan and Freeman (1984) developed structural inertia theory (SIT) to challenge prominent organization theories that explained variability in organizational characteristics through references to the accumulation of adaptations of a single organization. Indeed, Hannan and Freeman (1984) argued that the adaptation of organizational structures to the environment occurs principally at the population level, with organizational forms replacing each other as conditions change over time. As such, SIT adopts a population ecology perspective that sees organizational change as the result of a selection process rather than as the outcome of organizational actions (Hannan and Freeman, 1977). Accordingly, SIT is different from other theories that

also explain change since it emphasizes the importance of competitive forces and environmental selection as the key generative mechanisms of organizational change. Furthermore, because of its specific focus on a selection process that implies the interaction of two or more organizations, SIT adopts a multiple entity unit of change.

Anchored on these motors and unit of change, SIT depicts organizational change as a cycle that comprises three stages: variation, selection and retention. This ecological-evolutionary process is thus analogous to the process of natural selection in biology as it views adapted organizations as those being able to secure scarce resources from their competitors when environmental conditions change. To survive, organizations need to exhibit two critical competencies: reliability and accountability. Reliability can be defined as the capacity to generate collective actions with relatively small variance in quality while accountability can be defined as the ability to account rationally for the use of resources as well as the decision and rules behind particular outcomes (Hannan and Freeman, 1984; Kelly and Amburgey, 1991). Environmental selection will thus favor organizations that have high levels of reliability of performance and accountability. To achieve such a high level of reliability of performance and a high level of accountability, organizations continually need to reproduce their structure. As such, organizations will rely on an institutionalization process and create highly standardized routines to make their structure reproducible and stable over time. However, institutionalization and standardized routines are two-edge swords since, in addition to offering the advantage of reproducibility, they also generate strong pressures against change because organization members seek to maintain the status quo that protects their interests (Kelly and Amburgey, 1991). Hence, the very properties that give an organization its reproducibility also makes it highly resistant to change (Hannan and Freeman, 1984).

Consequently, structural inertia can be seen as a by-product of the ability to reproduce a structure with high fidelity. The concept can thus be defined as the tendency of an

organization to maintain the status quo or to resist deviating from existing structural schemes (Hannan and Freeman, 1984, Schwarz, 2010). As such, SIT goes well beyond the general notion that "history matters", and differs from other similar conceptualizations (e.g., path dependence, escalating, cohort effects, sunk cost, reactive sequencing) since it depicts the constraining effect of history as a by-product of environmental selection.

In addition, SIT recognizes that not all organization structures have the same bearing on resource mobilization and thus that some structures are easier to change than others. Accordingly, Hannan and Freeman (1984) distinguish between "core" and "peripheral" organizational features and posit that inertial forces will be stronger on core features because they mobilize more resources. Core organizational features include the organization's (1) stated goals; (2) forms of authority and exchange between members of the organization; (3) core technology, especially as encoded in capital investment, infrastructure, and the skills of members; and (4) marketing strategy in a broad sense. Peripheral organizational features include organizational charts (i.e., levels in authority structures, span of control, etc.) and patterns of specific exchange with organizations in the environment. Also, the age and size of the organization can exacerbate the influence of inertial forces. Indeed, since organizational change occurs through a selection that favors organizations with high levels of reliability of performance and accountability, surviving organizations become, over time, less and less likely to change due to their accumulating institutionalization and standardization efforts. As such, inertia increases monotonically with age and the probability of change in organizational core features declines over time (Kelly and Amburgey, 1991). Similarly, because larger organizations emphasize predictability, formalized roles, and control systems, their behavior becomes predictable, rigid and inflexible as they grow, which lessens the probability of change in the organization's core features over time (Kelly and Amburgey, 1991).

Recently, Schwartz (2010) complemented the literature on structural inertia by introducing the logic of deliberate structural inertia. The main difference between deliberate structural inertia and structural inertia concerns the emphasis put upon agency and the purposeful endorsing of structural inertia by decision makers during organizational change. Hence, according to the author, structural inertia should not only be understood as a by-product of reproducible structures but also as an intentionally selected response to change. Consequently, it appears that organizational change as depicted by SIT is not as deterministic as previously thought, since change agents within the organization can deliberately chose inertia as a course of action. Hence, SIT adopts an intermediate mode of change that views organizational evolution as incremental, stable and predictable, while being subject, to a limited extent, to agential influence.

In summary, the previous explanations depict structural inertia as an indirect effect of an ecological-evolutionary process, which favors reliable and accountable organizations. In addition, the theory posits that the very characteristics that guarantee organizational survival also generate resistance to change, which refrain the adoption of new organizational behaviors to the benefits of those already in place. Hence, SIT explains the constraining effect of history as the by-product of environmental selection. Based on Van de Ven and Poole's (1995) typology, SIT can thus be understood as an evolutionary theory that explains organizational change as a three-stage cycle (i.e., variation, selection, retention), caused/governed by competitive forces and environmental selection (see Table 2.2). Furthermore, by adopting a population ecology perspective, SIT adopts a multiple entity unit of change in explaining organizational change. Lastly, recent developments in regards to deliberate structural inertia (Schwarz, 2010) suggest that SIT adopts an intermediate mode of change where organizational change is partly prescribed by deterministic laws and partly constructed by change agents.

2.3 Methodology

We adopt a congruence case study approach to empirically compare and evaluate PDT, imprinting and SIT to identify the one that better explains why and how organizational IS changes unfold over time. A congruence case study is a particular kind of explanatory case study that aims to elucidate and compare the explanatory merits of competing or complementing theories through within-case analyses (Alisson, 1971; Blatter and Haverland, 2012; Markus, 1983). To do so, we develop a research design that takes advantage of unique case features and opportunities for triangulation (i.e., to intersect data from multiple sources) in order to confirm/infirm each theory's main tenets (Brown, 1999; Dubé and Paré, 2003; Lee, 1989). Specifically, our research design takes into account five important considerations: (1) the theory selection, (2) the case selection, (3) the unit of analysis of the study, (4) the data to be collected and the data collection techniques, and (5) the data analysis strategies (Johnston et al., 1999). Each of these issues is discussed in the following sub sections.

2.3.1 Theory selection

Based on our theoretical aspirations and theory's place in the scientific discourse, we elected to compare the theories related to the concepts of path dependency, imprinting and structural inertia. While these concepts are often used interchangeably within the IS literature, their respective underlying theories explain both the evolution of IS in organizations as well as the constraining effects of history that often accompany it.

Hence, clearing the confusion surrounding the concepts/theories of path dependence, imprinting and structural inertia is of perennial importance to explain why and how organizational IS changes unfold over time.

2.3.2 Case selection

Blatter and Haverland (2012) suggest that researchers pursuing a congruence case study approach should select a crucial case that enables the confirmation/disconfirmation of each theory's assumptions. Accordingly, some prior knowledge about specific features of the case (e.g., context and antecedent conditions) is useful. Based on this understanding, we selected a major university hospital located in Canada as our research case. Indeed, over these last few years, one of the authors has developed close personal and professional relationships with several members of the hospital that guaranteed the access to the research site once the study began. This author's knowledge of the evolution of the IS within the hospital, developed through his strong ties to key IS change agents, also allowed us to make an ex-ante assessment to ensure that the hospital represented a unique case where each theory had an equal chance to explain the evolution of the hospital's information systems as well as the constraining effect of history that often accompanies it. From a PDT perspective, the hospital is part of a broad healthcare infrastructure supported by an experienced workforce, which could have triggered key self reinforced mechanisms that constrain IS change. From an imprinting perspective, the hospital is subject to important periods of uncertainty and turmoil every four years or so due to the duration of a political term, which could lead to several cycles of IS imprints. Lastly, from a structural inertia

perspective, the provision of individual care is subject to strong pressures for reliability of performance and accountability that have fostered, over time, the development of several reproducible structures, that may have increased the hospital's inertia and impede IS change. Hence, the hospital offers a setting with a wide range of "natural controls" that allows us to confirm/infirm each theory's tenets on the evolution of the IS in organizations and the constraining effect of history that often accompanies it.

2.3.3 Unit of analysis

The specific unit of analysis of this study is the IS supporting the management of patient information (i.e., the MPI system) at the hospital. The MPI system is a key component of the hospital's fundamental process of providing patient individual care (PIC) since it keep tracks of all relevant patient information in each of its key sub-processes: (1) Reception and Orientation; (2) Evaluation, coordination and planning; (3) Diagnostic, and (4) Therapy. Anchoring our analyses of IS change on this particular unit of analysis provides us with several benefits. First, this key IS was one of the first to be implemented at the hospital and is still in use today, which provides us with several decades of data and a meaningful time-period to evaluate why and how organizational IS changes unfold over time. Second, managing patient information has always been a top priority for the hospital, at the very least for billing and revenue purposes, which makes respondents more likely to be well aware of the main issues related to this critical IS. Similarly, archival sources from the hospital library should also contain relevant information on this specific IS. Finally, in addition to having always been important for the hospital, a recent governmental decision asking all

healthcare establishments to participate in the creation of a single, centralized, and digital patient information file has recently put the management of patient information to the forefront of the hospital's priorities. This new governmental agenda has thus yielded strong interests and commitment for our research project since the various stakeholders of the hospital wish to alleviate IS change barriers in order to fulfill the government's request.

2.3.4 Data collection

Two methods were used to collect data. Structured interviews were the main source of data while documentary evidence in the form of annual reports[2] were used in support. Appendix A and B provides the consent form and the interview guide used to conduct the interviews. As can be seen from Appendix B, the focus of the interviews was twofold. First, to identify each of the major IS changes characterizing the evolution of the MPI system from its inception, in 1967, until 2001 when all the IS activities of the hospital were outsourced to a third party. Second, to understand which of Van de Ven and Poole's (1995) theoretical "primitives" and operating conditions best described each of the IS changes previously identified. That is, to assess which cycle, motor, unit and mode of change best characterized each IS change. As such, we did not collect data from the perspective of our pre-selected theories, but rather searched for the existence

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[2] Only three annual reports are missing from our analyses since they were not produced by the hospital for the year 1971, 1972 and 2000.

of Van de Ven and Poole's (1995) "primitives" and operating conditions in order to guard us from the fallacy of self-fulfilling prophecies that may occur when researchers expect certain results.

In total, 12 interviews were conducted with 6 different respondents (see Tables 2.3 and 2.4). We first conducted six preliminary 3-hour interviews with two active managers and one consultant responsible for the development of the MIP system at the hospital to obtain their commitment to participate in the research project, define the scope of the project and establish sound data collection procedures (i.e., finalize the development of the interview guide, the identification of key active and retired respondents, and respondent cross-validation techniques). Second, we conducted two 3 hour interviews with two active managers to establish a preliminary timeline of IS changes and gather preliminary narratives of each of the changes made to the MPI system from 1967 to 2001. A thorough analysis of the hospital's annual reports for the corresponding period complemented this second round of interviews to ensure data quality and accuracy. Third, we conducted one 4-hour interview with 3 active and 2 retired managers to finalize the timeline and each of the narratives previously developed. Fourth, we conducted a 2-hour interview with a retired manager and a 1-hour interview with another retired manager to gather additional information on each IS change and to make sure that no IS change was omitted in the development of our timeline and narratives. Once again, a thorough analysis of the hospital's annual reports for the corresponding period complemented these last two rounds of interviews to ensure data quality and accuracy. Lastly, we conducted one 4-hour interview with 3 active and 2 retired managers to confirm/disconfirm our interpretation of why and how the MPI systems evolved over these last forty years as well as to make sure that theoretical saturation was achieved.

Table 2.3 List of interviews

Interview	Date	Key objective	Respondents
1	05/15/2014	Present the research project to key stakeholders at the hospital	A, B and C
2	05/22/2014	Obtain hospital's commitment to participate in the research project	A, B and C
3	05/29/2014	Define the scope of the research project	A, B and C
4	06/17/2014	Identify the IS system to be studied	A, B and C
5	09/02/2014	Identify key respondents and cross-validation techniques	A, B and C
6	09/17/2014	Finalize the development of the interview guide	A, B and C
7	10/01/2014	Develop a preliminary timeline and narratives for each IS change characterizing the evolution of the MPI system (first 20 years)	A and B
8	10/22/2014	Develop a preliminary timeline and narratives for each IS change characterizing the evolution of the MPI system (last 20 years)	A and B
9	03/27/2014	Finalize the timeline and narratives of each IS change characterizing the evolution of the MPI system	A, B, D, E and F
10	07/21/2014	Gather additional information and obtain theoretical saturation	D
11	07/28/2014	Gather additional information and obtain theoretical saturation	E
12	07/28/2014	Confirm/disconfirm our interpretation of why and how the MPI systems evolved these last forty years and validate theoretical saturation	E

Table 2.4 Profile of key respondents

Respondent	Functions held at the hospital	Periods	Interviews
A	IS advisor in the department of personnel services	1993 - 1996	1, 2, 3, 4, 5, 6, 7, 8, 9 and 12
	Manager	1996 - 2003	
B	Beneficiary attendant	1979 - 1986	1, 2, 3, 4, 5, 6, 7, 8, 9 and 12
	Analyst/Programmer-analyst/Senior advisor	1986 - 2006	
C	IS consultant	2003 - 2006	1, 2, 3, 4, 5 and 6
D	Analyst/Programmer-analyst	1968 - 1969	9, 10 and 12
	IS department director	1970 - 1995	
E	Analyst	1970 - 1975	9, 11 and 12
	IS production manager	1976 - 1980	
	IS software manager	1981 - 2000	
F	Programmer-analyst	1987 - 1989	9 and 12
	Analyst	1990 - 1999	
	IS infrastructure management	2000 - 2006	
	Assistant director of IS operations	2007 - 2015	

Overall, our interview protocol allowed us to both triangulate our data across different sources and validate our interpretation of each IS change with respondents, which increases the validity of our findings. Also, with the help of our interview guide, our data collection was conducted in a manner that the data collected could be used to confirm/infirm the main tenets of each theory while at the same time minimizing the self-fulfilling prophecy bias.

2.3.5 Data analysis

Data analysis was mainly concerned with evaluating the level of congruence between the tenets of each theory and our observations in the field. To do so, we first developed a list of codes to reflect each of Van de Van and Poole's (1995) "primitives" and operating conditions. Then we reviewed the data for each IS change and coded meaningful excerpts from the interview transcripts and annual reports with the help of the ATLAS-ti 7 software (Auerbach and Silvertein, 2003). It took several iterations to code all documents and organize data to facilitate their analysis (Miles and Huberman, 1994). Specifically, four complementary process data analysis strategies were used to organize and make sense of our data: temporal bracketing, narrative, alternative template, and visual mapping (Langley, 1999) (see Table 2.5). Then, the researcher who conducted the interviews analyzed the data following a pattern matching strategy (Yin, 2003). This analysis resulted in the identification of eight IS changes characterizing the evolution of the MPI systems and the theory that best explains each of them (see Tables 2.6 to Table 2.13). The other researcher then validated the analysis and played the role of the devil's advocate (Eisenhardt, 1989) to establish evidence that each IS change was matched to the right theory and thus, that the chosen theory for each IS change was not the result of a spurious association.

Table 2.5 Our operationalization of Langley's data analysis strategies

Temporal bracketing	The temporal bracketing strategy consists of decomposing process data into successive adjacent periods. As such, the evolution of the MPI system was devised as a combination of successive episodes of IS changes and transformed into a series of more discrete but connected blocks (Langley, 1999). The data gathered for each episode (i.e., IS change) was used to describe an IS change as a linearly evolving pattern. Evidences were also drawn together to examine how the context affects each IS change, and determine the consequences of each IS change on future IS changes.
Narrative	Narratives are "stories [that] help explain the relationships between events in a process Pentland (1999, p. 711)". They generate a meaningful explanation of what is causing a particular outcome (Langley, 1999). Narratives are useful in process analysis because they incorporate time as an organizing device (Langley, 1999; Pentland, 1999). However, in producing process narratives, it is important to avoid treating description as an end in itself (Knights, 1995; Langley, 1999). According to Pettigrew (1997), meaningful explanations of process outcomes require more than the description of event sequences (i.e., a case study rather than a case history). Identifying the "generative structures" that shape a process requires a theoretical interpretation that enables knowledge and understanding of that process (Pentland, 1999). That is, some theoretical apparatus is needed to articulate how and why a particular process outcome emerges. Accordingly, we draw on Van de Ven and Poole's (1995) typology to structure the case narrative and our understanding of each IS change that characterizes the evolution of the MPI system.
Alternative Template	Our triple theoretical take of each IS change that characterizes the evolution of the MPI system required that our narrative strategy be complemented by an alternative template strategy (Langley 1999). That is, our interpretation of each IS change is based on the theories we selected a priori (i.e., PDT, imprinting theory, and SIT). Accordingly, we identify which theoretical template contributes to a satisfactory explanation of each IS change and the constraining of history that often accompanies it.
Visual mapping	A visual mapping strategy allows for the presentation of large quantities of information in relatively little space. As such, this data analysis strategy can easily be used to show precedence, parallel processes, and the passage of time (Langley 1999). Accordingly, we build a timeline of all the IS changes that characterize the evolution of the MPI system to synthesize our results (see Table 14).

2.4 Results

In total, we identified 8 major changes that were made to the MPI system over a 34 year period spanning from 1967 to 2001 (see Tables 2.6 to 2.13). The present section details the narrative of each of these eight key IS changes so that their respective dynamics can be properly understood. In addition, these brief narratives, by describing the cycle, motor, unit and mode of change characterizing each key IS change, also

reveal the underlying theoretical rationale that best explains their genesis and outcome. As a result, our findings provide an in-depth understanding of the evolution of the MPI system while also revealing the underlying theory that best explains why and how organizational IS changes unfold over time as well as the constraining effects of history may have influenced them.

2.4.1 Change #1: Creation of the MPI system

It is in 1966 that the hospital bought its first computer. At the time, the hospital decided to purchase a mainframe to replace old accounting machines that supported the already existing accounting and medical statistics systems. To realize this important migration, the hospital hired ABC, the mainframe's manufacturer, which re-located several of its employees at the hospital premises for the duration of the project. It is under the recommendation of ABC that the hospital hired its first IT employee, "Respondent D", and gave him the responsibility to manage this important project. During his first 18 months at the hospital, "Respondent #D" was thus in charge of implementing[3] the accounting and medical statistics systems for the new mainframe. Following this project, "Respondent #D" suggested that the hospital should continue its computerization efforts by also migrating its paper-based index system named "CARDEX" to the mainframe. Indeed, having worked extensively with accountants,

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[3] Implementing includes both development activities as well as deploying the newly developed system to users.

archivists and receptionists to implement the accounts receivable module of the accounting system for the mainframe which requires valid patient information to appropriately bill patients, "Respondent #D" noted that it would be advantageous for the hospital to implement a computer-based system that would capture all relevant patient information at the source and then feed it to the accounting and medical statistics systems on the mainframe.

Taking into account the recommendation of "Respondent #D" and the support of the hospital's business process management office (BPMO), which was also looking for a solution to improve the management of patient information, the hospital decided to start to implement the MPI system at the end of the year 1967. Fittingly, the first version of the MPI system was built on the mainframe that was originally put in place to support the accounting and medical statistics systems. At the time, its sole purpose was to electronically index all patient names and record numbers in order to replace the paper-based index system named "CARDEX". After an implementation that lasted 18 months, archivists and receptionists started to use the MPI system in 1969. While most managers welcomed the creation of the MPI system because they knew other major players in the healthcare sector were also pursing such a change, receptionists and archivists showed great resistance. Indeed, the passage from the old manual typewriters to the new electronic typewriters (i.e., the MPI system terminals) proved to be too difficult for most receptionists and archivists. So much so that a year after the implementation of the MPI system was completed, 21 of the 23 receptionists and archivists working at the hospital's admission and archive department were replaced.

Overall, the initial creation of the MPI system can be seen as the logical extension of previous computerization efforts conducted at the hospital. Indeed, the MPI system was seen by the hospital's IT personnel and the BPMO as a key complement to already existing computerized systems, since it could efficiently capture and disseminate patient information to the accounting and medical statistics systems on the mainframe.

Hospital managers perceived this change favorably because other institutions in the healthcare industry were also pursuing a similar change, while first level employees, who saw their daily tasks change drastically due to the introduction of electronic typewriters, resisted or were simply unable to make the necessary adjustments. In the end, the hospital replaced all reluctant receptionists and archivists and the implementation of the MPI system was deemed a success. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed a life-cycle cycle of change where the creation of the MPI system can be considered as the next logical phase in the ongoing process of computerizing hospital activities. Fittingly, two motors of change caused/governed the creation of the MPI system: (1) the strong complementarity effects between the MPI system and the accounting and medical statistics systems that would ensue from this key IS change; and (2) the learning effects that ensued from "Respondent #D's" previous work on the implementation of the accounting and medical statistics systems on the mainframe. This key IS change is also characterized by a single unit of change since most stakeholders in the creation of the MPI system were members of the hospital, even tough several hospital managers were aware of a similar change made elsewhere. Lastly, the creation of the MPI system followed an intermediate mode of change. Indeed, this change was highly debated amongst managers of the BPMO and a final accord was only reached once a friend of "Respondent #D" in favor of the project was promoted to a higher position in the BPMO hierarchy. Hence, this change was to some extent constructed. Based on this characterization, we can now establish that the tenets of PDT best explain the genesis and outcome of this key IS change as well as the constraining effect of history that accompanies it since the creation of the MPI system is driven by both complementarity and learning effects while following a cycle, unit and mode of change that correspond to the tenets of PDT (see Table 2.6).

Table 2.6 Change #1 – Creation of the MPI system

	Description	Supporting quotation(s)
Objective	To replace the paper-based index system named "CARDEX" with new functionalities implemented into the MPI system in order to electronically index all patient names and record numbers.	"Notre objectif, c'était de faire disparaitre les "CARDEX". (D, Interview #9, p. 4)"
Key dates	Decision to implement: 1967 Beginning of the implementation: 1968 Beginning of use: 1969	"Ça c'est milieu 1967, fin 1967 que ça c'est fait. Et il y a du travail qui a été fait durant à peu près un an et demi là-dessus: d'analyse, de programmation etc. Pis quelque part fin 1968 mettons on a installé. (D, Interview #9, p. 2)" "Mais je me souviens, de mémoire il y en avait 22 là. Mais il y en avait qui n'était pas tellement gros et il y en avait des énormes. Cliniques externes, radiologie, les archives, c'étaient des énormes index, pis il y avait aussi des laboratoires qui avaient leur propre index en plus de ça. Tsé quand tu regardais marché ça c'était une cacophonie. (D, Interview #10, p. 3)"
Context	The hospital had already implemented accounting and medical statistic systems on the mainframe and wanted to continue it's computerizing efforts.	"Début des années 60, ils avaient développé certains systèmes de statistique médicale, d'analyse des dossiers pis tout ça et c'était sur des cartes, des machines comptables etc. Pis, ils produisaient des rapports de statistique sur le nombre de patient qui est venu, le nombre de ci, le nombre de cas, le nombre de bébelle. Donc, les archivistes codaient des données à l'année et analysaient le dossier pis codaient des choses et puis ils faisaient ça sur ces machines là. Et à la fin, en 1966, fin 1966 est rentré le premier vrai ordinateur. Un modèle 360, modèle 25. Et là ils ont commencé à transférer les systèmes qu'ils avaient développé sur les machines comptables sur l'ordinateur et à cette époque là c'était des gars de IBM qui faisaient ça pour l'hôpital. (D, Interview #9, p. 1)"
Cycle of change	This change followed a life-cycle cycle of change since it represents a direct consequence of actions previously taken to migrate the accounting and medical statistics systems on the mainframe.	"Je voyais plein d'avantage de saisir à la source l'information pour les comptes à payer, pour les comptes à recevoir, pour les statistiques médicales et pour les archives et pour l'index. Donc, moi je voyait tous les liens qui avaient là-dedans, les synergies qui pouvaient se créer là-dedans, etc. Donc, c'était un petit peu un choix logique d'architecturer ça. (D, Interview #10, p. 6)"

Motor of change	Two motors of change caused/governed the creation of the MPI system: (1) the strong complementarity effects between the MPI system and the accounting and medical statistics systems that would ensue from this key IS change; and (2) the learning effects that ensued from "Respondent #D's" previous work on the implementation of the accounting and medical statistics systems on the mainframe.	"Le fait de se rabattre sur un seul index, à un seul endroit parce qu'il était électronique pis ça te permettait d'y accéder dans des lieux différents. C'est le gros avantage qui a du faire disparaitre les petites cartes de l'autre. C'est d'avoir une cohérence, c'est d'avoir le même numéro de dossier autant quand tu viens pour une visite que quand tu te présentes pour une hospitalisation. Ce qui fait qu'en bout de ligne les papiers se ramassaient dans le même dossier, à la même chemise physique pis ça du être l'apparition aussi des cartes d'hôpital. (F, Interview #9, p. 16)" "Donc, à cause du système de compte à recevoir, j'avais déjà été un peu mêlé à beaucoup de discussions avec le service d'accueil, les procédures, comment ça marche, les prises de dépôts, les perdîmes, comment ça marche le prix d'une chambre, une chambre privée, semi-privée, les salles, si c'est réservé, pas réservé, si le médecin prescrit, pis t'a pas le choix, toutes sortes de règles. Donc là, j'avais été mêlé beaucoup à çà, pour faire l'autre système. Donc, et avec le système quand on avait écrit les premiers systèmes de statistiques médicales, j'avais été très impliqué avec les archives, aussi sur ça : la fin du dossier, l'analyse du dossier par les archivistes, la codification des données médicales. Donc çà m'a amener comme analyste, j'étais le programmeur, l'analyste, j'étais tout, à regarder comment ça se passe. Comment ça se passe à l'index, comment ça se passe à l'accueil. Donc, j'avais les mains là-dedans et je développais beaucoup d'intérêts et j'étais assez engagé. Donc, là j'étais en contact avec un peu tout les gestionnaires de tous les milieux. Je dirais que j'ai probablement influencé beaucoup les choix qui font que c'est ça qu'on a développé. Je voyais plein d'avantage de saisir à la source l'information pour les comptes à payer, pour les comptes à recevoir, pour les statistiques médicales et pour les archives et pour l'index. Donc, moi je voyait tous les liens qui avaient là-dedans, les synergies qui pouvaient se créer là-dedans, etc. Donc, c'était un petit peu un choix logique d'architecturer ça. (D, Interview #10, p. 6)" "Puis évidemment, tsé, un peu tout le monde, un peu partout dans le monde les gens essayaient de faire ces choses là aussi. Donc, tsé des gens de l'hôpital ben allaient faire des visites, je sais pas moi, dans des hôpitaux aux USA, dans une autre place dans le Canada, puis ils revenaient, pis eux aussi essayaient de faire ces affaires là. Pis là c'était comme l'évolution, Donc, ils les voyaient, puis là on arrivait avec les projets, ils étaient bien d'accord puis ils poussaient pour que les choses se fasse. (D, Interview #10, p. 6)"

Unit of change	This change adopted a single unit of change since it only involves internal members of the hospital, namely managers, IS employees, members of the BPMO as well as receptionists and archivists.	"Donc, vite moi j'ai compris qu'on devrait remplacer ça. Donc, là, en tout cas, j'ai mis de la pression, j'ai mis de la pression au Bureau d'étude du travail, il y avait un Bureau d'étude du travail, méthodologies avec qui un gars qui étaient là-dedans j'étais chum avec eux autres ... il a eu une promotion qui fait que un moment donné on a eu le ok de commencer à développer l'index. Donc, ça partait, c'est ça qui a été la première décision de développer quelque chose pour remplacer l'index. (D, Interview #9, p.1)"
Mode of Change	This change followed an intermediate mode of change since the creation of the MPS system was predictable from the onset. Indeed, the functionalities provided by the system were a logical complement to those provided by the accounting and medical statistics systems. However, several members of the hospital (e.g., receptionists and archivists) tried with no avail to influence the outcome of this IS change.	"Tsé, montrer à une chef des archives, qui était la doyenne de l'Université de Montréal, madame Charland. Je peux vous dire, la présidente de l'association des archivistes de la province que un ordinateur était capable de mieux faire que ses petites archivistes pis qui se trompait moins à chercher dans les cartes, pis trouver le patient. Je peux te dire une affaire, attache ta tuque. (D, Interview #9, p. 6)" "Si je peux vous dire une anecdote, une réalité. Quand on a implanté le premier système d'admission, tsé la dactylo qui parlait. 23 employés au service d'accueil de l'hôpital. Un an après il ne restait que 2 employés de ces 23 là. Les employés, la résistance au changement était tellement forte que les gens sont partis. (D, Interview #9, p. 5)"
Corresponding theory	Path Dependency	

2.4.2 Change #2 : Upgrade of the MPI system's terminals

While migrating the "CARDEX" to the mainframe, "Respondent #D" asked the hospital for the permission to purchase computer monitors. His intent was to replace the electronic typewriters with state of the art monitors, which would enable archivists and receptionists to better interact with the MPI system. Unfortunately, the financial director in office denied his request since money was short and the hospital had other priorities at that time. Now, five years later, the chance to replace the electronic typewriters presented itself again due to an unanticipated turn of events. Indeed, another healthcare institution that was geographically close to the hospital, labeled XYZ, had just purchased new computer monitors and wanted to get rid of its old monitors. Aware that the hospital had overlooked the purchase of computer monitors five years earlier due to cost issues, ABC (i.e., the manufacturer of the hospital's mainframe), which was now selling the new computer monitors to XYZ, offered XYZ's the opportunity to donate its old monitors to the hospital. Discussions between the hospital, ABC and XYZ went swiftly and the hospital decided that this gift provided an excellent opportunity to replace its old electronic typewriters. Even though the hospital did not have to incur any acquisition costs for these computer monitors, two other factors may have also contributed to this key IS change. First, the organizational structure of the hospital had changed significantly since "Respondent D's" last request. Indeed, the IT department was no longer under the responsibility of the hospital's financial director for it was now reporting directly to the hospital's general manager. Second, information technologies had evolved rapidly and significantly over the past five years. So much so that the healthcare industry was now investing massively in new information technologies to diminish administrative costs. Hence, computer monitors were now common and their performance was vastly superior to the now obsolete electronic typewriters. As such, if the hospital wanted to remain competitive in the

years to come, it had no choice but to continue its computerization efforts, which inherently involved switching to computer monitors in order to keep pace with the steady evolution of information technologies. Although this fact may have been neglected five years earlier by the financial director since he was mainly concerned with balancing the hospital's budget at the time, the hospital's general manager concerned with the long term viability of the hospital was quick to understand the key role of information technologies and thus accepted the gift from XYZ.

Taken as a whole, this migration to state of the art computer monitors can be depicted as a process that was initially stopped by strong inertial forces, such as forms of authority and resource allocation, but was later resumed due to an unanticipated opportunity stemming from the hospital's environment, as well as a restructuring of the hospital's forms of authority and a rebalance of short-term and long-term goals. Indeed, changes in the healthcare industry and the arrival of a favorable general director who saw the necessity to comply with changing environmental conditions, enticed the hospital to change its terminals since information technologies were now considered strategic assets instead of simple expenses. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed an evolutionary cycle of change, where switching to computer monitors was a prerequisite to pursue the computerization of the hospital's activities and a necessity to ensure the hospital's competitiveness in the long run. Correspondingly, the motor of change that caused/governed the hospital's switch to computer monitors was the need to keep pace with the steady evolution of information technologies as well as a transformation of the hospital's forms of authority and stated goals. This IS change also adopted a multiple unit of change since there were multiple stakeholders, both internal (e.g., general manager) and external (e.g., the manufacturer of the hospital's mainframe and XYZ). Lastly, it followed a prescribed mode of change since the migration to computer monitors was, to some extent, predictable from the onset. That is, the hospital had no choice but to eventually replace its old electronic

typewriters to remain competitive. Furthermore, only the computer monitors given by ABC were considered due to their low acquisition costs. Based on this characterization, we can now establish that the tenets of SIT best explain the genesis and outcome of this key IS change, as well as the constraining effect of history that accompanies it since the upgrade of the MPI system's terminals was driven by competitive forces and a change in the hospital's core features (i.e., forms of authority and stated goals) while following a cycle, unit and mode of change that correspond to the tenets of SIT (see Table 2.7).

Table 2.7 Change #2 – Upgrade of the MPI system's terminals

	Description	Supporting quotation(s)
Objective	To replace old electronic typewriter terminals with state of the art computer monitors.	"Participant D : Non c'était de l'efficience parce que moi je voulais pas développer sur les 2740 là. Regarde je développais pas, regarde c'était de la "marde". Participant E : C'était plus bon ça. (Interview #9, p. 12)"
Key dates	Decision to implement: 1972 Beginning of the implementation: 1972 Beginning of use: 1973	"Moi je voulais pas développer ça sur ces terminaux là, je voulais avoir des vrais écrans, parce que ça existait. Mais j'ai pas pu et le premier changement technologique, c'est venue à peu près deux ans à trois ans après. Donc, 1967, donc début des années 1970 où là l'Hôpital Royal-Victoria, eux autres avaient développé aussi un système d'index, tout ça. Mais eux il avait développé ça sur des écrans. Pis là, ils ont été généreux, parce que là ils changeaient d'écrans, ils les ont donné à Notre-Dame. Ils ont fait un don. Pis on a rapaillé une vingtaine d'écrans, des terminaux mais qui étaient des écrans et là on a remplacé par nos anciens terminaux. Et notre système a été le premier à aller sur des écrans à ce moment là. (D, Interview #9, p. 2)"
Context	Five years earlier the financial director of the hospital had rejected a request from "Respondent #D" to purchase new computer monitors to replace the old electronic typewriters in order to enable archivists and receptionists to better interact with the MPI system. However, due to a gift from another healthcare institution geographically close and the help of ABC (i.e., the hospital's mainframe manufacturer), the hospital had now the opportunity to upgrade the MPI system's terminals for free.	"Moi je voulais pas développer ça sur ces terminaux là, je voulais avoir des vrais écrans, parce que ça existait. Mais je n'ai pas pu et le premier changement technologique, c'est venu à peu près deux ans à trois ans après. Donc, 1967, donc début des années 1970 où là l'Hôpital Royal-Victoria, eux autres avaient développé aussi un système d'index, tout ça. Mais eux il avait développé ça sur des écrans. Pis là, ils ont été généreux, parce que là ils changeaient d'écrans, ils les ont donné à Notre-Dame. Ils ont fait un don. Pis on a rapaillé une vingtaine d'écrans, des terminaux mais qui étaient des écrans et là on a remplacé par nos anciens terminaux. Et notre système a été le premier à aller sur des écrans à ce moment là. (D, Interview #9, p. 2)" "C'est ça, je voulais faire ça avec des écrans des le début, avec des terminaux intelligent ok, mais là l'hôpital, c'était des décisions difficiles, il n'y avait pas d'argent, il y a jamais eu d'argent. C'était toujours des déficits à toutes les années. J'ai vécu 36 de réunion de direction générale parce qu'il y avait un déficit, pis qu'il fallait résorber le déficit. Regarde, ça jamais changé depuis que je suis à l'hôpital Notre-Dame. Donc là c'était tellement nouveau qu'investir dans des écrans, voyons dont, c'était ben trop beau. (D, Interview #10, p. 7)"
Cycle of change	This change followed an evolutionary cycle of change since it represents a competitive reaction of the hospital to an opportunity stemming from its environment.	"C'était dépassé pis tout le kit. Faut voir que la technologie évoluait aussi : les langages, les logiciels, CICS, etc. (D, Interview #10, p. 10)"

Motor of change	Two motors of change caused/governed the upgrade of the MPI system's terminals: (1) competitive pressure that forced the hospital to keep pace with the steady evolution of information technologies; and (2) a transformation of the hospital's core features (i.e., organizational structure and stated goals).	"C'est parce que c'était déjà dépassé. Tsé, écoutes, les petites filles entraient : le nom / le prénom / le numéro de porte / prénom de la mère / le nom du père /. Faut pas oublier les petites "/" sinon il y a une erreur pis ça marche pas. Ce n'était pas évident comme application. C'était basic en tabarnouche. C'était comme, t'a pas le choix, à un moment donné tu passes avec des écrans, sinon tu n'a plus application. C'est comme, si tu te promenais encore avec un gros gros téléphone, tsé les premiers téléphones. (D, Interview #10, p. 10)"
Unit of change	This IS change adopted a multiple unit of change since multiple stakeholders both internal (e.g., general manager) and external (e.g., hospital's mainframe manufacturer and XYZ) were involved in the upgrade of the MPI system's terminals.	"Tsé dans les premières années on relevait du directeur des finances. Ok mais après on a relevé de la direction générale. Ok. Donc à partir de là on était directement connecté avec la direction générale. La pluparts du temps le directeur général adjoint, qui a longtemps été de qui on relevait. Ça changé 3-4, c'était différent mais au moins on était connecté directement à la direction générale. Ça facilitait nos choix, puis nos actions. Parce qu'il faut voir qu'on était impliqué partout dans l'hôpital, Tsé tu peux pas relever de un pis travailler pour l'autre, pour l'autre. Donc, c'était la meilleure place où on pouvait vraiment être attaché. Donc, c'était "driver" par le milieu, le cœur de l'organisation. (D, Interview #10, p. 9)" "Puis ils nous ont donné les écrans mais on a jamais parlé avec le monde du Royal-Victoria. C'était fait un peu entre la direction du Royal-Victoria, la haute direction du CHUM, probablement Gille Cuit qui était chef de l'informatique qui a dit ok. Pis là, c'est IBM qui était l'entremetteur. Dans le fond IBM reprenait les équipements du Royal-Victoria puis il nous les cédait. Tu vois. Donc, le Royal-Victoria ne nous les donnait pas vraiment. C'est pas le Royal-Victoria dans le fond, qui a dis je vous fait un don. C'est plus comme IBM qui reprenait les équipements du VIC puis qui nous les transmettait, qui nous les donnait parce qu'ils valaient plus rien. (D, Interview #10, p. 9)"
Mode of Change	This IS change followed a prescribed mode of change since the migration to computer monitors was, to some extent, predictable from the onset. That is, the hospital had no choice but to eventually replace its old electronic typewriters to remain competitive. Furthermore, only the computer monitors given by XYZ were considered due their low acquisition costs.	C'était de la "marde" à utiliser pis à faire marcher. Mais j'ai jamais été capable de faire accepter par monsieur Brêt, qui m'avait engagé, de dépenser pour acheter des écrans. Trop beau. (D, Interview #9, p. 12)" "Pis on a " rapaillé" une vingtaine d'écrans, des terminaux mais qui étaient des écrans et là on a remplacé par nos anciens terminaux. Et notre système a été le premier à aller sur des écrans à ce moment là. (D, Interview #9, p. 2)"
Corresponding theory	Structural Inertia	

2.4.3 Change #3: Extension of the MPI system to include admission functionalities

Recognizing the benefits stemming from the initial creation of the MPI system, which electronically indexed all patient names and record numbers in order to replace the paper-based index system named "CARDEX", many other departments (e.g., pharmacy, biology, dietetic) also wanted to computerize their activities to reap similar benefits. Pressured by these departments to develop various specialized information systems tailored to their respective needs, the hospital's IT personnel rapidly realized that all these future information systems would need to capture the same key patient information. Indeed, this information would inherently serve as the primary key to categorizing all the information captured in these specialized systems. Recognizing that it would be cumbersome and redundant to implement the same sub-set of functionalities in all future specialized systems to capture this key patient information, the hospital's IT personnel suggested that this information should instead be captured at the source by the MPI system when the patient checks-in at the admission desk of the hospital. As such, this specific sub-set of functionalities would only be implemented once and the MPI system would then feed the patient information to the hospital's other specialized systems. This alternative was presented to the administrative board, which accepted the project on the basis that capturing patient information centrally in the MPI system would improve data quality and reduce implementation costs. After taking a full year to implement these functionalities in the MPI system, receptionists and archivists started to use them in 1974. In the process, the traditional paper-based systems that were used to capture patient information were decommissioned despite user resistance. Similar to the initial creation of the MPI system, some users were afraid to lose their jobs, as they did not trust computer systems. As such, they resisted by continuing to use the old paper-based system stating that it was more reliable. Nonetheless, "Respondent #D", who was in charge of

implementing these new functionalities, convinced the hospital's general manager that the functionalities newly implemented in the MPI system were working properly and that errors were deliberately caused by the hospital's personnel. Accordingly, the hospital's general manager unilaterally decided that the old paper-based system should be scrapped and that the MPI system would, from now on, be the only system used at the hospital to capture key patient information.

Overall, the extension of the MPI system to include functionalities that would capture all key patient information at the hospital was a direct consequence of the success of previous computerization efforts and seen as a stepping-stone in the pursuit of the computerization of hospital activities. Furthermore, it is the redundancy that would have been created across all other specialized systems that made this change to the MPI system a logical and predictable course of action. Also, the strong user resistance faced by the implementation team suggests that this change was discussed extensively and that several organizational actors intentionally attempted to derail the implementation of the MPI system's new functionalities. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed a life-cycle cycle of change, where the extension of the MPI system to include functionalities to capture patient information can be considered as the next logical phase in the ongoing process of computerizing hospital activities. Correspondingly, two motors of change caused/governed this key IS change: (1) the strong complementarity effects that would ensue from combining the MPI system's new functionalities with the specialized systems to be implemented in the future; and (2) the coordination effects that would occur from using a single central system to capture and disseminate key patient information at the hospital. It also adopts a single unit of change since all stakeholders involved in this extension of the MPI system were internal to the hospital. Lastly, it follows an intermediate mode of change since user resistance was great despite the hospital's general manager's ruthlessness to enforce the change and the predictable nature of this specific extension. Based on this

characterization, we can now establish that the tenets of PDT best explain the genesis and outcome of this key IS change as well as the constraining effect of history that accompanies it since the extension of the MPI system to include functionalities to capture key patient information at the source was driven by both complementarity and coordination effects while following a cycle, unit and mode of change that correspond to the tenets of PDT (see Table 2.8).

Table 2.8 Change #3 – Extension of the MPI system to include admission functionalities

	Description	Supporting quotation(s)
Objective	To replace old paper-based forms that were previously used to register patients (i.e., AH-101 and AH-185) at the hospital with new functionalities implemented into the MPI system to enable the hospital to *electronically* and centrally capture all key patient information.	"Donc l'objectif c'est, non, on va chercher l'information à la source, à l'accueil. Quand ça va être rentré clic. Après ça on va savoir où elle est. La gestion des lits toc toc toc.... Donc là, ce système là va être capable d'alimenter toute les autres. (D, Interview #9, p. 13)"
Key dates	Decision to implement: 1973 Beginning of the implementation: 1973 Beginning of use: 1974	"Interviewer: En quelle année est arrivé cette étape? Participant D : Moi je dirais probablement 1974, dans ces eaux là. (D, Interview #9, p. 13)"
Context	Recognizing the benefits stemming from the initial creation of the MPI system, other departments (e.g., pharmacy, biology, dietetic) also wanted to computerize their activities to reap similar benefits. Pressured by these departments to develop various specialized information systems tailored to their respective needs, the hospital's IT personnel rapidly recognized that it would be cumbersome and redundant to implement the same sub-set of functionalities in all future specialized systems to capture the same key patient information. As such, the hospital's IT personnel suggested that this information should instead be captured at the source by the MPI system and then fed to the hospital's other specialized systems.	"Ben c'était toujours l'idée que, tsé tout le monde voulait qu'on développe un système informatique, tout le monde voulait qu'on développe : pharmacie, la diététique. Je prends ceux là parce qui sont plus imagé que d'autres, tous les systèmes de laboratoire, la bio, la micro, la sito. Regardes, il y en a toute une kyrielle. Ben là dans tous les systèmes, si tu développes ce système là en mode autonome tu ressaisis toujours toutes les données. Tout le temps. Donc l'objectif c'est, non, on va chercher l'information à la source, à l'accueil. Quand ça va être rentré clic. Après ça on va savoir où elle est. La gestion des lits toc toc toc.... Donc là, ce système là va être capable d'alimenter toute les autres. (D, Interview #9, p. 13)"

Cycle of change	This IS change followed a life-cycle cycle of change since it represented a direct consequence of the actions taken previously to electronically index all patient names and record numbers.	"Participant D: Après ça été la partie admission. Elles faisaient l'entrevue sur l'écran. La personne parlait, votre nom monsieur, elle entrait ça sur l'écran. Et là on a pu entrer et imprimer la formule d'admission. Participants A: L'équivalent de la AH-101. (Interview #9, p. 6)" "Non le formulaire AH-101 c'était comme l'inscription des patients. Pis en même temps on faisait l'inscription, il y avait le AH-185 qui était l'inscription en clinique externe. On ne parle jamais des cliniques externes, mais il y avait un gros index au clinique externe à cette époque là aussi. Qui lui a disparu très rapidement. (D, Interview #9, p. 15) " "Interviewer: Quand vous avez fait le processus d'admission comme tel avec le AH-101 et le AH-185, ce que vous avez remplacé finalement c'est juste un truc papier que vous faisiez pour un truc informatique? Participant D: Exact. Interviewer: Vous êtes passé d'un formulaire papier à un formulaire informatisé... Participant D: Qui était la base de capter l'information. L'information de base. Si t'as pas l'information de base tu es dans le trouble. Donc, avec moins d'effort opérationnel pour le personnel on réussissait à avoir toute l'information : Qui, qui est arrivé, à quelle heure, nom, prénom, c'est qui, il est dans quel lit. (Interview #10, p. 12)" "Pour toutes les pressions venaient. Que au lieu de développer, je sais pas, toute la saisi de l'information nécessaire à ce système là, dans ce système là, ben on va mettre nos efforts à faire marcher le système d'admission et en même temps ça va alimenter celui là, mais ça va alimenter tous les autres aussi. Donc c'était dans un modèle de développement global, de synergie globale. Que les décisions étaient, écoutes, on amenait ça pis personne pouvais dire le contraire là. C'était ça là. Écoutes, c'était tellement ça que ça ne pouvait pas être autre chose. (D, Interview #10, p. 14)"
Motor of change	Two motors of change caused/governed this extension of the MPI system to include admission functionalities: (1) the strong complementarity effects that would ensue from combining the MPI system's new functionalities with the specialized systems to be implemented in the future; and (2) the coordination effects that would occur from using a single central system to capture and disseminate key patient information at the hospital.	"Ben c'était toujours l'idée que, tsé tout le monde voulait qu'on développe un système informatique, tout le monde voulait qu'on développe : pharmacie, la diététique. Je prends ceux là parce qui sont plus imagé que d'autres, tous les systèmes de laboratoire, la bio, la micro, la sito. Regardes, il y en a toute une kyrielle. Ben là dans tous les systèmes, si tu développes ce système là en mode autonome tu ressaisis toujours toutes les données. Tout le temps. Donc l'objectif c'est, non, on va chercher l'information à la source, à l'accueil. Quand ça va être rentré clic. Après ça on va savoir où elle est. La gestion des lits toc toc toc.... Donc là, ce système là va être capable d'alimenter toute les autres. (D, Interview #9, p. 13)" "Donc l'interfaçage avec, l'objet, ben on avait l'information pis après ça, on voulait essayer de l'utiliser le plus possible ailleurs. Pis le plus rapidement possible. Donc, empêcher qu'on soit obligé de ressaisir l'information. Tsé ressaisir l'information dans le système de statistiques médicales qu'on avait développé dans les premières années. Tsé, ils remplissaient des formules, puis ça s'en venais, puis c'est des "punchs" qui tapait ça : nom, prénom docteur, qui traitant. Là, plus besoins de faires ça parce que le système d'admission me le donnait. Donc, je saisissais l'information, je l'utilisais. Puis les archives chialait parce qu'il y avait des erreurs. Mais ils avaient juste à corriger les erreurs. Ils évitaient toute la saisie au total de millier de dossier. (D, Interview #10, p. 13)"

Unit of change	This IS change adopted a single unit of change since all stakeholders involved in this extension of the MPI system to include admission functionalities were internal to the hospital (e.g., IT personnel, administrative board members, general manager, receptionists, archivists).	" On s'assurait de le "driver". Pis c'était pas ben long de faire la preuve, un plus un, égale deux. Là-dedans il y avait toujours des petits rapports qui fallait faire pour supporter, des petits plans d'action, un échéancier, une date. Comme tout projet, fallait que tu montes un petit peu ton projet, que tu le présentes un peu. Mais disons que l'effort n'était pas tellement là. C'était de le réaliser l'effort. Donc, on mettait un minimum de temps là-dedans en tabarnouche. Pis les décisions venaient, parce qu'au "A" les gens, les gens, vue qu'on était assez rattaché avec la gestion, la haute direction. Donc, on parlait tous les jours de ces choses là. Donc, ils étaient au courant, ils étaient impliqués jusqu'à un certain point. Parce qu'ils vivaient, où on était, moi tous mes amis, j'avais plein d'amis c'était des directeurs, des directeurs adjoints tout le kit. Puis je dinais avec eux le midi. On jouait au ballon ballais dans les ligues de ballon ballais de l'hôpital ensemble. Tsé, à l'autre bout, on échangeait, on parlait de tout ça ensemble etc. Ça prenait des fois un petit papier pour passer à direction générale pis au conseil d'administration pis encore là, la plupart du temps ça passait au bureau du directeur général. C'est tout. (D, Interview #10, p. 14)"
Mode of Change	This IS change followed an intermediate mode of change since user resistance was great despite the hospital's general manager's ruthlessness to enforce the change and the predictable nature of this specific extension.	"La décision de le faire, rendu là, c'était beaucoup la décision de l'informatique. Dans le fond j'étais comme le promoteur. J'étais partout dans l'hôpital, pis c'était pas l'hôpital d'aujourd'hui. Pis je voyais les choses que je pouvais faire. Pis tout le kit. Je devenais le promoteur, souvent le décideur… (D, Interview #9, p. 13)" "Mais moi on remettait ça comme c'était. Donc là, j'ai sorti des statistiques, grosse chicane. Pis là, c'est ce docteur là qui a tranché. Pis là, j'ai dit : écoutez, le seul moyen d'améliorer, pis d'être sur que nos systèmes vont bien, c'est que vous les utilisiez. Parce que, encore là, il y avait aussi un petit peu encore de magouille ou de résistance. Les gens qui aimaient pas ça parce qu'ils avaient peur de perdre leur job, ils faisaient tout à la main. Ils faisaient plein de choses à la main que le système faisait. Donc, moi je sortais des rapports, mettons des rapports de présences d'hôpital, pis présences de ça. Ben à l'accueil il ressortait les mêmes rapports à la main. Donc, il y avait du monde à plein temps qui ressortaient les mêmes rapports, pis là qui comparaient et qui disaient que mon système n'était pas bon. Pis tout le kit. Ce qui était important pour eux, c'est ce qu'ils faisaient à la main. C'était une "job" ça. Donc, ils ne rentraient pas les données, ils ne faisaient pas les "job". Dans le système, c'est vrai qu'il y avait les erreurs, mais ils ne les rentraient pas. Si le patient n'est pas là, c'est par ce qu'ils ne l'ont pas admis dans le système, ainsi de suite. Ce docteur là, à donné un gros coup de bar un moment donné. Il a dit bon, il a fait venir les gens, il a dit c'est tu bon ou c'est pas bon. Donc là, ils ont fini, parce qu'ils pouvaient pas dire que c'était pas bon. Donc là, il y a eu une décision que tout les systèmes manuels sont "scrapés" à partir de vous sortez du bureau on "scrappe" tout ça pis tout le monde travaille juste là dedans. (D, Interview #9, p. 13)" "Pour toutes les pressions venaient. Que au lieu de développer, je sais pas, toute la saisi de l'information nécessaire à ce système là, dans ce système là, ben on va mettre nos efforts à faire marcher le système d'admission et en même temps ça va alimenter celui là, mais ça va alimenter tous les autres aussi. Donc c'était dans un modèle de développement global, de synergie globale. Que les décisions étaient, écoutes, on amenait ça pis personne pouvais dire le contraire là. C'était ça là. Écoutes, c'était tellement ça que ça ne pouvait pas être autre chose. (D, Interview #10, p. 14"
Corresponding theory	Path Dependency	

2.4.4 Change #4 : Extension of the MPI system to include bed management functionalities

Following the first extension of the MPI system to include admission functionalities, which enabled the hospital to capture key patient information centrally and thus to keep track of patients that were checking-in the hospital, the IT personnel decided that it was opportune to add functionalities that would enable the hospital to electronically keep track of patients who were moving inside the hospital and/or checking-out. At that time, patient movements within the hospital and/or their departure were only recorded on paper slips that were then sent to the admission desk via a pneumatic system in order to be added to the patient's personal paper file. Once in the patient's personal paper file at the admission desk, patient movements would rarely be communicated to other departments within the hospital. Hence, further extending the MPI system to include bed management functionalities and keep track of all patient movements within the hospital and/or their departure was seen by the IT personnel as an opportunity to facilitate the dissemination of key patient information across departments and improve inter-departmental interactions. In addition, by keeping track of all patient movements electronically, this second extension would facilitate the production of several hospital reports that were previously produced manually (e.g., daily census of all hospital patients). As such, departments such as pharmacology and dietetic, which had already linked their own specialized information systems to the MPI system, would now be able to distribute patient prescriptions and meals more effectively and efficiently since their employees would now be aware of the exact location of each patient within the hospital or if their hospitalization has ended. Adding the bed management functionalities to the MPI system took about a year to implement and the old pneumatic system was retired in 1974 when "Respondent D" collected and destroyed all paper slips during an overnight whirl. Expecting protests from receptionists, archivists and

nurses, "Respondent #D" then prepared his response to the resistance he was expecting to face the next morning. However, to his surprise, he didn't receive any complaints and the implementation of the extension of the MPI systems to electronically keep track of all patient movements within the hospital and their departure was deemed a success.

Overall, the extension of the MPI system to include functionalities that electronically kept track of all patient movements within the hospital and their departure was seen as a complement to previous computerization efforts since it would reinforce the synergies that already existed between the MPI system and the hospital's other specialized systems. In addition, this extension was also a way to improve inter-departmental interactions and facilitate the production of several reports. Also, the lack of user resistance suggests that this extension to the MPI system was expected and that receptionists, archivists and nurses saw it as inevitable. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed a life-cycle cycle of change, where the extension of the MPI system to include bed management functionalities can be considered as the next logical phase in the ongoing process of computerizing the hospital's activities. Correspondingly, two motors of change caused/governed this extension of the MPI system to include bed management functionalities: (1) the strong complementarity effects that would ensue from combining the MPI system's new functionalities with those already implemented in the system as well as those previously implemented in the hospital's other specialized systems; and (2) the coordination effects that would occur from using up to date information on patient movements to facilitate inter-departmental interactions. It also adopted a single unit of change since all stakeholders involved in this extension of the MPI system were internal to the hospital (i.e., "Respondent #D", other IT personnel, receptionists, archivists and nurses). Lastly, it followed a prescribed mode of change since this extension of the MPIS systems was expected from the onset and everyone bought into the change without questions. Based on this characterization, we can now establish that the tenets of PDT best explain the

genesis and outcome of this key IS change as well as the constraining effect of history that accompanied it since the extension of the MPI system to include bed management functionalities was driven by both complementarity and coordination effects while following a cycle, unit and mode of change that correspond to the tenets of PDT (see Table 2.9).

Table 2.9 Change #4 – Extension of the MPI system to include bed management functionalities

	Description	Supporting quotation(s)
Objective	To replace the old system that relied on paper slips and pneumatic conveyors to send information from various healthcare units to the admission desk with new functionalities implemented into the MPI system to facilitate the dissemination of key patient information across the various departments of the hospital, improve inter-department interactions, and ease the production of reports.	"Ok, dans le fond la grosse évolution ça été après l'accueil. Parce que là, ça se ressemblait tout le temps l'admission. On imprimait la formule mais on ne savait pas trop qui était dans l'hôpital. On savait qui rentrait mais on savait pas qui partait. Donc, tous ce qu'on peut rattacher au mot gestion des lits : donc tout gérer qui part, quand qu'il part, quand il arrive, quand qu'il rentre dans le lit. Tous ce qui va avec ça pis la circulation d'information pour être capable de capter ce genre d'information là dans l'hôpital de façon efficace. (D, Interview #10, p. 11)"
Key dates	Decision to implement: 1974 Beginning of the implementation: 1974 Beginning of use: 1975	"Dans le fond, là où on était en 1973, on avait un système d'inscription. Mais là tout ce qu'on a ajouté, c'est les fonctionnalités pour faire le départ-transfert. Donc, tout pour faire le recensement de l'hôpital. (D, Interview #9, p. 15)" "Dans ton rapport, tu devrais parler plus, je vais corriger et je vais me corriger jusqu'à un certain point, au lieu de parler de départ-transfert, on va appeler ça : gestion des lits. Donc, je dirais 1974- 1975, le développement, l'implantation, la mise en place, le rodage de ce qui tourne autour de ce qu'on pourrais appeler la gestion des lits. (D, Interview #9. P. 16)"

Context	Following the first extension of the MPI system to include admission functionalities, which allowed to keep track of patients that were checking-in the hospital, the IT personnel decided that it was opportune to also add functionalities that would enable the hospital to electronically keep track of patients that were moving within the hospital and/or checking-out. At that time, such movements were only recorded on paper slips that were sent to the admission desk via a pneumatic system in order to be added to the patient's personal paper file. Once in the patient's personal paper file at the admission desk, patient movements were rarely communicated to other departments within the hospital	"Après les deux formulaires, c'est la partie, on a additionné au système la partie départ-transfert. Donc, quand une personne est partie, on dit au système : elle est partie. Parce qu'à l'inscription on savait quand es-ce qu'ils rentraient à l'hôpital. Mais on ne savait pas où ils étaient. Quand tu changeais de lit on savait pas où tu étais. (D, Interview #9, p. 16)" "Parce que ça marchait avec des petites requêtes. Pour un peu t'expliquer le contexte, on remplissait les petites requêtes avec les cartes du patient. Pis envoyait ça par pneumatique. Çà restait bloqué sur le toit de l'hôpital, perdait, allait dans un autre département, oubliait carrément de le faire. On en oublie 3-4 et les listes ne se remplissent pas. Il y a moins d'ouvrage sur les unités. Regarde plein d'affaires, Je te le dis moi. (D, Interview #10, p. 11)"
Cycle of change	This key *IS* change followed a life-cycle cycle of change since it represents a direct consequence of actions taken previously, namely: (1) to electronically index all patient names and record numbers; and (2) to centrally capture key patient information in the MPI system.	"Après les deux formulaires, c'est la partie, on a additionné au système la partie départ-transfert. Donc, quand une personne est partie, on dit au système : elle est partie. Parce qu'à l'inscription on savait quand es-ce qu'ils rentraient à l'hôpital. Mais on ne savait pas où ils étaient. Quand tu changeais de lit on savait pas où tu étais. (D, Interview #9, p. 16)" "Ok, dans le fond la grosse évolution ça été après l'accueil. Parce que là, ça se ressemblait tout le temps l'admission. On imprimait la formule mais on ne savait pas trop qui était dans l'hôpital. On savait qui rentrait mais on savait pas qui partait. Donc, tous ce qu'on peut rattacher au mot gestion des lits : donc tout gérer qui part, quand qu'il part, quand il arrive, quand qu'il rentre dans le lit. Tous ce qui va avec ça pis la circulation d'information pour être capable de capter ce genre d'information là dans l'hôpital de façon efficace. (D, Interview #10, p. 11)"

Motor of change	Two motors of change caused/governed this extension of the MPI system to include bed management functionalities: (1) the strong complementarity effects that would ensue from combining the MPI system's new functionalities with those already implemented in the system as well as those previously implemented in the hospital's other specialized systems; and (2) the coordination effects that would occur from using up to date information on patient movements to facilitate inter-department interactions.	"La gestion des lits, là on avait l'inscription, on avait le patient il est venait pis regarde, c'est ça, c'est lui. Pis, on a son index de créé. Mais là, on pouvait savoir : il est parti tel jour, à telle heure, où il a été transféré, de tel lit à tel lit. Donc ça nous as permis de pouvoir sortir des rapports comme le recensement de l'hôpital. Qu'on a commencé à distribuer dans tous les départements de l'hôpital, les unités de soins. De produire des statistiques d'Accueil, d'Admission. Donc ça été un élément important dans, pour greffé plein d'autres systèmes cliniques ou médicaux cliniques à travers ce système là parce qu'on avait cette information là. (D, Interview #9, p. 16)" "Donc là on l'a informatisé, pis ça leurs donnait, des choses. Pis ça nous a permis de produire des statistiques : admissions, départs, transferts, des rapports journaliers de ça. Ok, à tous les jour un hôpital c'est obligé d'avoir un registre, à minuit le soir, de qui est dans mon hôpital. Donc, on était capable de générer le registre. Pis que tout balance. Donc, il devenait le système de control pis qu'on avait toute l'information pis que tout est bon. (D, Interview #10, p. 11)" " Pis la gestion des lits, c'est important pour la gestion de l'accueil, les archives, les unités de soins. Mais c'était aussi extrêmement important pour tous nos autres applications : diététique, nutrition, les menus. Tsé, à quelle place il va le lunch aujourd'hui, etc. Pis là on développait toute sorte d'autres applications qui finissaient par se brancher sur notre système d'index-admission. D'admission plus que d'index là. Ok. Donc, de savoir où est le patient, c'est qui, c'est qui son médecin, tout son paramètre. Ben ça nous permettait d'avoir des liens qui nous permettaient d'alimenter tous les autres systèmes. (D, Interview #10, p. 12)" "Tout ça était concerté aussi avec tout le reste de nos projets de développement. Ce n'était pas juste ce système là. C'était ce système là dans la vie des autres. (D, Interview #10, p. 12)"
Unit of change	This IS change adopted a single unit of change since all stakeholders involved in this extension of the MPI system to include bed management functionalities were internal to the hospital (i.e., "Respondent #D, other IT personnel, receptionists, archivists and nurses).	"Donc, moi j'avais instauré ça. Pis j'ai dis : Ben là comment on marche, téléphonez à l'accueil pis vous leur dite que ce patient là, a son départ signé. Les filles à l'accueil enregistraient ça tout de suite. Pis là, il y avait toute la mécanique. Mais là, c'était confirmé. Mais les archives et l'accueil ça prenait le petit papier, parce que ça c'était la vraie preuve. C'était ben bon. Donc, un jour, j'ai décidé qu'il n'y avait plus de papier pis qu'on marcherait juste par téléphone. Donc je suis parti un soir vers à peu près 11h00-12H00. On était tout le temps à l'hôpital, on vivait là, on couchait là. Je suis parti avec un chariot, j'ai fait le tour de toute les unités de soins pis j'ai tout ramassé les petits papiers. Pis j'ai apporté ça à mon bureau. Je m'attendait à ce que le téléphone sonne, que ça allait être le drame, mais je n'en ai jamais entendu parlé. (D, Interview #9, p. 18)"
Mode of Change	This IS change followed a prescribed mode of change since it was expected from the onset and everyone bought into the change without questions.	"Donc, moi j'avais instauré ça. Pis j'ai dis : Ben là comment on marche, téléphonez à l'accueil pis vous leur dite que ce patient là, a son départ signé. Les filles à l'accueil enregistraient ça tout de suite. Pis là, il y avait toute la mécanique. Mais, là c'était confirmé. Mais les archives et l'accueil ça prenait le petit papier, parce que ça c'était la vraie preuve. C'était ben bon. Donc, un jour, j'ai décidé qu'il n'y avait plus de papier pis qu'on marcherait juste par téléphone. Donc je suis parti un soir vers à peu près 11h00-12H00. On était tout le temps à l'hôpital, on vivait là, on couchait là. Je suis parti avec un chariot, j'ai fait le tour de toute les unités de soins pis j'ai tout ramassé les petits papiers. Pis j'ai apporté ça à mon bureau. Je m'attendait à ce que le téléphone sonne, que ça allait être le drame, mais je n'en ai jamais entendu parlé. (D, Interview #9, p. 18)"
Corresponding theory	Path Dependency	

2.4.5 Change #5 : Upgrade of the MPI system's addressing method

In 1974, the growing number of functionalities offered by the MPI system, its increasing number of users, as well as the rising number of other specialized systems connected to the MPI system, forced the hospital to upgrade the MPI system's disc addressing method to restore an adequate level of performance. Indeed, data demands generated by previous computerization efforts had now led to a space shortage on computer discs, as well as a decrease in the input-output performance of the discs, which created a bottleneck that needed to be solved. At that time, the MPI system relied on a sequencial addressing method, called ISAM, to store and retrieve data. ISAM was extremely limited and did not maximize the storage and retrieval capabilities of the MPI system in terms of speed and capacity. In response to this important issue, "Respondent E" explored several avenues and conducted several tests to identify a useful alternative. Finally, based on his recommendation, the IT personnel of the hospital implemented a virtual addressing method, called VSAM, to overcome the MPI system's disc addressing problems. It is important to note that VSAM was compatible with the hospital's current information systems while also being used by many other organizations that had also purchased a mainframe from ABC (i.e., the hospital's mainframe manufacturer). Hence, the IT personnel of the hospital was confident that only a limited portion of the MPI system had to be re-written in order to complete the switch to VSAM and that the upgrade would yield satisfactory results. Accordingly, the MPI system was re-written in less than a year and users (i.e., receptionist, archivists, nurses) showed no resistance, as most of them were blind to the change.

Overall, the upgrade of MPI system's disc addressing method is a direct consequence of previous computerization efforts at the hospital as well as a prerequisite to electronically support current and future hospital activities. In addition, compatibility issues with the hospital's current information systems significantly constrained the

hospital's choice and made the selection of the VSAM disc addressing method a given. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed a life-cycle cycle of change, where the upgrade of MPI system's disc addressing method can be considered as the next logical phase in the ongoing process of computerizing hospital activities. Correspondingly, the motor of change that caused/governed this key IS change was the strong complementarity effects that would occur between the new disc addressing method and the hospital's current information systems. It also adopted a single unit of change since all stakeholders involved in the upgrade of the MPI system's disc addressing method were internal to the hospital (i.e., Respondent #E, other IT personnel, receptionists, archivist, nurses). Lastly, it followed a prescribed mode of change since no other viable options were available at the time and everyone involved bought into this key IS change without question. Based on this characterization, we can now establish that the tenets of PDT best explain the genesis and outcome of this key IS change as well as the constraining effect of history that accompanied it since the upgrade of the MPI system's disc addressing method was driven by complementarity effects while following a cycle, unit and mode of change that correspond to the tenets of PDT (see Table 2.10).

Table 2.10 Change #5 – Upgrade of the MPI system's addressing method

	Description	Supporting quotation(s)
Objective	To replace the old MPI system's disc addressing method called ISAM with a new disc addressing method called VSAM in order to overcome the MPI system's memory problems.	n/a
Key dates	Decision to implement: 1974 Beginning of the implementation: 1974 Beginning of use: 1975	"C'est en 1974 parce que moi j'avais fait une évaluation des bases de données. (E, Interview #11, p. 14)"
Context	In 1974, the growing number of functionalities offered by the MPI system, its increasing number of users as well as the rising number of other specialized systems connected to the MPI system, forced the hospital to upgrade the MPI system's disc addressing method to restore an adequate level of performance. Indeed, data demands generated by previous computerization efforts had now led to a space shortage on computer discs, as well as a decrease in performance of the discs input-output.	"Parce que là ce qui faut comprendre qu'on est toujours sur une machine qui a 64 K de mémoire. Mais, il n'y a pas un programme qui roule là-dessus, il y en a plusieurs. Tu as du administratif, tu as du "online", tu as le système d'exploitation, tout le monde prend de la mémoire. On a toujours juste 64 k pour toute la gang. (E, Interview #9, p. 11) "Tu fais pas du traitement de comptabilité pis la paie le jour. Tu fais ça pendant la nuit, pendant qu'il n'y a rien qui se passe. (D, Interview #9, p. 11)" "Parce que eux autres, tsé, les premiers systèmes c'est avec ISAM (E, Interview #9, p. 9)" "C'est la technologie, un index pour stocker sur disque. C'est le système d'adressage. (E, Interview #9, p. 9)". "C'est pas tant pour stocker que pour retrouver. C'est l'indexation des fichiers, si tu veux. (F, Interview #9, p. 9)"
Cycle of change	This IS change followed a life-cycle cycle of change since it represented a natural consequences of actions taken previously, namely: (1) to electronically index all patient names and record numbers; (2) to centrally capture key patient information in the MPI system; (3) to electronically keep track of all patient movements; and (4) to implement and connect several specialized systems to the MPI system.	"Parce que là ce qui faut comprendre qu'on est toujours sur une machine qui a 64 K de mémoire. Mais, il n'y a pas un programme qui roule là-dessus, il y en a plusieurs. Tu as du administratif, tu as du "online", tu as le système d'exploitation, tout le monde prend de la mémoire. On a toujours juste 64 k pour toute la gang. Là, c'est sur que tes programmes, un moment donné, tu as passé dedans pis tu t'en vas remettre du code à la place pour être capable d'utiliser le même petit coin. (E, Interview #9, p. 11)"

Motor of change	The motor of change that caused/governed this key IS change was the strong complementarity effects that would occur between the new disc addressing method and the hospital's current information systems.	"Parce que là ce qui faut comprendre qu'on est toujours sur une machine qui a 64 K de mémoire. Mais, il n'y a pas un programme qui roule là-dessus, il y en a plusieurs. Tu as du administratif, tu as du "online", tu as le système d'exploitation, tout le monde prend de la mémoire. On a toujours juste 64 k pour toute la gang. Là, c'est sur que tes programmes, un moment donné, tu as passé dedans pis tu t'en vas remettre du code à la place pour être capable d'utiliser le même petit coin. (E, Interview #9, p. 11)"
Unit of change	This IS change adopted a single unit of change since all stakeholders in this upgrade of the MPI system's disc addressing method were internal to the hospital (i.e., Respondent #E, other IT personnel, receptionists, archivist, nurses).	"Mais IBM eux autres, à ce moment là, travaillait, leur base de données utilisait VSAM. Qui est une méthode virtuelle de séquencer sur disque. Ça c'était efficace et c'est à ce moment là qu'on a imposé ça dans à peu près tout nos systèmes. Tout le monde c'est mis à développer VSAM parce que là c'était vite. (E, Interview #9, p. 10" "Ce qu'il faut que vous compreniez, peu importe le langage, IBM donnait des exemples de codes. Tu veux retrouver des données en Cobol dans un fichier VSAM voici c'est de même que tu codes ça. Tu veux retrouver des données dans un fichier, dans une BD IMS, pis tu es en Assembler, ben c'est de même que tu codes ça. Donc il y avait des exemples de routine pour aller chercher des données en fonction du langage et de la façon c'était "stocker". Donc on pouvait parfois changer des programmes et les passer de l'Assembler au Cobol parce qu'on avait une refonte profonde à refaire. Mais d'autre fois on restait en Assembler mais on changeait la méthode d'accéder aux données. On changeait rarement tout en même temps. (F, Interview #9, p. 14)"
Mode of Change	This change followed a prescribed mode of change since no other viable options were available at the time and everyone involved bought into this key IS change without questions.	"Mais IBM eux autres, à ce moment là, travaillait, leur base de données utilisait VSAM. Qui est une méthode virtuelle de séquencer sur disque. Ça c'était efficace et c'est à ce moment là qu'on a imposé ça dans à peu près tout nos systèmes. Tout le monde c'est mis à développer VSAM parce que là c'était vite. (E, Interview #9, p. 10"
Corresponding theory	Path Dependency	

2.4.6 Change #6 : Extension of the MPI system to include appointment functionalities

The objective of this important extension to the MPI system was to standardize and unify the management of appointments at the hospital. At that time, almost every department of the hospital managed their own appointments through homemade systems. Indeed, some departments were using old paper-based systems such as ledgers while others were using Excel files to schedule patients for their respective treatments. This plethora of diverging and unlinked systems created several deficiencies that impeded the provision of individual care at the hospital. For example, the same patient could be scheduled for two appointments, in two different departments at the same time. Such situations significantly confused patients and wasted precious hospital resources in terms of personnel and room allocations. Hoping to address these important issues, the hospital decided that is was time to implement a universal appointment system. More precisely, it was decided that the MPI system would be extended to include these new functionalities. Hence, similar to the extension to include bed management functionalities, this new extension would build on the functionalities already implemented in the MPI system to improve inter-departmental interactions. As such, by providing a centralized and up to date schedule, the MPI system would enable all departments to adequately plan their activities and be better prepared for the work to be done. It addition, as noted by "Respondent #D", it would have been impossible to develop these newer functionalities without having first implemented the index, admission and bed management functionalities into the MPI system. Indeed, appointment functionalities required the outputs of these previous functionalities to work properly. Furthermore, the outputs of appointment functionalities would later become the inputs of index, admission and bed management functionalities to allocate personnel and rooms adequately, as well as to improve the provision of individual care at the hospital. Hence, index, admission, bed management and appointment

functionalities are extremely complementary while each set of functionalities represents a critical building-block or phase in the overall development of the MPI system. However, although predictable, the decision to extend the MPI system to include appointment functionalities wasn't taken lightly since the hospital's administrative board was well aware of the difficulties of implementing such functionalities. Indeed, it was well known within the healthcare industry that standardizing appointment methods within a healthcare institution was extremely difficult and that many attempts made by other hospitals to implement such functionalities had failed in the past. Three reasons explained these failures. First, standardizing appointment methods involves multiple stakeholders with different needs and interests that may be at odds. Second, attempting to implement a universal appointment system to federate the activities of numerous departments that operate differently is a very difficult task. Third, the most powerful stakeholders within the healthcare institution, such as doctors, are likely to provide strong user resistance since centralizing appointment functionalities on a single system is likely to markedly alter their work practices. Despite these concerns, the hospital decided in 1979, after several years of postponing this IS change out of fear of failure, to implement the appointment functionalities into the MPI system. This implementation effort was completed in 1982. While the first attempt to extend the MPI system was a limited success, the appointment functionalities were not discarded but rather improved through time and are still being used to this day.

Overall, the extension of the MPI system to include appointment functionalities is a direct consequence of the other computerization efforts conducted at the hospital. Indeed, it would have been impossible to implement the appointment functionalities without having developed the index, admission and bed management functionalities a priori. As such, this extension can be seen as the next phase in the evolution of the MPI system. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed a life-cycle cycle

of change, where the extension of the MPI system to include appointments functionalities can be considered as the next logical phase in the ongoing process of computerizing hospital activities. Correspondingly, two motors of change caused/governed this key IS change: (1) the strong complementarity effects that would ensue from combining the MPI system's new functionalities with those already implemented in the system as well as those previously implemented in the hospital's other specialized systems; and (2) the coordination effects that would occur from using a single centralized system to schedule patient appointments and facilitate inter-department interactions. It also adopted a single unit of change since all stakeholders in this extension of the MPI system were internal to the hospital (i.e., IT personnel, administrative board members, receptionists, archivists, nurses, doctors). Lastly, it followed an intermediate mode of change since the hospital's decision makers mindfully weighted the pros and cons of implementing appointment functionalities into the MPI system before moving forward with the change. Based on this characterization, we can now establish that the tenets of PDT best explain the genesis and outcome of this key IS change as well as the constraining effect of history that accompanied it since the extension of the MPI system to include appointment functionalities was driven by both complementarity and coordination effects while following a cycle, unit and mode of change that correspond to the tenets of PDT (see Table 2.11).

Table 2.11 Change #6 – Extension of the MPI system to include appointment functionalities

	Description	Supporting quotation(s)
Objective	To replace various homemade appointment systems with new functionalities implemented into the MPI system in order to standardize and unify the management of appointments at the hospital and improve inter-department interactions.	"C'est d'avoir toute l'infrastructure de ce que ça prends pour donner un rendez-vous : des plages horaires, des calendriers, des plages de disponibilités, des ressources, des salles, etc. Les dossiers, faut que les dossiers sortent et s'en viennent pour le rendez-vous. Donc, il y avait énormément de chose là-dedans. (D, Interview #9, p. 21)" "Ben ça remplaçait les formulaires et tous les rapports qui étaient produits manuellement antérieurement à l'accueil. (D, Interview #10, p. 21)" "Ben qui étaient papier ou des petit fichier Excel ou je sais pas quoi, regarde, tsé, l'informatique avait un petit peu évolué là. Donc tout le monde c'était développé des petites patentes. Certain c'étais papier, il y en a d'autre c'était des registres, il tournait la page pis bingo. Donc c'étai un peu, tout sorte de chose. Mais, il y avait un bureau qui était un peu central, pour certain type de rendez-vous. (D, Interview #10, p. 21)"
Key dates	Decision to implement: 1979 Beginning of the implementation: 1979 Beginning of use: 1982	"Ça été probablement à travers le DSH et je dirais probablement au début des années 1980. Je dirais fin des années 1970 la décision s'est prise. (D, Interview #9, p. 21)" "Moi je dirais, un gros 2 ans pour les premier modules de rendez-vous qui était dans un secteur. (D, Interview #9, p. 21)" "En 1982, Ça marché, ça assez bien marché pour que ça continu toujours à évoluer. Mais, je ne dirais pas que c'est un grand succès. (D, Interview #9, p. 21)"
Context	At the time, almost every department of the hospital managed their appointments through homemade systems. This plethora of diverging systems working in silos created several deficiencies that impeded the provision of individual care at the hospital. Hoping to alleviate these deficiencies, the hospital decided that it was now time to implement a universal appointment system.	"Les rendez-vous je dirais que ça été probablement le système le plus dur à promouvoir, à vendre, à réaliser, à implanter. Ça c'est fait sur un temps fou. Parce que moi je voulais faire des rendez-vous. (D, Interview #9, p. 20)" "Au Royal-Victoria, ils avaient peut-être quelque chose. Mais, partout, aux USA même, partout, c'est probablement le système le plus compliqué à implanter à l'intérieur d'un établissement de santé. (D, Interview #9, p. 20)" "Pis paradoxalement, aux USA ça se développait comme dix ans avant chez-nous, avant nous autres. Mais c'est drôle les rendez-vous c'était pareil, plein d'hôpitaux qui venaient visiter ou qu'on a vu, qu'on allait là, ils avaient tous l'index, l'admission, mais ils n'avaient pas les rendez-vous ou les rendez-vous c'était prévu. (D, Interview #9, p. 21)"

Cycle of change	This IS change followed a life-cycle cycle of change since it represented a direct consequence of actions taken previously, namely: (1) to electronically index all patient names and record numbers; (2) to centrally capture key patient information in the MPI system; and (3) to electronically keep track of all patient movements.	"Donc les rendez-vous c'est quelque chose d'extrêmement gros, d'extrêmement complexe et partout partout au USA, partout partout, les rendez-vous c'est toujours la chose qui c'est comme informatisé en tout dernier et qui la plupart du temps à planté quand ça s'est fait. Donc ça nous épeurait. (D, Interview #9, p. 20)" "Tu n'aurais pas pu faire les rendez-vous si t'avais pas eu la gestion des lits. Tsé, complètement ton système d'accueil, d'admission, de gestion de dossier, tes index. Si tout ça ne marche pas bien tu ne peux pas faire marcher un système de rendez-vous. Parce que le système de rendez-vous il vient s'asseoir sur tout ça. OK. Il alimente tout ça aussi. Il alimente ta pré-accueil, tu sais qui vas venir. Puis il y a plein de rapports qui découlent de ça pour toute sorte de monde, toute sorte d'analyses, pis toute sorte de statistiques pour le corps médicale. (D, Interview #10, p. 21)"
Motor of change	Two motors of change caused/governed this key IS change: (1) the strong complementarity effects that would ensue from combining the MPI system's new functionalities with those already implemented in the system as well as those previously implemented in the hospital's other specialized systems; and (2) the coordination effects that would occur from using a single centralized system to schedule patient appointments and facilitate inter-department interactions.	"Pis développer le système de rendez-vous ça permettait d'automatiser plein de chose. Comme exemple, ben tu sais que le patient doit venir à telle place, donc on est capable de sortir les listes aux archives pour qu'ils sortent les dossiers, puis que les dossiers soient préparés. Donc, beaucoup de liens dans toutes ces opérations là et pour le médical, la pharmacie, plein de choses comme ça. (D, Interview #10, p. 19)" "Là tu es capable de savoir c'est quoi ta clientèle qui vient, quand es-ce qu'elle vient, Tsé, gérer. Tsé, un patient qui se présente pis qui à trois rendez-vous aujourd'hui. Donc, synchroniser qu'il va aller là. Avant ça, ils essayaient de faire ça par téléphone, puis il faisaient ça tout croche. Tsé, le patient, on ne s'en occupait pas pantoute. Il avait trois rendez-vous à la même heure dans trois départements différents. Tsé, regardes, parce que chaque département était indépendant. Ben la ça nous a permis de synchroniser un peu mieux. (D, Interview #10, p. 19)" "Tu n'aurais pas pu faire les rendez-vous si t'avais pas eu la gestion des lits. Tsé, complètement ton système d'accueil, d'admission, de gestion de dossier, tes index. Si tout ça ne marche pas bien tu ne peux pas faire marcher un système de rendez-vous. Parce que le système de rendez-vous il vient s'asseoir sur tout ça. OK. Il alimente tout ça aussi. Il alimente ta pré-accueil, tu sais qui vas venir. Puis il y a plein de rapports qui découlent de ça pour toute sorte de monde, toute sorte d'analyses, pis toute sorte de statistiques pour le corps médicale. (D, Interview #10, p. 21)"
Unit of change	This IS change adopted a single unit of change since all stakeholders involved in this extension of the MPI system were internal to the hospital (i.e., IT personnel, administrative board members, receptionists, archivists, nurses, doctors)	"Regardes, cela faisait 10 ans je pense qu'on parlait, que les rendez-vous. Écoutes, les rendez-vous là, c'était comme. Faut voir le contexte. Tsé, je ne sais pas, je ne sais plus combien il y avait de cliniques médicales. Ça pleut, je vais dire 40. Je me souviens plus des nombres. Donc, toutes ces places là ont tous des rendez-vous. Tous les départements ciliaires. Ben les rendez-vous, tout dans l'hôpital marche par rendez-vous dans l'hôpital. Les patients en radiologies, ça prend un rendez-vous, pis là, je sais pas, en radiologie il y a plein de chose pour être capable de le rencontrer. Le rendez-vous pour avoir la technicienne, le radiologiste, l'équipement, le matériel, la salle en question pour cet examen là, l'autre examen c'est une autre affaire avec tout une autre préparation puis tout le kit. Pis c'est la même chose dans plein de départements. (D, Interview #10, p. 19)"

Mode of Change	This IS change followed an intermediate mode of change since the hospital's decision makers mindfully weighted the pros and cons of implementing appointment functionalities into the MPI system before moving forward with the change.	"Premièrement c'est utilisé partout dans l'hôpital. Par toutes les cliniques externes, tous les bureaux médicaux, Pis il n'y en a pas deux qui marche de la même façon. En tous cas, c'était très aléatoire la façon dont tous le monde fonctionnait. Pis ils avaient tous leurs méthodologies propres. Pis c'est des chasses gardées, parce que là c'est les médecins. Là tu vas céduler le médecin de cette façon là. Lui il veut ça, l'autre veut pas ça. Donc, ça devient extrêmement complexe quant tu essaie de faire un quelque chose. (D, Interview #9, p. 20)" "Pis c'est une plaie les rendez-vous parce que tout le monde chiale, parce que tout le monde attends trop longtemps, pis ça pas de maudit bon sang, pis tout le kit, Regardes, c'est l'enfer ce thème là. Tout le monde chiale. (D, Interview #10, p. 19)" "C'est quelque chose qu'on a toujours un peu repoussé, analysé un petit peu, repoussé, regardé, repoussé. Moi, personnellement, j'aurais foncé plus vite que ça là. Mais disons qu'après ça on a décidé, à un moment donné, d'y aller. Mais ça été aussi une décision d'hôpital. (D, Interview #10, p. 19)" "Interviewer : Encore un fois c'est juste à l'interne de l'hôpital que ce changement a été conduit? Il n'y a pas de partenaire externe qui a poussé? Participant D : non, c'est vraiment, dans le fond une forme. C'est un peu comme une forme de synergie qui implique plein de choses qui convergent en même temps et qui fait que c'est cela qu'on fait. C'était plus, jusqu'à un certain point, pas mal orchestré par l'informatique: moi, Lavallée, Gille Courrie, Michel Boivers, les patrons de l'informatique, puis nos analystes principaux. Pis là, ça devenait comme une forme de consensus que, là, c'est ça qu'on fait au détriment de l'autre. Parce que tu pourrais pas tout faire. (Interview #10, p. 20)"
Corresponding theory	Path Dependency	

2.4.7 Change #7 : Upgrade of the MPI system's operating system

In 1987, the sum of all previous computerization efforts forced the hospital to change the MPI system's operating system. Indeed, over the years, the constant addition of key functionalities, as well as the development of complementary specialized information systems created a situation were the MPI system's operating system could no longer manage the demands stemming from an ever-increasing ecology of information systems. Interestingly, this situation was not unique to the hospital. Indeed, many other organizations, from all kinds of industries, were also facing the same issue at that time. Furthermore, the hospital's mainframe manufacturer, who knew about the issue and had made the decision to no longer support the hospital's current operating system, had already warned the hospital about this critical issue and had put significant pressure on the hospital during the last five years to upgrade its operating system. Left with no other choice, the hospital considered the possibility of replacing its old operating system, called "Disk Operating System" (DOS) with a an operating system called "Multiple Virtual System" (MVS), which had already been successfully implemented by larger organizations, such as banks and food retailers that had faced the same issue in the past. However, a member of the hospital's board of advisors, who had already supervised a similar upgrade at a food retailer, cautioned the hospital that such a change, while necessary, would be risky and costly. Indeed, such an upgrade was no easy task since every program that had been developed at the hospital, including the MPI system, would need to be substantially re-written in order to continue to function properly on the new operating system. Nonetheless, confident in their ability to deliver a smooth transition to MVS, the IT personnel of the hospital convinced the administrative board that the move could be completed on time and within budget. At first, external consultants were hired to help the IT personnel of the hospital. However, for cost and budgetary reasons, their contract was not renewed in the second year.

Ultimately, it took two years to complete the upgrade and users started to use the appointment functionalities implemented into the MPI system in 1990.

Taken as a whole, the migration to the MVS operating system can be viewed as a period of great turmoil that led the hospital to mimic the characteristics of its environment. First, the constant addition of key functionalities as well as the development of complementary specialized information systems imposed overwhelming demands on the DOS operating system. Furthermore, ABC (i.e., the hospital's mainframe manufacturer) had already pressured the hospital to change the DOS operating system, since it would no longer be supported. Together, these events created a sense of urgency inside the hospital and put to the forefront the search for an alternative operating system. Then, well aware of the risks related to such upgrades, the hospital probed and copied its environment to find and select the best operating system available. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed an evolutionary cycle of change, where internal needs and environmental pressures forced the hospital to upgrade its operating system to MVS. Correspondingly, two main motors of change caused/governed this key IS change: (1) the turmoil created by the need to manage the demands stemming from an ever-increasing ecology of information systems; and (2) the technological landscape characterizing the hospital environment at the time. It also adopted a multiple unit of change since stakeholders involved in this upgrade of the MPI system were both internal and external to the hospital. Indeed, the hospital received strong pressures from ABC to upgrade the MPI system's operating system while copying other organizations present in its environment by selecting the MVS operating system as the definitive solution. Lastly, it followed a prescribed mode of change since few other options were available at the time and the MVS operating system was collectively seen as the best and only option form the onset. Based on this characterization, we can now establish that the tenets of imprinting best explain the genesis and outcome of this key IS change as well as the constraining effect of history

that accompanied it since the upgrade of the MPI system's operating system was driven by the hospital's internal turmoil and isomorphic tendencies as well as the technological conditions in effect at the time while following a cycle, unit and mode of change that correspond to the tenets of imprinting (see Table 2.12).

Table 2.12 Change #7 – Upgrade of the MPI system's operating system

	Description	Supporting quotation(s)
Objective	To replace the old MPI system's operating system called DOS, with a new operating system called MVS in order to manage the demands of an ever-increasing ecology of information systems.	"Là on passe en MVS. Pis MVS ça te permet d'avoir des machines plus grosses, plus efficaces, pis le système d'exploitation est évidemment beaucoup plus sophistiqué. (E, Interview #9, p. 23)" "C'est un système d'exploitation qui est beaucoup plus sophistiqué qui permet. Et ça remplace le DOS. C'est le top d'IBM, c'est la Cadillac. Mais ça c'est un gros changement, c'est vraiment majeur. (E, Interview #9, p. 14)"
Key dates	Decision to implement: 1987 Beginning of the implementation: 1988 Beginning of use: 1990	"C'est assez simple comme système. Là, on a quoi 150 terminaux de branché là-dessus, mais c'est toujours juste une machine et c'est là qu'on, en 1987-1988, qu'on fait le changement. On passe à MVS. MVS, c'est plusieurs machines DOS dans le fond. (E, Interview #9, p. 22)"
Context	The sum of all previous computerization efforts forced the hospital to change the MPI system's operating system. In addition, the hospital's mainframe manufacturer had made it clear over the last five years that it would no longer support the hospital's current operating system.	"Pis là, dans le temps des ordinateurs, c'est parce qu'on avait beaucoup plus d'ouvrage, parce que lui il vendait en plus. On n'avait plus juste 4 clients. On commençait à en avoir des centaines. Donc, ça grossissait et sa prenait des machines plus fortes, parce que c'était toujours central. Pis on était pas mal à la limite du DOS. (E, Interview #9, p. 14)" "Pour "Multiple Virtual Systems". Mettons dans l'informatique de l'époque. Toutes les "shops", que se soit Gaz Métropolitain, Métro Richelieu, toutes ces place là, tout le monde marchait sur DOS. OK. Pis là, un moment donné, tout le monde était accoté au plafond. Là, fallait passer au même système que les banques. Les banques avaient déjà MVS. Mais là, c'était pour les plus gros systèmes. (E, Interview #9, p. 14)"
Cycle of change	This key IS change followed an evolutionary cycle of change since it represents a reaction of the hospital to mimic its environment in order to solve the internal turmoil created by the need to manage the demands of an ever-increasing ecology of information systems.	"C'était, comment dirais-je. Tsé, on est arrivé au bout du DOS avant d'aller dans OS. Pis quand on est arrivé au bout d'OS ben on est allé à MVS. C'était comme, ce n'était plus supporté depuis trois ans à l'autre bout. Regardes, tu n'as pas le choix. On n'était pas les premiers dans ces nouveautés là. Regardes, c'était comme on est les derniers dans la province qui est encore sur ça. (D, Interview #10, p. 22)"

Motor of change	Two main motors of change caused/governed this key IS change: (1) the turmoil created by the need to manage the demands stemming from an ever-increasing ecology of information systems; and (2) the technological landscape characterizing the hospital environment at the time.	"D'après moi, les systèmes évoluent tranquillement, il n'y a pas de nouveaux systèmes qui se rajoutent. Mais sauf que ça devient un peu plus engorgé. Parce que DOS, c'est une machine directe. Tsé, tu es direct sur la machine et tout se fait là. C'est assez simple comme système. Là on a quoi 150 terminaux de branché là-dessus, mais c'est toujours juste une machine et c'est là, en 1987-1988, qu'on fait le changement. On passe en MVS. MVS, c'est plusieurs machines DOS dans le fond. (E, Interview #9, p. 22)" "Le plus gros changement après c'est MVS. Parce que là, ce qui arrive, c'est qu'on a trop d'application en même temps, pis DOS à beaucoup de misère à gérer ça. Ce n'est pas un système d'exploitation qui est fait pour gérer beaucoup de choses en même temps. Alors que MVS lui, il n'a pas de limites. Tsé, c'est le gros système de l'époque. C'est un système qui est stable au bout, système que les banques utilisent, que tout le monde utilise à ce moment là. Mais ça prend une plus grosse machine. (E, Interview #11, p. 5)" "C'est parce qu'il y avait trop d'applications à passer en même temps. Pis à ce moment là nous autre on roule, tu as des applications qui roulent l'admission, des applications qui roulent les rendez-vous. À ce moment là, je pense qu'il y a la diététique aussi, tu as la paie, tu as les projets administratifs. Si tu mets tout ça ensemble, pis tu voulais que ça roule en même temps comme de raison. Le seul système qui permet vraiment de rouler différentes applications en même temps, c'est vraiment MVS. Il est moins "single" thread » si tu veux. (E, Interview #11, p. 6)" "Mais c'était un changement où on n'avait pas le choix parce qu'au moment où on là fait si on le faisait pas on aurait fermé. Regardes, on était plus là. (E, Interview #11, p. 7)"
Unit of change	This IS change adopted a multiple unit of change since stakeholders involved in this upgrade of the MPI system were both internal and external to the hospital. Indeed, the hospital received strong pressures from ABC to upgrade the MPI system's operating system while copying other organizations present in its environment by selecting the MVS operating system as the definitive solution.	"Oui on était drôlement poussé parce que je te le dis, on était plus supporté là. Pis pour eux autres c'est inquiétant aussi. Si on se plante pis qu'il n'y a plus rien qui marche, puis qu'ils ne sont pas capable de nous corriger ou bien de régler le problème pis que l'hôpital Notre-Dame ne marche plus , puis etc. Bien stratégiquement, pis politiquement très très néfaste pour leur image. Mais tu vois, regardes, je sais pas, Microsoft, ils sortent leur version Windows 8, 10. Pis, ils commencent à faire de la publicité pour envoyer tout le monde lé dessus. Ceux qui sont en 8 puis en 7. (D, Interview #10, p. 23)" "Oui, Donc, il nous en parlait, Mais au bout de 5 ans qui nous en parlait de ce changement. Bon on vas faire le changement là tsé. On n'est plus seulement 1 ou 2 dans la province de Québec là, qui marche encore en MVS ou en OS. Il faut. C'est ça, on a plus eu le choix. (D, Interview #10, p. 23)" "On s'est débarrassé, parce que là au début on a commencé avec des consultants, qui sont venus nous aider. Pis là, on était parti pour défoncer nos budgets nous autre aussi. Donc, on a gardé un des consultants sur le groupe, qui était de DMR, mais il y en avait un qui était vraiment plus fort, c'était lui qu'on avait de besoin. On a exigé de garder juste lui, pis on a tout mis le reste dehors. (E, Interview #11, p. 7)"

Mode of Change	This IS change followed a prescribed mode of change since few other options were available at the time and the MVS operating system was collectively seen as the best and only option from the onset.	"Ça c'était une grosse décision. Mais encore là, à l'époque, il y a beaucoup de place qui change. Nous la décision a été drôlement prise parce que sur le conseil d'administration de l'hôpital, il y avait quelqu'un de Métro Richelieu qui était en informatique et eux autres avaient pris la décision de passer à MVS. Pis cela a coûté pas mal plus cher qu'ils s'attendaient. Donc, nous autre, quand on est arrivé avec notre idée de passer à MVS, on se disait dépenser à peu près un million pour effectuer les conversions pis on va arriver. Faque là, ça, ça bloqué. Pour eux autres du conseil c'était impossible. Finalement on a réussi à convaincre le DG que oui ça pouvait se faire mais que, oui on prenait des risques, mais nous on était confiant. (E, Interview #11, p. 7)"
Corresponding theory	Imprinting	

2.4.8 Change #8 : Switching to a client-server architecture

The switch to the client-server architecture was triggered by the millennium bug. Indeed, the MPI system only accepted dates with two digits. Aware of this important issue as early as 1990, the hospital quickly realized that it would not have enough resources to re-write all of its information systems, including the MPI system, to overcome this issue. Indeed, the hospital had spent more than 20 years to develop its current information systems and now had only 10 years to re-write all of them. Not to mention that the hospital had to invest, in parallel, a significant amount of time to maintain its information systems already in use during that period. As such, the hospital had to make a gripping decision: to decide which systems should be re-written internally and which should be replaced by the purchase of information systems pakages that were available on the market. While making this important decision the hospital's IT personnel realized that its homemade specialized information systems such as those supporting pharmacy or blood testing could easily be replaced by package information systems available on the market. However, it also realized that no information system package available on the market could replace the MPI system due to its idiosyncrasies. Indeed, the MPI system had been developed to mirror the healthcare practices that were unique to the hospital and the Canadian context. Accordingly, the hospital decided that the MPI system would be re-written to overcome the millennium bug while its other specialized systems would be replaced by off the shelf solutions. While time-efficient, this dual approach imposed significant constraints on the MPI system's implementation team since the MPI system needed to be well integrated with the off the shelf solutions that were going to be purchased by the hospital. Without such integration, the benefits stemming of the MPI system would be significantly reduced since its main purpose is to feed its key patient information to the other specialized information systems. As the industry had already abandoned

mainframes to move to a client-server architecture, the hospital had no choice but to follow industry standards and re-write the MPI system accordingly. It took more than six years for the hospital to implement a client-server architecture and re-write the MPI system. In the beginning, the hospital's IT personnel proceeded by trial and error since they weren't familiar with client-server architecture. However, midway trough the implementation, they received clear guidelines from the government, which facilitated their implementation efforts. The implementation was completed in 1994. Nonetheless, the MPI system that has been working on the mainframe remained in operation until 2003 since other ancillary information systems which had not been updated to the client-server architecture still needed key patient information which they could only access through the original MPI system.

Taken as a whole, the passage to the client-server architecture can be viewed as a period of great turbulence that led the hospital to copy the characteristics of its environment. First, the millennium bug triggered an important decision-making process that focused on identifying which systems would be re-written internally and which would be replaced by off the shelf solutions. Hence, this key event created a sense of uncertainty inside the hospital and put to the forefront the need to re-write the MPI system. In addition, constrained by industry standards, the hospital's IT personnel had no choice but to re-write the MPI system so that it could work on a client-server architecture. Furthermore, key guidelines from the government imposed additional constraints on the implementation team to facilitate the migration to a client-server architecture. Accordingly, based on Van de Ven and Poole's (1995) set of theoretical "primitives" and operating conditions, this key IS change followed an evolutionary cycle of change, where internal needs and environmental pressures forced the hospital to adopt a client-server architecture and to re-write the MPI system accordingly. Correspondingly, two motors of change caused/governed this key IS change: (1) the uncertainty created by the need to address the millennium bug; and (2) the technological landscape characterizing the hospital's environment at that time. It also adopted a multiple unit

of change since key stakeholders involved in this key IS change were both internal and external to the hospital. Indeed, the hospital decisions were strongly influenced by the IT personnel, the information system market and government guidelines. Lastly, it followed a prescribed mode of change since few options were available and external actors essentially imposed the switch to the client-server architecture. Based on this characterization, we can now establish that the tenets of imprinting best explain the genesis and outcome of this key IS change, as well as the constraining effect of history that accompanies it since the switch to a client-server architecture was driven by the hospital's internal turbulence and isomorphic tendencies, as well as the technological context in effect at that time while following a cycle, unit and mode of change that correspond to the tenets of imprinting (see Table 2.13).

Table 2.13 Change #8 – Switching to a client-server arcitecture

	Description	Supporting quotation(s)
Objective	To migrate the MPI system from the mainframe so that it could work on a client-server architecture in order to address the millennium bug.	n/a
Key dates	Decision to implement: 1990 Beginning of the implementation: 1990 Beginning of use: 1994	"Moi je dirais que c'est à peu près 1992-1994, parce que là, on a commencé, à cette époque là, à tout réécrire nos applications pour aller en client-serveur. Pis la raison pourquoi on faisait ça. Premièrement, pour aller sur les nouvelles technologies... (D, Interview #9, p. 24)" "Moi ce que je dirais Jacques, c'est que le passage des systèmes basés sur des ordinateurs, sur un ordinateur central, à des systèmes basés sur le monde PC. Ça c'est fait en peut-être 6 à 7 ans. Parce qu'il y a eu toute sorte de courants qui voulaient guider ça. (F, Interview #9, p. 24)" "Donc, avant que le vrai client-serveur soit commercialisé, pis puisse être utilisé, pis fonctionnel là, ça du aller dans les années 1993-1994. Pour nos premiers modules. Pis entre temps, on a développé l'ADT dans Dataflex. (F, Interview #9, p. 24)"
Context	Aware of the millennium bug as early as 1990, the hospital quickly realized that it would not have enough resources to re-write all of its information systems, including the MPI system, to overcome this issue. As such, the hospital had to make a gripping decision: to decide which system should be re-written internally and which should be replaced by the purchase of information system packages available on the market.	"Moi je te dirais, on était toujours pogné dans le cercle vicieux des ordinateurs qu'ils fallaient grossir tout le temps. Tu as juste une machine pis elle n'est jamais assez grosse. Pas compliqué. Pis la technologie a fait qu'ils ont sorti des machines Unix qui étaient, dans le fond, des minis ordinateurs, mais qui pouvaient se parler entre eux autres, pis qui pouvaient être connecté à des PC, parce que les PC venaient d'arriver. Donc là, ça faisait comme des réseaux ça. Je pense que là, il y avait une avenue qui était intéressante. Beaucoup plus intéressante que travailler avec les mainframes. Parce que là tu pouvais multiplier plus facilement. Tu pouvais arriver pis bâtir quelque chose. C'est un peu ce qui est arrivé aussi. C'est qu'on prenait un serveur pis on bâtissait une application qui roulait dessus. Les PC étaient capable d'y parler, ça faisait un réseau mais oups y arrivait une autre application pis le même PC pouvait parler à ce serveur là mais il pouvait aussi parler à l'autre serveur. Donc là, c'était beaucoup plus simple, tu n'étais pas obligé de toujours grossir. T'avais pris un serveur qui faisait pour un secteur pis ça faisait la job. Pis là, tu pouvais te concentrer sur un autre secteur. Je pense, que cet aspect là a fait un peu la différence. (E, Interview #11, p. 10)"

Cycle of change	This key IS change followed an evolutionary cycle of change since it represented a reaction of the hospital to mimic its environment in order to alleviate the internal uncertainty created by the need to address the millennium bug.	"Pendant que Jo travaillait avec JP sur l'ADT-rendez-vous, Pis après ça, il y avait.... Ça nous a permis d'explorer les premiers systèmes client-serveur. Pis d'aller chercher une certaine expérience, expertise de programmation là-dedans, pour arriver au vrai client-serveur avec les bases de données oracles plus préparé. (F, Interview #9, p. 26)" "Quand l'ADT à été mise en place sur client-serveur la première interface qu'il fallait avoir avant même de débuter et c'est pour ça qu'on avait vendu le système à d'autres hôpitaux, c'était de ramener toutes les transactions de l'ADT dans le mainframe, quasi en temps réel. Parce que tous les systèmes : laboratoire, pharmacie, pathologie, étaient sur le mainframe et avaient besoin de connaitre en temps réel la position du patient. Et pourquoi ça été plus long par rapport au fait qu'on a vendu ça à d'autres hôpitaux, c'est que la fameuse fonctionnalité de "tracking" du patient sur l'unité de soin, ben c'était compliqué à ramener ça, (F, Interview #9, p. 27)" "On a repris des fonctionnalités, qu'on a recodé pour une interface graphique. (F, Interview #9, p. 28)" "Là on gardait le mainframe pendant deux ans, après que tu sois parti, pis c'est dans la deuxième année que j'ai éteint le mainframe, 2004. Pis je me souviens, parce que eux autres, il mettait des enfants au monde pis y s'en "collissaient" après. Ils s'en foutaient. Le gros défis de "décomissionner" cet environnement là, c'était de savoir qui utilise les fameux rapports. Parce qu'ils sortaient des caisses de papier de rapports, mais eux autres on leur demandait un rapport un jour ça voulait dire un rapport toujours. (F, Interview #11, p. 30)"

Motor of change	Two motors of change caused/governed this key IS change: (1) the uncertainty created by the need to address the millennium bug; and (2) the technological landscape characterizing the hospital's environment at that time.	"Il y avait une pression au niveau de la qualité d'interface utilisateur qui était plus "cute" sur PC. Tout le monde voulait avoir un PC, pis le PC tu pouvais faire plein d'autres affaires à coté avec Lotus 1-2-3. (F, Interview #9, p. 24)" "Pis l'autre élément, j'y reviens, la pression c'était le bogue de l'an 2000. Vous, lui a peut-être pas connu ça, le poids de l'an 200 c'était gros. Comme je te disais on avait une panoplie de systèmes incroyables. Pour le nombre de personnes qu'on avait. Pis fallait tous les changer. (D, Interview #9, p. 27)" "Ben, il y avait le bogue de l'an 2000. Ça c'était assez important. Parce que dans beaucoup de nos applications, ben effectivement on avait que deux dates. On n'avait jamais 1900. C'était juste 92 ou 93. Tsé, en 67 on pensait pas qu'il y aurait un bogue de l'an 2000. Donc, nos applications ont roulé longtemps. Donc, beaucoup de produits étaient à refaire et là il y avait plein de questionnement. (D, Interview #10, p. 24)" "Ben, nos applications commençaient à être veillottes. Donc, il y avait toute sorte de logiciels, d'outils de développement nouveaux, des formes de package de développement qui permettaient de développer plus vite, mieux, plus beau. Les écrans étaient plus beaux etc. Tsé, nos écrans, nos premiers écrans dessinés là c'était laid en maudit. C'était des écrans, mais c'était laid en maudit là. C'était quasiment des écrans noir et blanc, jaune, orange et vert style. Oublies pas l'histoire du gars qui fait tourner les assiettes, pis des assiettes. Donc, un moment donné, au début des années 90, l'an 2000 qui s'en vient, faut redévelopper toutes les applications. Regardes, ça nous a pris 20 ans tout développer ça, pis là on a juste 10 ans à continuer à faire marcher tout ça, garder ça d'actualité, parce que là ça change, pis en même temps toutes les réécrire. Donc là, la job devenait comme, oublies ça, on n'a pas les ressources pour tout faire ça. Donc, il y a eu plein de décision qu'on a été obligé de prendre difficile. Dire ok, laboratoire, ben on refera pas laboratoire on vas acheter ça, on peut trouver ça sur le marché. Tu comprends? Donc là, on sait questionné : qu'es-ce qu'on peut trouver sur le marché qui fait la job. Pis le reste : qu'es-ce qu'on peut pas trouver facilement sur le marché. Comme ce n'est pas vraiment facile de trouver un système d'index, admission, inscription, gestion des lits, gestion des rendez-vous, adapté au contexte québécois, à la culture québécoise et à la façon dont la médecine se gère au Québec. C'est ce système là qui contrôle comme ça se fait. Trouver un système de banque de sang, quand tu tombes dans cette unité là, elle est peut-être un petit peu différente de celle à New York ou à Paris, mais fondamentalement ça ce ressemble en maudit. Donc, les laboratoires, c'est des laboratoires parce que c'est tous les mêmes auto-analyseurs pis tout le kit. Bon un système de pharmacie, le notre était bon en maudit, mais qu'es-ce que tu veux, on peut pas le refaire parce qu'on a pas les ressources pour être capable de le refaire. Donc là, on va trouver un systèmes de pharmacie sur le marché, dans le commercial qui peut faire la job etc. (D, Interview #10, p. 24)"

Unit of change	This IS change adopted a multiple unit of change since key stakeholders involved in the switch to a client-server architecture were both internal and external to the hospital. Indeed, the hospital decisions were strongly influenced by the IT personnel, the information system market and government guidelines.	"Il y a eu une tendance pis un moment donné, il y a eu des alignements au niveau du ministère au niveau des technologies, pis c'était lui qui était là à ce moment là, pis là ils ont dis : on s'en vas vers des basses de données Oracle pis du client-serveur. (F, Interview #9, p. 24)" "Interviewer: Et là, sur le marché, les gens avaient déjà délaissé l'idée du mainframe. Tous les logiciels qui étaient disponibles, c'était en client-serveur. Participant D: Exact. Donc, on refaisait les systèmes pour les prochaines décennies. Donc c'est pour ça qu'on est allé en client-serveur Interviewer: Donc, si on veut que le reste fonctionne avec notre affaire, va falloir que nous aussi on soit en client-serveur Participant D: Exactement. Il y avait toute sorte de règles pis de courbes de logiciel. Fallait s'en aller avec des systèmes ouverts. Donc, fallait s'adapter aussi à s'exploser dans les technologies, dans l'usage de nos produits. Donc, c'est un ensemble de tout ça qui fait qu'on a choisi ces technologies là. (D, Interview #10, p. 24)
Mode of Change	This IS change followed a prescribed mode of change since few options were available and external actors essentially imposed the switch to the client-server architecture.	"Il y a eu une tendance pis, un moment donné, il y a eu des alignements au niveau du ministère au niveau des technologies, pis c'était lui qui était là à ce moment là, pis là ils ont dis : on s'en vas vers des basses de données Oracle pis du client-serveur. (F, Interview #9, p. 24)" "Interviewer: Et là, sur le marché, les gens avaient déjà délaissé l'idée du mainframe. Tous les logiciels qui étaient disponibles, c'était en client-serveur. Participant D: Exact. Donc, on refaisait les systèmes pour les prochaines décennies. Donc c'est pour ça qu'on est allé en client-serveur Interviewer: Donc, si on veut que le reste fonctionne avec notre affaire, va falloir que nous aussi on soit en client-serveur Participant D: Exactement. Il y avait toute sorte de règles pis de courbes de logiciel. Fallait s'en aller avec des systèmes ouverts. Donc, fallait s'adapter aussi à s'exploser dans les technologies, dans l'usage de nos produits. Donc, c'est un ensemble de tout ça qui fait qu'on a choisi ces technologies là. (D, Interview #10, p. 24)
Corresponding theory	Imprinting	

2.5 Discussion

The objective of this study was twofold: to clarify the concept of path dependence in regards to similar conceptualizations, namely imprinting and structural inertia and to elucidate and compare the explanatory merits of these three theories in order to identify the one that better explains why and how organizational IS changes unfold over time. Anchored on Van de Ven and Poole's (1994) typology, our results show that each of these concepts and their respective underlying theories rely on a different combination of cycle, motor, unit and mode of change to explain an IS change and the constraining effect of history that often accompanies it (see Table 2.2 for a detailed comparison). Hence, using these concepts and theories interchangeably is ill advised, as it does not reflect the idiosyncrasies that distinguish each of them.

Our results also illustrate that no single concept or theory could account for the eight key IS changes we identified in our study of the evolution of the MPI system at the hospital. Indeed, five IS changes can be labeled as path dependent while two other IS changes are best explained by the tenets of imprinting theory and another one is best explained by the tenets of SIT (see Table 2.14). This finding suggests that the evolution of information systems in organizations can follow multiple dynamics. Hence, this finding corroborates the tenets of PDT and imprinting theory, which stipulate that multiple paths or several imprints may simultaneously influence organizational change (Kock, 2011; Marquis and Tilcsik, 2013; Vergne and Durand, 2011).

Table 2.14 Synthesis of the IS changes characterizing the evolution of the MPI system

Change	#1	#2	#3	#4	#5	#6	#7	#8
Title	Creation of the MPI System	Upgrade of the MPI System's terminals	Extension of the MPI System to Include Admission Functionalities	Extension of the MPI System to Include Bed Management Functionalities	Upgrade of the MPI System's disc addressing method	Extension of the MPI System to Include Appointment Functionalities	Upgrade of the MPI System's Operating System	Switching to a Client-Server Architecture
Corresponding theory	Path dependency	Structural inertia	Path dependency	Path dependency	Path dependency	Path dependency	Imprinting	Imprinting
IS component(s) extended or upgraded	▪ Functionalities	▪ Terminals	▪ Functionalities	▪ Functionalities	▪ Disc addressing method	▪ Functionalities	▪ Operating system	▪ Operating system ▪ Architecture ▪ Interface ▪ Server hardware ▪ Client hardware
Dates	1967-1969	1972-1973	1973-1974	1974-1975	1974-1975	1979-1982	1987-1990	1990-1994

Interestingly, our results also show that PDT is better suited to explain changes made to the functionalities of the MPI system while SIT and imprinting theory best explain changes made to either the interface, hardware and/or the architecture of the MPI system (see Table 2.14). These results may be explained by the fact that extending the MPI system's functionalities was driven, in accordance with PDT's single unit of change, by forces internal to the hospital. On the other hand, upgrading the MPI system's terminals, operating systems and client-server architecture was driven, in accordance with SIT'S and Imprinting's multiple units of change, by forces that were both internal and external to the hospital. Making a parallel with Wand and Weber's (1995) framework, which defines an IS object along three sets of characteristics: 1) the surface structure that refers to "the way the system appears to its users (Wand and Weber, 1995, p. 205)"; 2) the deep structure that "manifests the meaning of the real-world system the information system is intended to model (Wand and Weber, 1995, p. 20)"; and 3) the physical structure that "manifests the nature and form of the technology used to implement the system (Wand and Weber, 1995, p. 206), our results seem to indicate that PDT better explains changes made to the deep structure of information systems while SIT and imprinting theory better explain changes made to the surface and physical structure of information systems. Future research should explore this important insight as it reveals the limited autonomy that organizations may have when attempting to change key components of their IT infrastructure.

Another interesting finding stemming from our study is that the number of IS changes made to the MPI system tended to diminish over time. Indeed, five of the eight changes we identified occurred in the first ten years following the MPI system's implementation, while only three changes occurred over the last twenty years (see Table 2.14). Interestingly, Respondent #D explained this phenomenon through a juggling metaphor:

> "Tsé on avait pas des ressources infinies. Regarde on était toujours en déficit à tous les ans. Ok. Mais, donc, on pouvait, on avait une marge, je sais pas là. On avait 40 développeurs, pis là on pouvait utiliser 40 développeurs. On ne pouvait pas faire de l'ouvrage pour plus de 40 développeurs. À quoi on les utilise? Donc là il faut voir qu'au début cela allait bien, parce qu'on avait un système, 2 systèmes, 3 systèmes, pis faire un autre système… pis un autre système… pis là, "up" faut que tu refasses lui. Donc tu n'en fait pas d'autres, tu recommences à faire lui. Lui se dégrade, Lui se dégrade, Lui se dégrade, Lui se dégrade, donc il faut que tu retouches tout les systèmes. Tsé, c'est comme les gars qui font tourner des assiettes sur des bâtons. Tsé, ils tournent les bâtons, ils sont tous piqués. Pis, ils mettent une autre assiette pis une autre assiette, mais à un moment donné il y a tellement d'assiette, qu'a un moment donné, il y en a qui vont tomber à terre. Tu comprends le phénomène. C'est exactement ce phénomène là qu'on devait gérer." (Respondent #D, Interview #10, p. 21)

"Respondent #D's" interpretation of events seems to corroborate the tenets of SIT which posits that, over time, organizations gaining in size and age will tend to show greater inertia and change less frequently since organizational resources will become increasingly mobilized by the accumulation of institutionalization and standardization efforts.

Lastly, our results also suggest that an IS change following a path dependent dynamic can lead to positive outcomes. Indeed, all path dependent changes identified in this study yielded significant benefits to the hospital in terms of complementarity, learning, and coordination effects. Correspondingly, no more path dependent changes were made to the MPI system once additional increasing rents could no longer be expected. Interestingly, "Respondent #E" explained this phenomenon as follows:

> "Moi je te dirais, on était toujours pogné dans le cercle vicieux des ordinateurs qu'il fallait grossir tout le temps. Tu as juste une machine pis elle n'est jamais assez grosse. C'est pas compliqué. Pis la technologie a fait qu'ils ont sorti des machines Unix qui étaient dans le fond des mini ordinateurs, mais qui

> pouvaient se parler entre eux autres, pis qui pouvaient être connecté à des PC, parce que les PC venaient d'arriver. Donc, là ça faisait comme des réseaux ça. Je pense que là, il y avait une avenue qui était intéressante. Beaucoup plus intéressante que travailler avec les mainframes. Parce que là tu pouvais multiplier plus facilement. Tu pouvais arriver pis bâtir quelque chose. C'est un peu ce qui est arrivé aussi, c'est qu'on prenait un serveur pis on bâtissait une application qui roulait dessus. Les PC étaient capables d'y parler, ça faisait un réseau mais oups y arrivait une autre application pis le même PC pouvait parler à ce serveur là mais il pouvait aussi parler à l'autre serveur. Donc là, c'était beaucoup plus simple, tu n'étais pas obligé de toujours grossir. T'avais pris un serveur qui faisait pour un secteur pis ça faisait la job. Pis là tu pouvais te concentrer sur un autre secteur. Je pense, que cet aspect là a fait un peu la différence". (Respondent #E, Interview #11, p. 10)

Hence, the evolution of the MPI system supports the tenets of PDT, which posits that self-reinforcing mechanisms may eventually lead to a lock-in that impedes an organization's ability to change. Additionally, this finding also suggests that path dependent changes are not always undesirable. Indeed, the hospital reaped significant benefits from adding the various MPI system functionalities. It is only when increasing rents could no longer be reaped and when changing environmental conditions required further improvements to the MPI system that the hospital's lock-in became problematic. Further research should be conducted to validate this assertion. In addition, similar efforts should be conducted in order to understand the benefits that stem from IS changes that follow the dynamics of both imprinting and SIT.

2.6 Limitations and implications for research and practice

Before we discus the theoretical, methodological and practical implications of our results, it is appropriate to mention the limits of our study, which rest on retrospective accounts given by the personnel of a single hospital. Two potential concerns may surface when using such a data collection strategy. First, respondents could have recalled past events incorrectly, which may bias our results. However, considering that our results have been validated by multiple respondents, as well as by another data source (i.e., the hospital's annual reports), we believe that our results depict an accurate portrait of past events. Second, our results can only be attributed to the study of a single case, which limits the generalizability of our findings. Nevertheless, our case selection process ensured that our case offered unique features and natural controls that were necessary to appropriately test the tenets of each theory. Hence, we are confident that our findings are relevant for similar organizations facing similar circumstances.

From a theoretical perspective, we elucidate the key differences between three important concepts that were previously used interchangeably within the IS literature. Furthermore, by empirically validating each conceptualization's underlying theory, this study highlights their relative predictive power and their complementarities in explaining the constraining effect of history on organizational IS change. Specifically, we showed that no theory could singlehandedly explain all the changes made to the information system at the heart of our case study. As such, IS researchers should be cautious before labeling the evolution of an information system as being path dependent since its evolution may be constrained by other dynamics such as imprinting and structural inertia. Also, our results suggest that changes made to extend the functionalities of an information system could mainly be explained by theories that focus on a single unit of change while changes made to an information system's

terminals, operating system and/or architecture could mainly be explained by theories that focus on multiple units of change.

From a methodological standpoint, this study shows that to adequately explain IS change, researchers should first develop a sound data collection framework and then built their own theories or draw from already existing ones. Proceeding otherwise would seriously jeopardize the validity of their findings as well as the legitimacy of their theoretical efforts, since it would be hard to avoid the fallacy of self-fulfilling prophecies. Accordingly, by successfully using Van de Ven and Poole's (1994) typology, this study provides a sound theoretical anchor that IS researchers may use to build their data collection framework when investigating IS change. In doing so, this study also provides a sound template that could be used by other IS researchers who wish to conduct positivist case studies.

From a practical perspective, by clarifying the concept of path dependence in regards to similar conceptualizations, namely imprinting and structural inertia, this study informs IS change agents about the different problems of organizational change, as well as the different roles and strategies they may use to cope with these problems. Furthermore, since "a way of seeing is a way of not seeing (Poggie, 1965, p. 284)", this study, by clearing the confusion surrounding these conceptualizations and their respective underlying theories, offers different theoretical perspectives from which IS change agents can draw from to comprehend their reality and, hopefully, better manage the evolution of the IS under their responsibility. Correspondingly, by showing that there are different types of IS change barriers that are each the result of a specific change dynamic characterized by a temporal sequence of events and generative mechanims, this study informs IS change agents about the different forces that need to be harnessed to implement an IS change. Furthermore, by identifying constraints that are both internal and external to the organization, this study reminds IS change agents

that despite their best intentions forces out of their control may limit their ability to bring the change they desire.

2.7 Conclusion

We set out to clarify the concept of path dependence in regards to similar conceptualizations, namely imprinting and structural inertia, and compare the explanatory merits of their underlying theories in order to identify the one that better explains why and how organizational IS changes unfold over time. As a result we contribute to the IS literature in three ways. First, by theoretically exposing the distinctive nature of path dependence, imprinting and structural inertia, this study clears the confusion that exists between these conceptualizations. Second, by empirically validating each conceptualization's underlying theory, this study highlights their relative predictive power and their complementarities in explaining the evolution of an information system and the constraining effect of history that often accompanies it. In addition, by revealing several cycles, motors, units and modes of change that give to history it's meaning, this study identifies strategies that can help IS change agents to better manage the evolution of the IS under their responsibility.

2.8 Appendix A: Consent form

ESG UQÀM
École des sciences de la gestion
Université du Québec à Montréal

FORMULAIRE DE CONSENTEMENT

«Comprendre l'influence de l'histoire sur la post-adoption des technologies de l'information par les individus et les organisations : une perspective selon la théorie de l'effet de sentier»

IDENTIFICATION DU CHERCHEUR

Chercheur responsable du projet : Philippe Marchildon
Programme d'enseignement : Doctorat en Administration des Affaires
Adresse courriel : marchildon.philippe@courrier.uqam.ca
Téléphone : (514) 987-3000 # 0360

BUT GÉNÉRAL DU PROJET ET DIRECTION

Vous êtes invité(e) à prendre part à ce projet visant à développer une théorie expliquant comment les organisations peuvent maitriser leurs trajectoires technologiques afin de minimiser et/ou maximiser les emprisonnements technologiques auxquels elles doivent faire face et ainsi atteindre leurs objectifs d'affaires. J'accomplie ce projet, sous la supervision de Pierre Hadaya, professeur du département de management et technologie de l'École des Sciences de la Gestion de l'Université du Québec à Montréal (ESG-UQAM), dans le but d'obtenir mon doctorat en gestion des systèmes d'information à l'Université du Québec à Montréal.

PROCÉDURE(S) OU TÂCHES DEMANDÉES AU PARTICIPANT

Votre participation consiste à donner une entrevue individuelle au cours de laquelle il vous sera demandé de décrire l'évolution d'un système informatique de votre organisation et de préciser les éléments organisationnels et/ou environnementaux qui ont marqué son évolution. Cette entrevue prendra environ 2h00 heures de votre temps et sera enregistrée numériquement avec votre permission. Le lieu et l'heure de l'entrevue seront convenus en fonction de vos disponibilités. La transcription sur support informatique qui en suivra ne permettra pas de vous identifier. Au besoin, nous pourrions vous recontacter afin de valider et/ou compléter les informations recueillies lors de la première rencontre.

AVANTAGES ET RISQUES

Votre participation contribuera à l'avancement des connaissances sur les trajectoires technologiques au sein des organisations et leurs impacts sur la performance de l'organisation. Il n'y a pas de risque d'inconfort important associé à votre participation à cette étude. Vous demeurez libre, en tout temps, sans avoir à vous justifier, de ne pas répondre à une ou plusieurs questions que vous estimez embarrassantes. Il est de la responsabilité du chercheur de suspendre ou de mettre fin à l'entrevue s'il estime que votre bien-être est menacé.

ANONYMAT ET CONFIDENTIALITÉ

Afin que vous vous sentiez libre de répondre de façon franche aux questions qui vous seront posées, il est entendu que les renseignements recueillis lors de l'entrevue seront confidentiels et que seuls le responsable du projet, Philippe Marchildon, et son directeur de recherche, Pierre Hadaya, auront accès à votre enregistrement et au contenu de sa transcription. Le matériel de recherche (enregistrement numérique et transcription codée) ainsi que votre formulaire de consentement seront conservés séparément sous clé par le responsable du projet. Ils seront conservés pour la durée totale du projet et les 5 années qui suivront. Après ce délai, le matériel de recherche ainsi que le formulaire de consentement seront détruits.

PARTICIPATION VOLONTAIRE

Votre participation à ce projet est volontaire. Cela signifie que vous acceptez de participer au projet sans aucune contrainte ou pression extérieure, et que vous êtes libre de mettre fin à votre participation à la recherche en tout temps. Dans ce cas, le matériel de recherche vous concernant sera détruit. Votre participation implique également que vous acceptez que le responsable du projet et son directeur puisse utiliser les renseignements recueillis aux fins de la présente recherche (articles, mémoire, essai ou thèse, conférences et communications scientifiques) à la condition qu'aucune information permettant d'identifier votre personne ou votre entreprise ne soit divulguée publiquement à moins d'un consentement explicite de votre part.

COMPENSATION FINANCIÈRE

Votre participation à ce projet est offerte gratuitement. Un résumé des résultats de recherche vous sera transmis au terme du projet sous la forme d'un rapport décrivant l'évolutions du système informatique de votre organisation, les trajectoires technologiques qui s'y rattachent et des pistes de solution afin de minimiser et/ou maximiser les effets des emprisonnements technologiques qui s'y rattachent.

DES QUESTIONS SUR LE PROJET OU SUR VOS DROITS?

Vous pouvez contacter le responsable du projet au numéro (514) 987-3000 # 0360 pour des questions additionnelles sur le projet, les conditions dans lesquelles se déroule votre participation et vos droits en tant que participant à la recherche. Vous pouvez également discuter de ces différents sujets avec son directeur de recherche M. Pierre Hadaya en le contactant au numéro (514) 987-3000 # 0360.

De plus, le projet auquel vous allez participer a été approuvé par le comité d'éthique de la recherche pour étudiants (CÉRPÉ) de l'ESG-UQAM. Pour toute question ne pouvant être adressée au directeur de recherche ou pour formuler une plainte ou des commentaires, vous pouvez contacter le coordonnateur du CÉRPÉ de l'ESG-UQAM, par l'intermédiaire de son secrétariat au numéro (514)-987-3000 # 3237 ou par courriel à prohet.alexandra@uqam.ca

REMERCIEMENTS

Nous tenons à vous remercier pour votre collaboration qui est essentielle à la réalisation de ce projet.

SIGNATURES :

Je reconnais avoir lu le présent formulaire de consentement et consens volontairement à participer à ce projet de recherche. Je reconnais aussi que le responsable du projet a répondu à mes questions de manière satisfaisante et que j'ai disposé suffisamment de temps pour prendre la décision d'y participer. Je comprends que ma participation à cette recherche est totalement volontaire et que je peux y mettre fin en tout temps, sans pénalité d'aucune forme, ni justification à donner. Il me suffit d'en informer le responsable du projet.

Signature du participant : _____ Date :_____

Nom (lettres moulées) : _____

Coordonnées : _____

_____

_____

_____

Je déclare avoir expliqué le but, la nature, les avantages, les risques du projet et avoir répondu au meilleur de mes connaissances aux questions posées.

Signature du responsable du projet : _____Date :_____

Nom (lettres moulées) : Philippe Marchildon

Coordonnées:

Département de management et technologie
École des Sciences de la Gestion
Université du Québec à Montréal
Boite postale 8888, Station centre-ville
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Un exemplaire du formulaire d'information et de consentement signé doit être remis au participant.

2.9 Appendix B: Interview guide

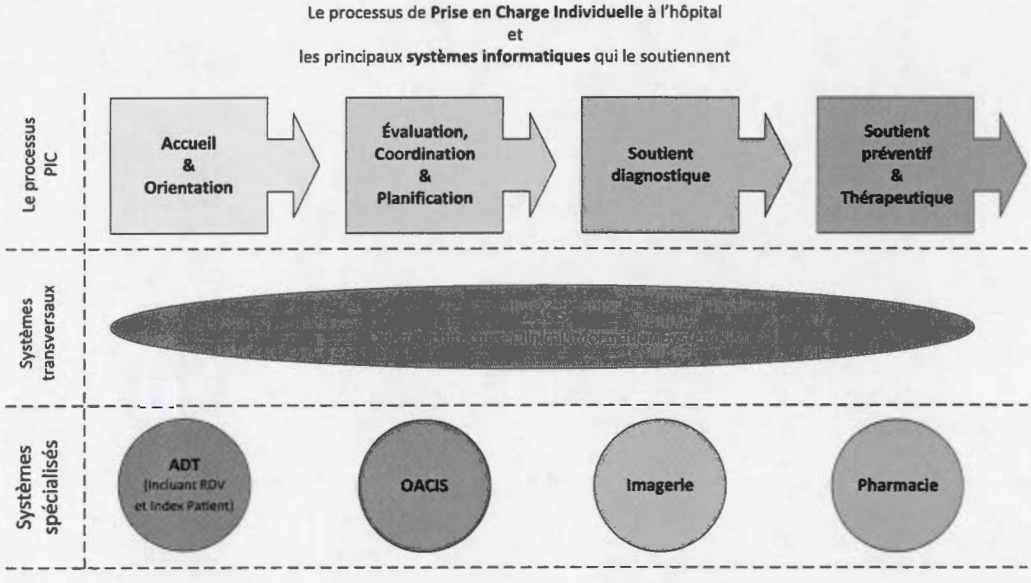
ESG UQÀM
École des sciences de la gestion
Université du Québec à Montréal

GUIDE D'ENTREVUE

«Comprendre l'influence de l'histoire sur la post-adoption des technologies de l'information par les individus et les organisations : une perspective selon la théorie de l'effet de sentier»

CONSIGNES

Les questions qui vous seront posées se rattachent à votre implication dans le développement ou l'utilisation du système informatique ADT (Admission-Départ-Transfert) ainsi qu'aux éléments organisationnels et environnementaux qui ont marqué son évolution. Le système auquel nous faisons référence est directement lié à la prise en charge individuelle au sein de l'Hôpital (voir image ci-dessous). Vos réponses à nos questions nous permettrons de construire la ligne de vie de ce système et de caractériser les principaux changements et les périodes de stabilités qui ont marqué sont évolution.



DÉFINITIONS CLÉS

1. **Système informatique :** un ensemble organisé d'éléments (ex., interface utilisateur, fonctionnalités, données, système d'exploitation, interface de programmation d'application (API), langage de programmation, matériel, etc.) qui permet de collecter, regrouper, classifier, traiter et diffuser de l'information au sein d'une organisation.

2. **Changement :** le passage d'un état à un autre pouvant affecter les divers éléments d'un système informatique et ce à différents niveaux.

3. **Période de stabilité** : Période durant laquelle un système informatique subit peu ou aucune transformation et conserve ses caractéristiques initiales.

4. **Développement, maintenance, et disposition d'un système informatique :** Processus permettant la planification, la création, le test, le déploiement, la maintenance et la disposition d'un système informatique. Ce processus comprend les dix phases suivantes : l'initiation, la conceptualisation, la planification, l'analyse des besoins, le design, le développement, les tests, l'implantation, maintenance, et la disposition.

LES CHANGEMENTS APPORTÉS AU SYSTÈME INFORMATIQUE ADT

Identifiez et décrivez les principaux changements qui ont marqué l'évolution du système ADT de son origine à aujourd'hui en fonction des 12 éléments suivants (voir Tableaux ci-dessous) :

1. Description sommaire du changement
2. Composantes touchées par ce changement
3. Option(s) remplacée(s) par ce changement
4. Description de l'infrastructure en place au moment du changement
5. Alternative(s) à l'infrastructure en place au moment du changement
6. Bénéfices escomptés et réalisés
7. Cycle des évènements caractérisant ce changement
8. Principaux moteurs derrière ce changement
9. Parties-prenantes impliqué dans ce changement
10. Changement de type prescriptif ou construit
11. Contexte organisationnel
12. Contexte Environnemental

Changement #1		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte environnemental		

Changement #2		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte environnemental		

Changement #3		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte environnemental		

Changement #4		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte environnemental		

Changement #5		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte Environnemental		

Changement #6		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte environnemental		

Changement #7		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte Environnemental		

Changement #8		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte environnemental		

Changement #...		
Date de décision : / /	**Date de développement : / /**	**Date de l'utilisation : / /**
Description sommaire du changement		
Composantes touchées par ce changement	Interfaces utilisateur : Fonctionnalités et données : Infrastructure technologique:	
Option(s) remplacée(s) par ce changement		
Description de l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Alternative(s) à l'infrastructure en place au moment du changement	Terminaux: Processeur: Système d'exploitation: Langage applicatif: Langage interface: Langage intégration:	
Bénéfices escomptés et réalisés		
Cycle des évènements caractérisant ce changement		
Principaux moteurs derrière ce changement		
Parties-prenantes impliqué dans ce changement		
Changement de type prescriptif ou construit		
Contexte organisationnel		
Contexte environnemental		

PROFIL DU PARTICIPANT

Nom et Prénom: _____
Age : _____
Sexe : □ Femme □ Home

Quelle est votre formation (domaine d'étude, plus haut niveau de scolarité complété)?

_____
_____
_____
_____
_____

Quelle est votre expérience au sein de chacun des secteurs d'activités dans lesquels vous avez déjà exercé (ex., technologie de l'information, administration, finance, soin de santé)?

Secteurs d'activités	Années d'expérience

Depuis combien d'années travaillez-vous au sein de l'industrie de la santé (poste occupé, date de début et date de fin)?

_____
_____
_____
_____
_____
_____

Quels sont les différents postes que vous avez occupés au sein de l'hôpital Notre-Dame?

Postes occupés	Périodes

Spécifiez, les rôles que vous avez joués au sein de l'hôpital dans le développement et/ou l'utilisation de chacun des systèmes informatiques suivants :

Système	Rôle(s)	Période(s)
Admission Départ Transfert (ADT) (Incluant RenDez-Vous et l'Index Patient)		
Imagerie		
Pharmacie		
OACIS (Open Architecture Clinical Information System)		

2.10 References

Allison, G.T. (1971) "Essence of Decision", Little Brown, Boston, MA.

Arthur, W.B. (1989) "Competing Technologies, Increasing Returns, and Lock-in by Historical Events", Economic Journal, 99(394), pp. 116-131.

Arthur, W.B. (1994) "Increasing Returns and Path Dependence in the Economy", University of Michigan Press, Ann Arbor, MI.

Auerbach, C.F. and Silverstein, L.B. (2003) "Qualitative Data: An Introduction to Coding and Analysis", New York University Press, New York, NY.

Beyer, J. (2010) "The Same or Not the Same – On the Variety of Mechanisms of Path Dependence", International Journal of Economic Perspective, 5(1), pp. 1-11.

Blatter, J. and Haverland, M. (2012) "Two or Three Approaches to Explanatory Case Study Research?", APSA 2012 Annual Meeting Paper, Available at SSRN: http://ssrn.com/abstract=2105542.

Brown, C.V. (1999) "Horizontal Mechanisms Under Differing IS Organization Contexts", MIS Quarterly, 23(3), pp. 421-454.

Burgelman, R.A. (2002) "Strategy as Vector and the Inertia of Coevolutionary Lock-In", Administrative Science Quarterly, 47(2), pp. 325-357.

Burgelman, R.A. (2009) "Strategic Consequences of Co-evolutionary Lock-in: Insights from a Longitudinal Process Study", In Schreyögg, G. and Sydow, J. (EDS) "The Hidden Dynamics of Path Dependence: Institutions and Organizations," Palgrave Macmillan, Houndmills, UK, pp. 233-248.

Collier, R.B. and Collier, D. (1991) "Shaping the Political Arena: Critical Junctures, the Labor Movement, and Regime Dynamics in Latin America", Princeton University Press, Princeton, NJ.

Dubé, L. and Paré, G. (2003) "Rigor in Information Systems Positivist Case Research: Current Practices, trends, and Recommendations", MIS Quarterly, 27(4), pp. 597-635.

Garud, R. and Karnøe, P. (2001) "Path Creation as a Process of Mindful Deviation", In Garud, R. and Karnøe, P. (Eds) "Path Dependence and Path Creation", Erlbaum, Mahwah, NJ.

David, P.A. (1985) "Clio and the Economics of Qwerty", The American Economic Review, 75(2), pp. 332-337.

Dunphy, D. (1996) "Organizational Change in Corporate Settings", Human Relations, 49(5), pp. 541-552.

Dobusch, L. and Kapeller, J. (2013) "Breaking New Path: Theory and Method in Path Dependence Research", Schmalenbach Business Review, 65(1), pp. 288-311.

Dobusch, L. and Schüßler, E. (2012) "Theorizing Path Dependence: A Review of Positive Feedback Mechanisms in Technology Markets, Regional Clusters, and Organizations", Industrial and Corporate Change, 22(3), pp. 617-647.

Eisenhardt, K.M. (1989) "Building Theories from Case Study Research", Academy of Management Review, 14(4), pp. 532–550.

Hannan, M.T. and Freeman, J. (1977) "The Population Ecology of Organizations", American Journal of Sociology, 82(5), pp. 929-964.

Hannan, M.T. and Freeman, J. (1984) "Structural Inertia and Organizational Change", America Sociological Review, 49(2), pp. 149-164.

Heinroth, O. (1911) "Beiträge zur Ethologie, namentlich der Ethologie und Psychologie der Anatiden", In Schalow, H. (Ed.), "Verhandlungen des V. Internationalen Ornithologen-Kongresses in Berlin, 30. Mai bis 4. Juni 1910 (pp. 589–702)", Deutsche Ornithologische Gesellschaft, Berlin.

Immelmann, K. (1975) "Ecological Significance of Imprinting and Early Learning", Annual Review of Ecology & Systematics, 6, pp. 15–37.

Johnson, E.J., Bellman, S. and Lohse, G. (2003) "Cognitive Lock-in and the Power Law of Practice", Journal of Marketing, 67(2), pp. 62-75.

Katz, M.L. and Shapiro, C. (1985) "Network Externalities, Competition, and Compatibility", The American Economic Review, 75(3), pp. 424-440.

Kelly, D. and Amburgey, T.L. (1991) "Organizational Inertia and Momentum: A Dynamic Model of Strategic Change", Academy of Management Journal, 34(3), pp. 591-612.

Knights, D. (1995) "Refocusing Case Study: The Politics of Research and Researching Politics in IT Management", Technology Studies, 2(2), pp. 230-254.

Koch, J. (2008) "Strategic Paths and Media Management. A Path Dependency Analysis of the German Newspaper Market of High Quality Journalism", Schmalenbach Business Review, 60(1), pp. 50-73.

Koch, J. (2011) "Inscribed Strategies: Exploring the Organizational Nature of Strategic Lock-in", Organization Studies, 32(3), pp. 337-363.

Langley, S. (1999) "Strategies for Theorizing from Process Data", Academy of Management, 24(4), pp. 691-710.

Lee, A.S. (1989) "A Scientific Methodology for MIS Case Studies", MIS Quarterly, 13(1), pp. 33-52.

Leonard-Barton, D. (1992) "Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development", Strategic Management Journal 13(1), pp. 111–125.

Liebowitz, S.J. and Margolis, S.E. (1995) "Path Dependence, Lock-In, and History," Journal of Law, Economics & Organization, 11(1), pp. 205-226.

Lorenz, K. (1937) "On the Formation of the Concept of Instinct", Natural Sciences, 25(19), pp. 289-300.

Lu. Y. and Ramamurthy, K. (2011) "Understanding the Link Between Information Technology Capability and Organizational Agility: An Empirical Examination", MIS Quarterly, 35(4), pp. 931-954.

Markus, M.L. (1983) "Power, Politics, and MIS Implementation", Communication of the ACM, 26(6), pp. 430-444.

Marquis, C. and Tilcsik, A. (2013) "Imprinting: Toward a Multilevel Theory", The Academy of Management Annals, 7(1), pp. 193-243.

Miles, M.B. and Huberman, M.A. (1994) "Qualitative Data Analysis", 2nd ed., Sage, Thousand Oaks, CA.

Miles, W.E., Snow, C.C., and Pfeffer, J. (1974) "Organization-environment: Concepts and Issues", Industrial Relations, 13(3), pp. 244–264.

Pentland, B. (1999) "Building Process Theory with Narrative: From Description to Explanation", Academy of Management Review, 24(4), pp. 711-724.

Pettigrew, A.M., (1997) "What is Processual Analysis?", Scandinavian Journal of Management, 13(4), pp. 337-348.

Poggie, G. (1985) "A Main Theme of Contemporary Sociological Analysis: Its Achievements and Limitations", British Journal of Sociology, 16(4), pp. 283-294.

Sambamuthry, V., Bharadwaj, A. and Grover, V. (2003) "Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms," MIS Quarterly, 27(2), pp. 237-263.

Saxenian, A. (1999) "Comment on Kenney and von Burg, Technology, Entrepreneurship and Path Dependence: Industrial Clustering in Silicon Valley and Route 128", Industrial and Corporate Change, 8(1), pp. 105-110.

Schawrz, G.M. (2010) "The Logic of Deliberate Inertia", Journal of Management, 38(2), pp. 1-25.

Schreyögg, G. and Kliesch-Eberl, M. (2007) "How Dynamic Can Organizational Capabilities Be? Towards a Dual-Process Model of Capability Dynamization", Strategic Management Journal, 28(9), pp. 913-933.

Shapiro, C. and Varian, H.R. (1999) "Information Rules: A Strategic Guide to the Netwrok Economy", Harvar Business School Press, Boston, MA.

Spalding, D.A. (1873) "Instinct. With original observations on young animals", Popular Science Monthly, June, pp. 126–142.

Stinchcombe, A.L. (1965) "Social structure and organizations", In March, J.G. (Ed.) "Handbook of organizations", Rand McNally, Chicago, IL, pp. 142–193.

Sydow, J. and Schreyögg, G. and Koch, J. (2009) "Organizational Path Dependence: Opening the Black Box", Academy of Management Review, 34(4), pp. 689-709.

Sydow, J., Windeler, A., Müller-Seitz, G. and Lange K. (2012) "Path Constitution Analysis: A Methodology for Understanding Path Dependence and Path Creation", Business Research, 5(2), pp. 155-176.

Teece, D.J., Pisano, G. and Shuen, A. (1997) "Dynamic Capabilities and Strategic Management," Strategic Management Journal, 18(7), pp. 509-35.

Van de Ven, A.H. and Poole, M.S. (1995) "Explaining Development and Change in Organizations", Academy of Management Review, 20(3), pp. 510-540.

van Oosterhout, M., Waarts, E., van Hillegersberg, J. (2006) "Change Factors Requiring Agility and Implications for IT," European Journal of Information Systems, 15(2), pp. 132-145.

Vergne, J.-P. and Durand, R. (2011) "The Path of Most Persistence: An Evolutionary Perspective on Path Dependence and Dynamic Capabilities", Organization Studies, 32(3), pp. 365-382.

Wand, Y. and Weber, R. (1995) "On the Deep Structure of Information Systems", Information Systems Journal, 5(3), pp. 203-223.

Weick, K.E. and Quinn, R.E. (1999) "Organizational Change and Development", Annual Review of Psychology, 50(1), pp. 361-381.

Yin, R.K. (2003) "Case Study Research, Design and Methods", 3rd ed., Sage, Newbury Park, CA.

CHAPTER III

DEVELOPING HIGH-QUALITY INDIGENOUS THEORIES IN THE INFORMATION SYSTEMS DISCIPLINE

3.1 Introduction

Theories considered indigenous to the discipline of information systems (IS) can be defined as theories "specifically developed to describe, explain, predict, or design IS phenomena (Straub, 2012, p. v)". Sprung by the debate over the IS discipline's legitimacy, calls for the development of such theories within the IS discipline have become stronger and recurrent over the years (Grover, 2013; Grover et al., 2008; Hassan, 2011; Markus and Saunders, 2007; Weber, 2003a). Indeed, some authors have argued that IS indigenous theories are essential in shaping the core of the discipline (Benbasat and Weber, 1996; Weber, 2003a) while others have affirmed that such theories are key to the emergence/survival of the discipline, as well as for moving IS research from good to great (Grover, 2013; Markus and Saunders, 2007). In addition, the development of IS indigenous theories, by requiring the theorizing of IS phenomena, is also considered crucial for enhancing our collective understanding of IS phenomena and to make an enduring contribution to the IS discipline and knowledge in general (Grover et al., 2008; Watson, 2001; Zmud, 1998). However, despite the acknowledged significance that IS indigenous theories can shape the identity and

legitimacy of the IS discipline, as well as make enduring contributions to IS and other disciplines, to date, the discourse on theory and theory development within the IS discipline is extremely limited and offers few insights to IS researchers as to how they may develop IS indigenous theories (Gregor 2006; Weber 2012). Indeed, IS research is predominantly anchored on theories from other disciplines, while much more has been written on theory testing than theory building within the IS discipline (Weber, 2003a). Hence, IS researchers can benefit from more guidance on how to develop high-quality IS indigenous theories.

Past research has shown that theory development in a specific discipline is inextricably linked to its domain of knowledge (Gregor, 2006). Indeed, the domain of knowledge of a discipline defines the range of phenomena of interest in that specific discipline and hence which phenomena the theories in the discipline should address (Gregor, 2006; Gregor and Jones; 2007; Weber 2003b). Unfortunately, within the IS discipline, the domain of knowledge includes a constellation of topics and encompasses numerous diverging views. For example, some authors argue that the IS discipline should focus on the IT artifact and its immediate nomological network (Benbasat and Zmud, 2003), while others suggest that the IS discipline should focus on the work system (Alter, 2003a, 2003b) or a coalescence of the two (Wu and Saunders, 2003). Furthermore, Orlikowski and Iaconno (2001) argue denote that the IT artifact is conceptualized in four different ways across the IS discipline, making the delineation of a common ground even more difficult. This current lack of a clear understanding within the IS discipline as to what constitutes an IS phenomena (Straub, 2012), crystallized in the long-lasting debates over the nature and importance of the IT artifact (Sidorova et al., 2008), seriously undermines the development of IS indigenous theories as IS researchers are left in limbo in regards to the phenomena their indigenous theories should address. This leads to our first research question:

Research question 1: What is the IS discipline's domain of knowledge?

Past IS research has also shown that the development of IS indigenous theories is intimately related to the research paradigm(s) espoused by IS researchers (Gregor, 2006; Gregor and Jones; 2007; Kuechler and Vaishnavi, 2012). A research paradigm refers to the general perspective or way of thinking that reflects fundamental beliefs/assumptions, that define, for a researcher, the nature of the "world", its individual's place in it and the range of possible relationships to that world and its parts (Guba and Lincoln, 1994; Gioia and Pitre, 1990). On this matter, the IS discipline can be seen as a "tapestry" of several research paradigms each of which can produce markedly different ways of approaching theory and theory development (Becker and Niehaves, 2007; Gioia and Pitre, 1990; Orlikowski and Baroudi, 1991). This is epitomized by the divide that exists between positivist and interpretive studies, as well as between behavioral and design research. This current lack of a clear understanding of IS research paradigms (Becker and Niehaves; 2007; Robey, 1996) seriously undermines the development of IS indigenous theories because unresolved conflicting views lead to markedly different ways of approaching the development of IS indigenous theories (Becker and Niehaves, 2007; Gioia and Pitre, 1990; Orlikowski and Baroudi, 1991). This leads to our second research question:

Research question 2: What are the IS discipline's research paradigms?

In addition, theory development rarely starts from scratch, and hence researchers need to be aware of the bridges that enable the integration of knowledge from different

paradigms in order to build theories that are comprehensive and not anchored on fragmented knowledge (Gioia and Pitre, 1990). Unfortunately, the current confusion over the IS discipline's domain of knowledge and the unresolved conflicting views across IS research paradigms creates a situation where bridges between IS research paradigms are undefined, which makes it difficult to adapt and integrate the diverse knowledge required to develop IS indigenous theories. This leads to our third research question:

Research question 3: How to create bridges between different IS Research paradigms?

The answers to our three research questions are accompanied by six key theory development guidelines that can help IS researchers to develop their own IS indigenous theories. In addition, using insights from our previous theorizing efforts, this study also provides two concrete examples as to how the six proposed guidelines can be operationalized in a given study.

By revealing the idiosyncrasies of indigenous theory development within the IS discipline, this article contributes to the IS literature on theory and theory development in three ways. First, by defining the IS discipline's domain of knowledge, this article helps IS researchers to identify pertinent phenomena of interest. Second, by identifying the four IS research paradigms, this article helps researchers to identify the content, development steps and evaluation criteria relevant for their particular theorizing efforts. Third, by identifying IS bridges, this article provides sound theories and methods to facilitate the adoption and integration of IS knowledge. Which is also likely to foster the accumulation of knowledge in the IS discipline by providing a cohesive view of different, but related IS research endeavors. Lastly, by providing six clear guidelines

and two concrete examples of how they can be operationalized in a single study, this article provides much needed guidance to IS researchers who wish to develop their own IS indigenous theories.

The rest of this article is structured as follows. The next three sections aim to answer our three research questions, respectively. Indeed, in the second section we answer our first research question by defining what the IS discipline's domain of knowledge is, while in the third section we answer our second research question by proposing a typology of IS research paradigms and by describing how the development of IS indigenous theories varies across IS research paradigms. In the fourth section we answer our third research question by identifying four bridges that can link the four IS paradigms. Lastly, in the fifth section, we illustrate how the guidelines put forth in this article may be operationalized by providing concrete examples drawn from two of our past research efforts.

3.2 What is the IS discipline domain of knowledge?

The IS discipline's domain of knowledge has been the subject of longstanding debates, with the most recent from 2001 to 2005 (Zhang et al., 2011). Wrongfully or rightfully, depending on one's allegiance, this most recent debate has been mainly focused on the importance of the IT artifact in defining the IS discipline's domain of knowledge (Sidorova et al., 2008). This debate began with Orlikowski and Iaconno's (2001) and Benbasat and Zmud's (2003) arguments that IS research should theorize specifically about the IT artifact and focus on issues directly related to its development, use and

impact. This provocative recommendation spurred a number of responses from other IS academics (e.g., Agarwal and Lucas, 2005; Iivari, 2003; Lyytinen and King, 2004; Myers, 2003; Power, 2003; Robey, 2003; Wu and Saunders 2003). For example, Agarwal and Lucas (2005) agree with Benbasat and Zmud's argument on the need for a new, stronger identity of the IS discipline, but also caution that taking such a micro focus and giving little attention to broader business issues may result in the elimination of IS from many academic programs. These authors also present an alternative view of the IS identity crisis. They argue that IS researchers, with their deep knowledge of the underlying IT artifact, have a powerful story to tell about the transformational impact of information technology. Adding to the debate, Robey (2003) also argued for a more flexible domain of knowledge, which would ensure higher adaptability of the discipline, making diversity a major strength of the field. Fittingly, we propose to answer our first research question by taking into account the centrality of the IT artifact in the debate over the IS discipline's domain of knowledge. As such, we first explain our conceptualization of the IT artifact. Next, we offer our own interpretation of its importance to the IS discipline. Finally, based on this understanding, we define the IS discipline's domain of knowledge as the IT system.

3.2.1 Conceptualizing the IT artifact

Several definitions of the IT artifact have been proposed in the IS literature (see Table 3.1). Our definition of the IT artifact complies with these previous definitions while allowing IS researchers to explore whatever IT artifacts they are interested in, from whatever IS research paradigm employed. More precisely, our definition is anchored

on three key commonalities that can be gleaned from these previous definitions. First, most of these definitions imply that IT artifacts are instantiated (Nevo et al., 2009). That is, they have a physical existence in the real world (Gregor and Jones, 2007). Second, these definitions infer that IT artifacts do not occur naturally but are rather constructed by humans to accomplish the purposes of man (Gregor and Jones, 2007; March and Smith, 1995). Third, these definitions suggest that IT artifacts rest on both tangible (e.g., hardware) and intangible (e.g., data, software) components (Orlikowski and Iacono, 2001; Zhang et al., 2011). Anchored on these 3 commonalities, we offer the following IT artifact definition:

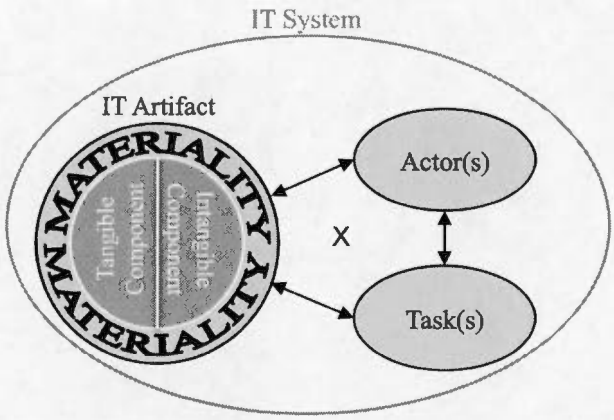
> An IT artifact is an instantiated human created object comprised of tangible and intangible components that provides opportunities for or constrains human actions.

Table 3.1 Popular definitions of the IT artifact

Authors	Definition
Agarwal and Lucas, 2005	"We also recommend expanding the definition of the IT artifact from "enabling or supporting some tasks" to specify IT as the integration of the processing logic found in computers with the massive stores of databases and the connectivity of communications networks. The IT artifact includes IT infrastructure, innovations with technology, and especially the Internet." (p. 394)
Benbasat and Zmud, 2003	"We conceptualize the IT artifact (see Figure 1) as the application of IT to enable or support some task(s) embedded within a structure(s) that itself is embedded within a context(s). Here, the hardware/software design of the IT artifact encapsulates the structures, routines, norms, and values implicit in the rich contexts within which the artifact is embedded." (p. 186)
Ein-Dor and Segev, 1993	"Our definition of IS is: any computerized system with a user or operator interface is an information system, provided the computer is not physically embedded." (p. 167)
Hevner et al., 2004	IT artifacts are broadly defined as constructs (vocabulary and symbols), models (abstractions and representations), methods (algorithm and practices), and instantiations (implemented and prototype systems)(p. 77)
Nevo et al., 2009	"Thus, we adopt this view and recognize IT artifacts as artificial systems which are either prototyped or implemented. Hence, a composite made up of some combination of software, hardware, database and network components with an information processing capability aimed at enabling individual, group and organizational tasks" (p. 224)
Orlikowski, 2000	"a technological artifact is a bundle of material and symbol properties packaged in some socially recognizable form, e.g. hardware, software"(p.408)
Orlikowski and Iaconno, 2001	"those bundles of material and cultural properties packaged in some socially recognizable form such as hardware and/or software" (p. 121)
Wand and Weber, 1995	"an object that can be studied in its own right, independently of the way it is developed and deployed in its organizational and social context" (p. 205)
Zhang et al., 2011	"An IT artifact is an entity/object, or a bundle thereof, intentionally engineered to benefit certain people with certain purposes and goals in certain contexts. It is developed, introduced, adopted, operated, modified, adapted, discarded, and researched within contexts and with various perspectives" (p. 3).

Based on this definition, our graphic representation of the IT artifact is shown in Figure 3.1. Our representation stipulates that the tangible and intangible components of the IT artifact jointly create its materiality (i.e., its ability to afford or constrain human action). Combined, our definition and representation of the IT artifact extends the work of Wand and Weber (1995) who distinguish between three sets of characteristics to describe an IS object: (1) the surface structure that refers to "the way the system appears to its users (Wand and Weber, 1995, p. 205)"; (2) the deep structure that "manifests the meaning of the real-world system the information system is intended to model (Wand and Weber, 1995, p. 20)"; and (3) the physical structure that "manifests the nature and form of the technology used to implement the system (Wand and Weber, 1995, p. 206). Indeed, just as Wand and Weber (1995), we see the IT artifact as being composed of three different but interrelated layers. However, contrary to Wand and Weber (1995) who conceptualize the surface structure as a distinct structure, we see the materiality of the IT artifact as an emerging layer formed by the interaction of tangible and intangible components or, stated differently, as the outcome of the IT artifact's internal layers (i.e., tangible and intangible components).

Figure 3.1 The proposed IS discipline's domain of knowledge



3.2.2 The importance of the IT artifact

Having proposed our conceptualization of the IT artifact, we now examine its importance to the IS discipline's domain of knowledge. This is essential because some authors have expressed their doubts in developing a discipline around an artifact. For instance, Weber (2003b, p. vi) has noted:

> "If we believe a theory of the core lies in information technology-related phenomena, presumably we believe theories of the core exist for other sorts of technology-related phenomena – for instance, a theory of the core of automobile related phenomena, or space shuttle-related phenomena, or electric toothbrush-related phenomena."

In response to these sound critiques, we argue that the IT artifact is no ordinary artifact and that its inclusion in the IS discipline's domain of knowledge is justified. Artifacts obtain their distinctive status by the specific forms by which they define a particular domain and organize knowledge and social experience within such a domain (Kallinikos, 2002). Accordingly, the intangibility of IT artifacts allows them to organize and embody knowledge in various ways, which, in turn, provides them with a wider range of application. Hence, because of their partly intangible nature, IT artifacts offer the possibility for more complex and unique affordances that make them more malleable than non-IT artifacts (Kallinikos, 2002; Kallinikos et al., 2013; Leonardi, 2010; 2011).

The improved malleability and partially intangible nature of the IT artifact have important consequences that highlight its uniqueness compared to other non-IT artifacts. First, because an infinite amount of knowledge can be inscribed in the design of IT artifacts, they allow humans to be free from remembering and thus forced, for the first time, to combine and not to simply remember knowledge to be considered intelligent (Serres, 2007). Second, the partly intangible nature of IT artifacts (Kallinikos et al., 2013) has also forced a review of the notion of physicality, a key characteristic of non IT artifacts (Leonardi, 2010; Leonardi and Barley; 2008). Indeed, if IT artifacts are intangible, how can they assume a physical presence in the real world? As argued by Leonardi (2010), intangible components, just as tangible components, afford or constrain human actions. Therefore, the unique intangible nature of IT artifacts forces us to understand physicality in terms of having significance rather than in terms of consisting of matter, the latter representing a narrower and more traditional definition of physicality (Leonardi, 2010; Leonardi and Barley, 2008). Third, because of their intangibility, IT artifacts necessitate greater theorizing in their creation when compared to non IT artifacts. Indeed, theorizing to adequately understand the nature of the world to be embodied in IT artifacts is much more complex than for natural artifacts that are not intended to mirror or represent a specific reality (Weber, 2003a)

Accordingly, researchers concerned with the construction of IT artifacts have greatly relied on kernel theories, typically defined as "natural science theories from other disciplines" (March and Smith, 1995), that suggest either the meta requirements or the construction process of IT artifacts (Kuechler and Vaishnavi, 2012). Based on these three consequences that highlight the uniqueness of the IT artifact, we argue for the inclusion of the IT artifact in the IS discipline domain of knowledge.

3.2.3 Defining the IS discipline's domain of knowledge as the IT system

Despite this inclusion, the very nature of the IT artifact disqualifies its candidacy as the sole and unique constituent of the IS discipline's domain of knowledge. Indeed, as mentioned previously, IT artifacts are constructed by humans (Gregor and Jones, 2007; March and Smith, 1995) and thus it is impossible to study them in a vacuum without the human values and goals that are embodied in their construction (Kallinikos, 2002; Orlikowski and Iacono, 2001; Zhang et al., 2011). For example, as stated by Brooks (1987, p. 12), "Einstein argued that there must be simplified explanations of nature because God is not capricious or arbitrary", but concludes that, "No such faith comforts the software engineer" because the objects of study "were designed by different people rather than God." Consequently, the IS discipline's domain of knowledge is neither exclusively about technology or people, nor is it exclusively about procedures that provide context for their interaction. Instead, it is an elaborate construction of the three (Benbasat and Zmud, 2003; Hevner et al., 2004; Orlikowski and Iaconno, 2001; Zhang et al., 2011). This definition of the IS discipline is also supported by Lee (2001, p. iii) who states:

> "the information systems field examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact."

Accordingly, we posit that the IS discipline's domain of knowledge revolves around the study of the IT system, which includes, in its most basic form, an IT artifact, an actor and a task (Figure 1). We define an actor as an individual person who interacts with an IT artifact and a task as a goal-directed action performed by an actor (Burton-Jones and Straub, 2006). Although our definition of the term "actor" does not directly relate to the notion of group or organization, our conceptualization of the IT system allows the study of IT artifacts in group or organization contexts through multilevel approaches that take into account interdependency between actors (Burton-Jones and Gallivan, 2007).

In support of our conceptualization, we refer to the work of Burton-Jones and Straub (2006) who have recently proposed a reconceptualization of system usage. The authors argue that rich and relevant assessment of system usage is tripartite, comprising a user, system, and task. Hence, in light of our definition of the IS discipline's domain of knowledge, this reconceptualization can be seen as an instantiation of our reasoning for a specific phenomena of interest (i.e., system usage) that comprises the three essential constituents of the IT system: IT artifact, actor and task. Our conceptualization can also be seen as a complement to the work of Benbasat and Zmud (2003). In an attempt to define and communicate the IS discipline's core properties, these authors have proposed a set of concepts and phenomena, organized in a simple nomological network, that should define the IS discipline's domain of knowledge. Although we do not aim to specify a precise ensemble of phenomena, we believe that all phenomena included in their nomological network can and should be defined along the three constituents of

the IT system: IT artifact, actor and task. Lastly, our conceptualization is also complementary to the set of heuristics proposed by Agarwal and Lucas (2005) to assess what lies within the domain of IS scholarship as our conceptualization applies to both micro and macro studies. Taken as a whole, these observations suggest that our conceptualization of the IT system is specific enough to provide a valid framework to assess the IS discipline's domain of knowledge while, at the same time, being flexible enough to accommodate the diverging views on what constitute the IS discipline's phenomena of interest.

Going back to our initial purpose of fostering the development of IS indigenous theories, our conceptualization of the IS discipline's domain of knowledge provides a sound understanding of the phenomena that should be of interest to IS researchers. Consequently, we argue that an IS indigenous theory should address an IS phenomenon, which we have described as an IT system characterized by an IT artifact, actor(s) and task(s). This assertion is summarized in our first theory development guideline:

Guideline #1: To develop an IS indigenous theory, IS researchers should study an IS phenomenon described as an IT system characterized by an IT artifact, actor(s) and task(s).

3.3 What are the IS discipline's research paradigms

Theories rarely if ever appear out of thin air as they usually have a well-established history behind them (Burrell and Morgan, 1979). Indeed, when theorizing, a researcher usually adopts a particular research paradigm. That is, a general perspective or a particular way of thinking that reflects his/her fundamental beliefs/assumptions that define, for him/her, the nature of the "world", his/her individual place in it and the range of possible relationships to that world and its parts (Guba and Lincoln, 1994; Gioia and Pitre, 1990). The idiosyncrasies of research paradigms are succinctly characterized by their differing fundamental assumptions about the nature of the world (ontology), the nature of knowledge about the world (epistemology), and the nature of ways of studying the world (methodology) (Gioia and Pitre, 1990). Based on these three characteristics, we propose to answer our second research question by first identifying the IS research paradigms and then highlighting their key differences with regard to theory development. We conclude this section by demonstrating the value of our typology compared to other efforts that have also focused on IS research paradigms.

3.3.1 Identifying the IS research paradigm

To this day, the differences between research paradigms are probably best articulated by Burrell and Morgan (1979) in their classification of research paradigms for the analysis of social and organizational theory (Goles and Hirschheim, 2000). Their typology, a simple 2 x 2 matrix, is anchored on two dimensions: objective-subjective

and regulation-radical change. The first dimension, labeled the philosophy of science, differentiates between researchers who adopt either an objective or a subjective "worldview" while the second dimension, labeled the nature of society, differentiates between researchers who investigate either problems of radical change or problems of regulation. As such, these authors contend that researchers either aim to provide explanations to the deep-seated structural conflicts, modes of domination and structural contradictions that they see in modern society (i.e., problems of radical change) or to provide explanations to the underlying unity and coheviseness that they see in modern society (i.e., problem of regulation) and that they can investigate these problems from two different "worldviews". They can adopt an objective "worldview" where they perceive the world as a hard, external, and deterministic reality and look for relationships or regularities between the various elements it contains or adopt a subjective "worldview" that stresses the importance of the subjective experience of the individual in the creation of the social world and look to understand how the individual creates, modifies and interprets his reality. Hence, Burrell and Morgan's (1979) typology identifies four different research paradigms: functionalism (objective "worldview" - problems of regulation), interpretivist (subjective "worldview" - problems of regulation), radical structuralist (objective "worldview" – problems of radical change), and radical humanist (subjective "worldview" – problems of radical change).

Burrell and Morgan's (1979) typology has mainly been used in the IS discipline to show the absence of a unifying paradigm (Hirschheim and Klein, 1989) and that objective "worldview" studies focusing on problem of regulation largely dominate IS research (Goles and Hirschheim, 2000). However, despite having expanded IS researchers' consciousness to the influence of research paradigms on theory development, their typology does not account for the idiosyncrasies of IS research. Indeed, although evidence suggests that the objective and subjective "worldviews" are core to the IS discipline (Chen and Hirschheim, 2004; Orlikowski and Baroudi, 1991)

and thus that the philosophy of science dimension is amenable to understand IS research paradigms, other observations suggest that Burrell and Morgan's (1979) nature of society dimension offers a poor understanding of IS research paradigms because it does not take into account the particular research problems at the heart of the IS discipline. Indeed, contrary to their social counterparts, IS researchers mainly investigate problems related to the creation and/or the appropriation of IT artifacts, leading many IS researchers to perceive the IS discipline as being composed of both behavioral and design studies (Gregor and Hevner, 2013; Gregor and Jones; 2007; Hevner et al., 2004). Based on this understanding, we propose to redefine Burrell and Morgan's (1979) nature of society dimension in order to reflect more adequately the behavioral and design duality within the IS discipline[4]. As such, our redefinition of the nature of society dimension reflects a continuum characterizing the IT artifact lifecycle, which begins with its creation and culminates with its appropriation. Accordingly, when mapped onto the philosophy of science dimension, our IT artifact lifecycle dimension yields four new different paradigms that reflect the uniqueness of IS research: naturalist (objective "worldview" - problems of appropriation), humanist (subjective "worldview" - problems of appropriation), technologist (objective "worldview" - problems of creation), and systemist (subjective "worldview" - problems of creation) (Figure 3. 2).

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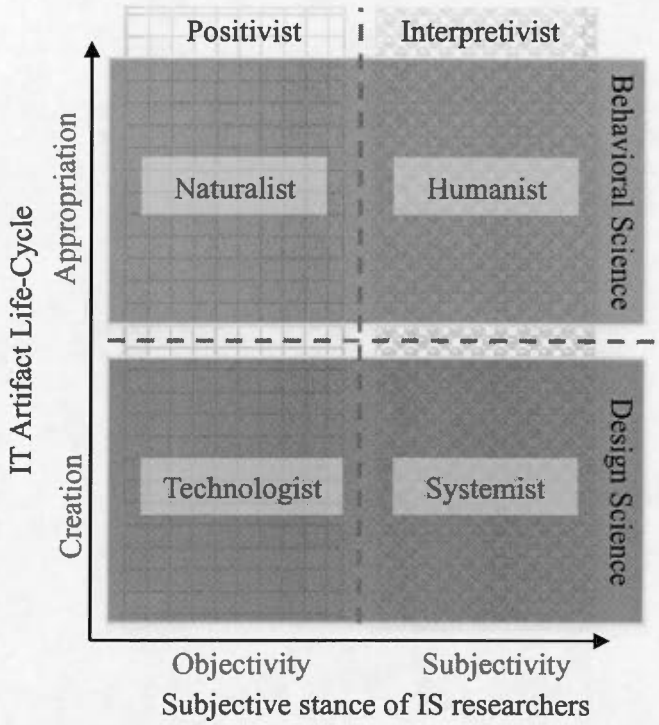
[4] It is important to note that similar critiques have been made against the content of Burrell and Morgan's (1979) matrix by other researchers in other disciplines (e.g., Deetz, 1996). However, similar to our arguments, none have questioned its structure or anatomy.

Figure 3.2 The proposed typology of IS research paradigms



Before providing a detailed description of each IS research paradigm, it is important to note that the four paradigms identified in our typology are not as clear-cut as they are made out to be. Indeed, there is an overlap between them and their differences are overstated for the purpose of effect. As such, the four IS research paradigms we propose are in fact, archetypes – highly simplified but powerful conceptions of an ideal or character type (Hirschheim and Klein, 1989) – that rarely exist as real entities. It is rather the properties exhibited (to a greater of lesser degree) by these existing entities that give each archetype its meaning (Hirschheim and Klein, 1989). Finally, the four identified paradigms play an important role in conveying the essential differences that exist in alternative approaches to develop IS indigenous theories.

Naturalists assume there is an objective physical and social world that exists independent of humans, and whose nature can be unproblematically apprehended, characterized, and measured (Orlikowski and Baroudi, 1991). It is this objective and independent reality that provides the foundation for human knowledge (Weber, 2004). This dualism between reality and humans also characterizes the epistemological standpoint of naturalists as they assume that investigators and investigated objects are independent entities (Orlikowski and Baroudi, 1991). Consequently, investigators are considered to be distinct from the knowledge they create and capable of studying phenomena without influencing them (Weber, 2004). Accordingly, the role of naturalists is to "discover" the objective physical and social reality by crafting precise and structured instrumentations (measures) that will detect and gauge those dimensions of reality that interest the researchers (Orlikowski and Baroudi, 1991). Key procedures adopted by naturalists include inferential statistics, hypothesis testing, mathematical analysis, and experimental and quasi-experimental design (Lee, 1991) Based on these beliefs and procedures, naturalists seek, in a deductive manner, to examine regularities and relationships that lead to generalizations and (ideally) universal laws or principles that can explain and predict patterns of behavior across situations (Orlikowski and Baroudi, 1991). For examples of naturalist research please refer to Bhattacherjee (2001) and Limayem et al., (2007).

Humanists believe that the physical and social world is not conceived as a fixed constitution of objects but rather as an emergent social process (Lee, 1991). Reality and knowledge about that reality are thus considered as social products and only understood in relation with the social actors that construct and make sense of that reality (Orlikowski and Baroudi, 1991). As such, humanists never assume a value-neutral stance, and are always implicated in the phenomenon being studied. They presume that their prior assumptions, beliefs, values, and interests shape their investigations (Orlikowski and Baroudi, 1991). Knowledge is thus intentionally constituted. Indeed, meaning and intentional descriptions are important, not merely because they reveal

subjects' states of mind which can be correlated with external behavior but also because they are constitutive of those behaviors (Orlikowski and Baroudi, 1991). As such, the investigator is interactively linked to the object of investigation and the "findings" are literally created as the investigation proceeds. Accordingly, the role of humanists is to get inside the world of those generating it (Orlikowski and Baroudi, 1991). Key procedures adopted by humanists include ethnography, hermeneutics, phenomenology, and case studies (Lee, 1991). Based on these beliefs and procedures, humanists seek, in an inductive manner, to generate descriptions, insights, and explanations of events to understand how members of a social group, through their participation in social processes, enact their particular realities and endow them with meaning. They also aim to show how the meaning, belief and intentions of the members help to constitute their social action (Orlikowski and Baroudi, 1991). For an example of humanist research please refer to Orlikowski (1993).

Technologists recognize the objective world of material things (Gregor and Hevner, 2013) and seek to produce objective knowledge (Gregg et al., 2001), which is then applied through design practices (Hevner et al., 2004). As such, these researchers implicitly adopt an epistemological position where the researcher is considered to be distinct from the knowledge he has created (Niehaves, 2007). The role of technologists consist of building and evaluating IT systems; their main focus being on the technological innovations/extensions which are intended to affect individual and organizational experience in a positive manner (Gregg et al., 2001). Based on these beliefs and procedures, technologists seek, in a deductive manner, to build and evaluate socio-technical artifacts intended to solve observed problems and serve human purposes (Gregor and Hevner, 2013). For an example of technologist research please refer to Dickson et al. (1977).

Systemists recognize that reality is individually and socially constructed. Thus, they understand that system design is not a problem of collecting and manipulating data in

order to accurately picture a situation but rather a problem of enactment where design is about creating a new situation (Boland and Day, 1989). As such, the developed systems are neither a mirror nor a looking-glass, but rather a new stage where actors produce their reality (Boland and Day, 1989). The role of systemists is thus to step inside the social process to be supported by the newly developed system(s) in order to reveal deep meaning structures. As such, systemists focus on understanding how social actors conceive the system(s) to be developed while knowing that the knowledge they produce is inextricably tinted by their own interpretation of that reality. Key procedures adopted by systemists include ethnography, hermeneutics, phenomenology, and case studies (Gregg et al., 2001). Based on these beliefs and procedures, systemists seek, in an inductive manner, to create socio-technical artifacts that provide a stage for actors to enact their reality. For examples of systemist research please refer to Boland and Day (1989) and Tremblay et al. (2010).

In regards to our initial purpose of fostering the development of IS indigenous theory, our typology of IS researcher paradigm bring clarity to the IS discipline's "tapestry" of research paradigms and highlights the key differences that lead to markedly different ways of approaching theory and theory development within the IS discipline. Accordingly, IS researchers should be aware of these differences and specify, a priori, in which paradigm they operate or intend to chose to develop their theory. This assertion is summarized in our second theory development guideline:

Guideline #2: To develop an IS indigenous theory, IS researchers must adopt one of the following four IS research paradigms: Naturalist, Humanist, Technologist, and Systemist.

3.3.2 Paradigmatic differences in regards to theory development

Keeping in mind that the proposed paradigms are archetypes, we now highlight the particularities of developing theories in each IS research paradigm. More precisely, we highlight how the content of theories, the steps of theory development and the interpretation of theory evaluation criteria vary across the four IS research paradigms.

3.3.2.1 Differences in content

Based on our adaptation of Burrell and Morgan's (1979) typology, we contend that the content of IS indigenous theories varies along two dimensions: the philosophy of science dimension which differentiates between IS researchers who adopt objective or subjective "worldviews" and the nature of society dimension which differentiates between design and behavioral IS researchers.

The differences between the content of theories developed by objective IS researchers and the content of theories developed by subjective IS researchers are rooted in each of these "worldview's" fundamental assumptions about the nature of the world (ontology), the nature of knowledge about the world (epistemology), and the nature of ways of studying the world (methodology). On the one hand, objective IS researchers assume that the natural world exists independently of human cognition, that they are distinct from the knowledge they create and that theory building follows a deductive approach. On the other hand, subjective IS researchers believe that the world is

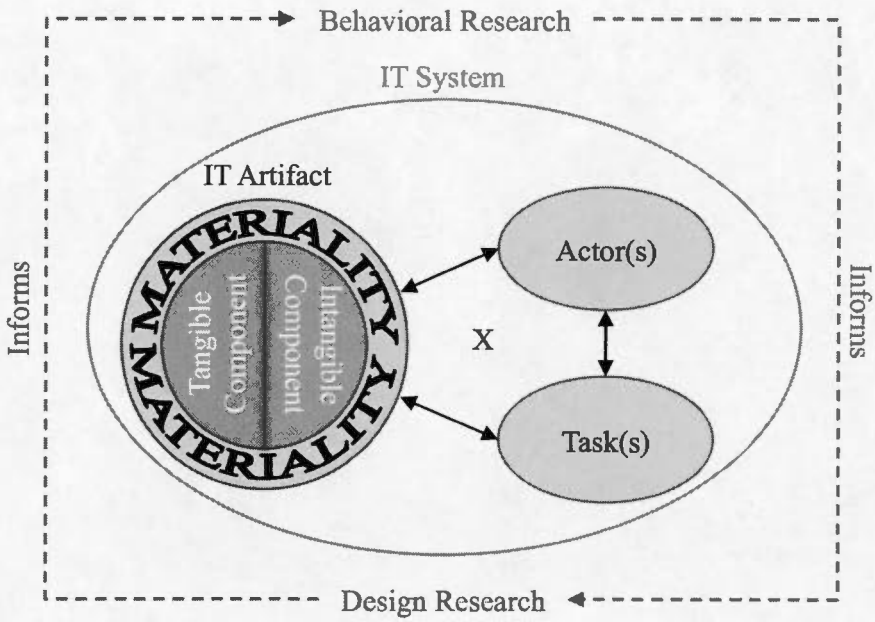
individually and socially constructed, that they are inextricably linked to the knowledge they create and that theory building follows an inductive approach. These key differences have for consequences that the theories developed by objective IS researchers will predominantly take the form of tested universal principles or natural laws that may be used to control and predict our reality while the theories developed by subjective IS researchers will predominantly take the form of elaborated descriptions and interpretations that may be used to diagnose and explain our reality. Hence, objective and subjective researchers operate in a virtuous sequence where explanations from the particulars developed by subjective researchers may later be tested and generalized to a wider base by objective researchers. In addition to producing this virtuous sequence, the uneven importance given to prediction and explanation in both "worldviews" may also explain the ongoing and long-lasting debate within and outside the IS discipline as to whether or not a single theory should explain, predict or do both simultaneously (Gregor, 2006; Lee, 1991; Tsang and Ellsaessser, 2011; Weber, 2003a).

To illustrate how the content of a theory varies according to an IS researcher's worldview, we describe how media richness theory (MRT), an IS indigenous theory, is instantiated differently by objective and subjective researchers. MRT is anchored on two fundamental premises. First, that individuals process information to reduce uncertainty and equivocality (Daft and Lengel 1986). According to the theory, when equivocality is high, the individual does not know what questions to ask while the individual knows the questions but lacks the necessary information to answer the question when uncertainty is high. Second, that commonly used media work better for certain tasks than others. Specifically, Daft and Lengel (1984) posit that written media are better for unequivocal messages while face-to-face media are more appropriate for equivocal messages. Accordingly, Daft, Lengel, and Trevino (1987), under an objective "worldview", propose and test a set of principles that predict the influence of different media on human behavior. The authors then use these principles to develop a

media richness hierarchy, which posits that the richest communication medium is face-to-face meetings followed by telephone, e-mail, and finally memos and letters. On the other hand, in an attempt to interpret the managerial use of electronic mail, Lee's (1994) work, based on a subjective "worldview", argues that the medium of e-mail is, in itself, neither rich nor lean. Rather, the author explains that richness is an emergent property of the interaction of the e-mail medium with its organizational context. As such, the richness of a media should not be seen as a universal characteristic, but rather as a property that is socially constructed by organizational users.

The differences between the content of the theories developed by design IS researchers and the content of the theories developed by behavioral IS researchers, in turn, are rooted in their study of dissimilar phases of the IT artifact's lifecycle. Indeed, design researchers are concerned with the creation of the IT artifact while behavioral researchers are concerned with its appropriation. This key difference has for consequences that theories developed by design researchers will predominantly take the form of prescriptions and narratives that may be used to guide and frame the construction of IT artifacts while the theories developed by behavioral IS researchers will predominantly take the form of predictions and explanations that may be used to foretell and understand the appropriation of the IT artifact. As such, design researchers will focus more on the tangible and intangible components of the IT artifact, as well as the procedures to combine them in order to create the materiality of the IT artifact (i.e., their ability to either afford or constrain human actions), while behavioral researchers will focus more on the materiality of the IT artifact and its influence on human actions. Hence, design and behavioral researchers operate in a virtuous cycle where the output of a design study can become the input of a behavioral study and vice-versa (Niederman and March, 2012) (see Figure 3.3).

Figure 3.3 The virtuous cycle of IS research



To illustrate how the content of a theory varies depending on the IT artifact's lifecycle, we explain how socio-technical system theory (STS), an IS indigenous theory, is instantiated differently in design and behavioral studies. STS posits that an organization or organizational work system (e.g., a department) can be described as a socio-technical system, which is made up of two independent, but interacting sub-systems: the social and the technical. The technical system is concerned with the processes, tasks, and technology needed to transform inputs into outputs whereas the social system is concerned with the attributes of people (e.g., attitudes, skills, values), as well as the relationships between the people, the reward systems, and the authority structures. The theory also stipulates that the outputs of the work system are the result of the joint interactions between these two sub-systems. Accordingly, Bostrom and

Heinen (1977a, 1977b), concerned with the creation of successful IT artifacts, instantiated the STS theory in the form of a three-phase design methodology to guide the design, change, and/or redesign of information systems. Similarly, Lyytinen and Newman (2008), have instantiated STS in a way to explain the evolution of information systems. On the other hand, concerned with the appropriation of the IT artifact, authors such as Chai and Kim (2012) have instantiated the STS to explain how the usage of online social networking websites can vary from one user to another, as well as to demonstrate that these variations can be attributable to both the technical and social components of websites, although the social component seems to play a more important role.

In regards to our initial purpose of fostering the development of IS indigenous theories, our typology of IS research paradigms provides a sound understanding of the various contents that IS indigenous theories can provide. More precisely, based on our 2x2 matrix, we argue that the content of an IS indigenous theory may be of four different types (see Table 3.2). In support of our argument, we refer to the work of Gregor (2006) who classifies IS theories according to their content. Through her taxonomy of IS theories, she identifies five different ways in which the term "theory" has been used in the IS discipline: Type I – theories for analysis; Type II – theories for explanation; Type III – theories for prediction; Type IV – theories for explanation and prediction; and Type V – theories for design and action. The importance given to explanation and prediction in Gregor's (2006) typology suggests that our characterization of objective and subjective IS indigenous theories is adequate as both predominantly focus on predicting (Type III) or explaining (Type II), while recognizing that complete theories should do both (Type IV). Furthermore, her identification of specific theories for design and action (Type V), suggests that the content of design and behavioral theories is indeed different. Accordingly, we propose our third theory development guideline:

Guideline #3: To develop an IS indigenous theory, IS researchers must align the content of their theory with the IS research paradigm chosen to develop the theory.

Table 3.2 Comparison of theoretical content across IS Research Paradigms

Naturalist	Humanist	Technologist	Systemist
Universal principles and natural laws that control and predict the appropriation of IT artifacts	Descriptions and interpretations that diagnose and explain the appropriation of IT artifacts	Prescriptions and heuristics that guide and direct the creation of IT artifacts	Narratives and understandings that situate and frame the creation of IT artifacts

3.3.2.2 Differences in the development steps

Because each IS research paradigm adopts a particular "worldview" (objective or subjective) and focuses on a specific phase of the IT artifact's lifecycle (creation or appropriation), the four steps toward development – opening works, data collection, analysis, and theory building (Gioia and Pitre, 1990) – will vary from one IS research paradigm to the other (see Table 3.3). First, because of their ontological, epistemological and methodological standpoints, objective and subjective researchers adopt different theory development methods. Objective researchers generally rely on a deductive method while subjective researchers generally rely on an inductive method. A deductive method is one:

> "that involves "going from generals to particulars; deriving conclusions based on premises through the use of a system of logic" (Samuels, 2000: 214) and, in generating inferences, is typically associated with a top-down approach to theory building that begins with the existing knowledge. (Shepherd and Sutcliffe, 2011, p. 361)"

On the other hand, an inductive method is one:

> "that involves "going from particulars to generals; deriving knowledge from empirical experience based upon a system of handling sense data" (Samuels, 2000: 214) and is typically associated with a bottom-up approach to theory building that starts with data. (Shepherd and Sutcliffe, 2011, p. 361)"

Second, because they focus on different phases of the IT artifact's lifecycle, the theory development end results of design studies and behavioral studies are quite different. Design researchers attempt to create the materiality of the IT artifact whereas behavioral researchers try to understand how it is appropriated (March and Smith, 1995). As such, design researchers produce and apply knowledge of tasks or situations in order to create effective artifacts, while behavioral researchers produce theoretical explanations and predictions of appropriation behaviors (March and Smith, 1995). Consequently, aiming for these two different end results produces different ways of approaching theory development steps. Taking into account these differences that are rooted in each paradigm's worldview and the IT artifact's lifecycle phase each paradigm focuses on, Table 3.3 adapts Gioia and Pitre's (1990) steps towards theory development for each of the IS research paradigms we propose. Accordingly, we propose our fourth theory development guideline :

Guideline #4: To develop an IS indigenous theory, IS researchers should follow the steps as prescribed by the IS research paradigm chosen to develop the theory.

Table 3.3 Comparison of the theory development steps across IS research paradigms

Naturalist	Humanist	Technologist	Systemist
Opening work SELECTING A TOPIC: ▪ What are the issues? ▪ What are the research questions? REVIEWING LITERATURE: ▪ What do we know? FIND A GAP: ▪ What is missing? PUTTING A FRAMEWORK TOGETHER: ▪ What are the relevant theories and relevant variables FORMULATING HYPOTHESES: DESIGN THE RESEARCH: ▪ What are the data? ▪ Where to find the data? ▪ How to measure the data? Data Collection ▪ PROBING REPRESENTATIVE SAMPLE OF SUBJECTS: According to the hypotheses formulated Analysis TESTING HYPOTHESES: ▪ Evaluate the significance of the data according to initial problem and hypotheses Theory building WRITING UP RESULTS: ▪ Show how the theory is refined, supported, or disconfirmed ▪ Show what it tells the scientific community and the practitioners	Opening work SELECTING A TOPIC: ▪ What are the issues? ▪ What are the research questions? DESIGN THE RESEARCH: ▪ What are the data? ▪ Where to find the data? ▪ How to record the data? Data Collection IDENTIFYING SPECIFIC CASES: QUESTIONING INFORMANTS: ▪ According to what is relevant to them in context Analysis CODING: ▪ Provide a description at the first and sometimes at second level of abstraction FORMULATING CONJECTURES: ▪ Identify the relations between concepts at first level or across levels of abstraction EVALUATING CONJECTURES: ▪ Validate with informants through new data collection FORMULATING THEORY: ▪ Identify emerging concepts and relationships REVIEWING LITERATURE: ▪ Identify what was already known Theory Building WRITING UP A SUBSTANTIVE THEORY: ▪ Show how it all fits together	Opening work SELECTING A TOPIC ▪ What is the problem? ▪ What are the meta-requirements? ▪ What are the objectives for a solution? REVIEWING LITERATURE ▪ What are the possible solutions? ▪ Which solution is most promising? PUTTING A FRAMEWORK TOGETHER: ▪ What are the relevant kernel theories and relevant intuitions FORMULATING HYPOTHESES: DESIGN THE RESEARCH: ▪ What are the data? ▪ Where to find the data? ▪ How to measure the data? Data collection DEVELOPING ARTIFACT PROTOTYPES ▪ According to meta-requirements formulated DEVELOPING TEST CASES ▪ According to the problem formulated PROBING REPRESENTATIVE SAMPLE OF SUBJECTS: ▪ According to the hypotheses formulated Analysis TESTING HYPOTHESES: ▪ Evaluate the significance of the data according to initial problem, meta-requirements and hypotheses Theory building WRITING UP RESULTS: ▪ Final codification of design and kernel theories ▪ Final formalism of design and kernel theories	Opening work SELECTING A TOPIC ▪ What is the problem? ▪ What are the meta-requirements? DESIGN THE RESEARCH: ▪ What are the data? ▪ Where to find the data? ▪ How to record the data? Data collection IDENTIFYING SPECIFIC CASES: QUESTIONING INFORMANTS: ▪ According to what is relevant to them in context DEVELOPING ARTIFACT PROTOTYPES ▪ According to meta-requirements formulated DEVELOPING TEST CASES ▪ According to the problem formulated Analysis CODING: ▪ Provide a description at first and sometimes at second level of abstraction of meta-requirements and problems formulated FORMULATING CONJECTURES: ▪ Identify the relations between meta-requirements and problems formulated at first level or across levels of abstraction. EVALUATING CONJECTURES: ▪ Validate with informants through new prototypes FORMULATING THEORY: ▪ Identify emerging constructs and relationships REVIEWING LITERATURE: ▪ Identify what was already known Theory building WRITING UP A SUBSTANTIVE THEORY: ▪ Show how it all fits together

3.3.2.3 Differences in the interpretation of the theory evaluation criteria

Because each paradigm has a unique combination of "worldview" (objective or subjective) and phase of the IT artifact's lifecycle it focuses on, some theory evaluation valuation criteria may also be understood differently across the paradigms. To illustrate these differences, we identify 5 key theory evaluation criteria often cited in the theory building literature (Bacharach, 1989; Corley and Gioia,2011; Kuhn, 1977; Popper, 1959; Wacker, 1998; Weber, 2003a; Weick, 1989; Whetten, 1989), namely comprehensiveness, originality, utility, simplicity, and falsifiability, and present how their interpretation may vary according to the four IS research paradigms we propose in our typology (see Table 3.4).

Table 3.4 Interpretation of theory evaluation criteria under each IS research paradigm

	Definition	Naturalist	Humanist	Technologist	Systemist
Comprehen-siveness	The extent to which the theory accounts for all known data on the phenomena it applies	Must consider all empirical evidence on the studied phenomenon	Must consider all actors' accounts of the studied phenomenon	Must consider all empirical evidence on the studied phenomenon	Must consider all actors' accounts of the studied phenomenon
Originality	The extent to which the theory brings novelty	Must reveal a new law/principle or refine those that already exist	Must uncover new interpretations or enhance those that already exist	Must develop new prescriptions or improve those that already exist	Must expose new narratives or extend those that already exist
Utility	The extent to which the theory corresponds to reality	Must allow for the control and prediction of the appropriation of IT artifacts	Must provide individually and socially constructed explanations of the appropriation of IT artifacts	Must guide the creation of IT artifacts that solve stated problems	Must foster the creation of IT artifacts that allow actors to enact their reality
Simplicity	The extent to which the theory has paucity in its parameter	Must possess a minimal number of parameters	Must possess a minimal number of parameters	Must possess a minimal number of parameters	Must possess a minimal number of parameters
Falsifiability	The extent to which the theory is logically constructed	Must be logically constructed	Must be logically constructed	Must be logically constructed	Must be logically constructed

As can be seen in Table 3.4, the interpretations of three of the five theory evaluation criteria, namely comprehensiveness, originality, and utility, vary from one paradigm to

another. This may be explained by the fact that these three criteria refer to the external value of the theory's input and output. Specifically, these criteria do not refer to intrinsic characteristics of the theory, but rather to the theory's position regarding the current state of scientific and practical knowledge. Accordingly, these criteria have multiple interpretations since IS researchers espousing different ontological, epistemological, and methodological assumptions will interpret these criteria in markedly different manners. As such, these criteria reveal the need for IS researchers to position their theories in the appropriate IS research paradigm if they want their work to be evaluated against relevant standards and similar theoretical efforts. On the other hand, the last two theory evaluation criteria, namely simplicity and falsifiability, refer the internal value of the theory's structure or anatomy. Accordingly, because these criteria assess the intrinsic characteristics of the theory and not its relative position regarding to current scientific and practical knowledge, they are not subject to diverging ontological, epistemological, and methodological interpretations and hence have a single meaning. Accordingly, we propose our fifth theory development guideline:

Guideline #5: To evaluate an IS indigenous theory, IS researchers should follow the interpretation of the theory evaluation criteria given by the IS research paradigm chosen to develop the theory.

3.3.3 The value of our proposed typology when compared to past efforts that focused on IS research paradigms

Very few attempts have been made within the IS literature to identify the various paradigms espoused by IS researchers. Originally concerned with the legitimacy of IS research as a scientific discipline, Banville and Landry (1989) were, to the best of our knowledge, the first to conduct a paradigmatic inquiry of the IS discipline. Anchored on Whitley's (1982; 1984) model for scientific fields, these authors concluded that: "MIS is a fragmented field, or to put it in other words, an essentially pluralistic scientific field, in view of its vocational character (p. 58)". Hence, our typology, which proposes a coalescence of paradigms, adheres to this pluralistic characterization of the IS discipline, but also goes a bit further by identifying the key differences that make a difference within the IS research community: differences in "worldviews" and research problems.

Similarly, Hirschheim and Klein (1989) used Burrell and Morgan's (1979) typology to propose four approaches to develop information systems. Interestingly, the authors conclude their article with the following remark: "... although it was not possible to relate systems development methodologies to paradigms in this article, an exploration of their relationship would nevertheless appear to be a key issue? (p. 1214)". As such, their own application of Burrell and Morgan's (1979) typology to the IS discipline supports our initial assertion that design studies are not taken into account within this particular matrix and further validate the typology we propose.

Subsequently, Orlikowski and Baroudi (1991) conducted an extensive review of the IS literature to identify the different research approaches and assumptions that characterize IS research. Anchored on Culnan's (1986, 1987) framework, these authors argued that IS research mainly focuses on three distinct theoretical topics: individual approaches to MIS design and use, MIS management, and organizational approaches

to design and use. This finding, which characterizes the IS discipline as comprising studies that either investigate the creation or appropriation of the IT artifact, validates, to some extent, our typology by showing that these theoretical concerns are core to the IS discipline and have been so from its very beginning. Furthermore, anchored on Chua's (1986) classification of research epistemologies, Orlikowski and Baroudi (1991) also showed that positivist and interpretive "worldviews" were, at the time of the study, the dominant "worldviews" espoused by IS researchers and that the critical "worldview" had yet to be used in IS reseaerch. This finding indicates that our characterization of the IS discipline as being composed of both an objective and a subjective "worldview" is congruent with previous findings and that this divide has been pervasive over the years. This finding also suggests that classifying IS studies along problems of regulation and/or problem of change is ill advised since the authors found no critical study within the IS discipline. In line with Orlikowski and Baroudi's (1991) conclusions, later reviews of the IS literature by Goles and Hirschheim (2000) and Chen and Hirschheim (2004) also showed that IS research mainly espouses the objective and subjective "worlviews" and that radical structuralism and radical humanist studies, key to Burrell and Morgan's (1979) typology, are rarely found within the IS discipline which indicates, once again, that problems of regulation and/or problems of change are not core to the IS discipline, just as our proposed typology suggests.

Finally, some may argue that our typology simply discards studies that focus on problems of regulation and/or problems of change. In response to this sound critic, we respond that our typology, while not explicitly taking into account such studies, implicitly sees them as being part of the four IS research paradigm proposed. In other words, we believe that problems of regulation and problems of change are amenable to both design and behavioral research as well as to studies based on objective or subjective "worldviews". As such, naturalists, humanists, technologists, and systemists can choose to focus on these specific issues if they deem it appropriate. However, they

will do so within the broader context of the four IS research paradigms we have identified. Others may also argue that our four IS research paradigms only represent polarizing archetypes and that our typology does not take into account "worldviews" that simultaneously accept different types of object of knowledge that have different ontological and epistemological characteristics and meanings (e.g., critical realism paradigm, transformative-emancipatory paradigm). To this critiques, we respond that our typology does not discredit these "worldviews" or deny their existence. Rather, its aim is to highlight how basic and fundamental beliefs and assumptions about the world influence the development of IS indigenous theories. As such, our typology fosters the understanding of these more complex "worldviews" by highlighting the key conflicting beliefs they reconcile. Hence, we accept that these more complicated "worldviews" exist and suggest, as explained in section 4, several ways as to how IS researchers may aspire to bridge conflicting beliefs and assumptions in order to obtain a more comprehensive understating of the IS discipline's domain of knowledge.

3.4 Linking the different IS research paradigms

In the IS discipline, theory development rarely starts from scratch. As such, the identification of bridges between IS research paradigms is required to permit the adaptation and integration of the diverse IS knowledge required to develop IS indigenous theories. Indeed, it is by linking the theoretical understandings developed in the different IS research paradigms that IS researchers can assemble a comprehensive understanding of a specific IS phenomenon of interest. To identify IS bridges, the literature first suggests to adopt a pragmatic view of knowledge integration

(Venkatesh et al., 2013). That is, to move beyond the debate on the incompatibility of methodology and paradigmatic incommensurability to propose different ways by which knowledge created within the IS discipline can be integrated. Indeed, despite arguments that paradigms are irreconcilable, it has been argued that it is feasible to develop a multi-perspective view of theory development that cuts across paradigms (e.g., Gioia and Pitre, 1990; Lewis and Grimes, 1999, Venkatesh et al., 2013). The literature also suggests that the boundaries between research paradigms should be conceived as transition zones. Indeed, Gioia and Pitre (1990) have argued that although the central assumptions of different paradigms are at odds, there is an overlap between them, making it difficult, if not impossible, to establish where one paradigm leaves off and another begins. Hence, paradigmatic dimensions should be conceived as continuum and the boundaries between them as transition zones (Gioia and Pitre, 1990). Lastly, the literature also suggests that the discussion of bridging across transition zones can be facilitated by employing second-order concepts (Van Maanen, 1988), which are explanatory constructs used to describe dimensions of scientific understanding (as compared to first-order concepts which are manifested by the people experiencing a phenomenon). Indeed, second-order concepts help clarify possibilities for communicating across paradigm transition zones because their level of abstraction permit to relate analogous concepts more easily (Gioia and Pitre, 1990).

Taking into consideration these three suggestions to facilitate paradigm bridging, as well as the particularities of the IS discipline identified in the previous sections, we contend that the materiality of the IT artifact (a key layer of the IT artifact) is the sole common denominator linking all IS research paradigms and thus that it should be used as a second-order concept to discuss the possibilities of bridging across IS transition zones. Indeed, while it may be interpreted differently according to researchers' "worldviews" (objective or subjective) and the research problems they aim to address, the materiality of the IT artifact is of concern to all IS researchers. This key assertion corroborates previous critics of the IS discipline who have emphasized that IS

researchers generally treat the IT artifact as a black box instead of taking into account its particular characteristics (Benbasat and Zmud, 2003; Orlikowski and Iaconno, 2001). These arguments lead us to our sixth and last theory development guideline:

> Guideline #6: To develop an IS indigenous theory that will foster the accumulation of knowledge within the IS discipline, IS researchers must detail the materiality of the IT artifact at the heart of their theory.

Having defined a second-order concept of concern to all IS research paradigms, we now propose four bridges that can help researchers from different IS research paradigms to mutually reinforce their respective work.

3.4.1 Bridging the Naturalist-Humanist paradigms

In the naturalist paradigm, which presumes an objective reality, materiality is often perceived to be deterministic and technocentric. That is, the objective materiality of the IT artifact inevitably guides or constrains its appropriation in a certain way. On the other hand, in the humanist paradigm, which presumes a subjective reality, materiality is interpretively flexible, leading to different appropriation patterns (DeSanctis and Poole, 1994). If any bridge is to be drawn between these two paradigms, a connection must be made between these two different conceptualizations of materiality. Adaptive

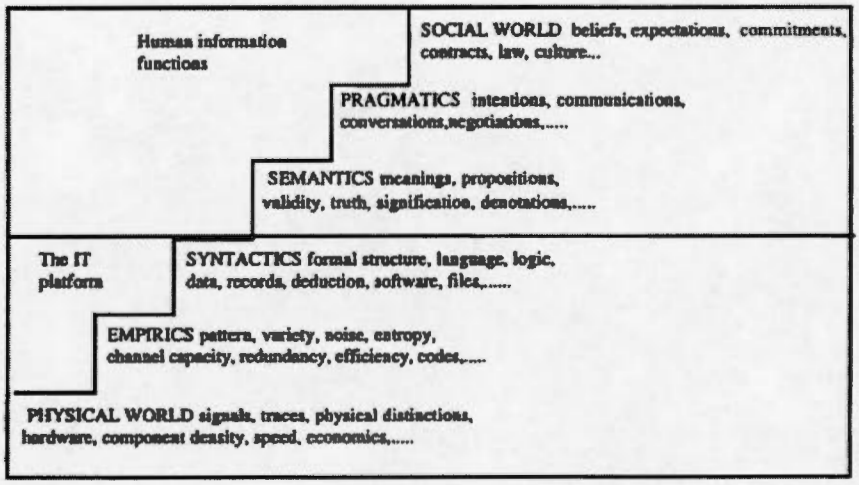
structuration theory (AST) developed by DeSanctis and Poole (1994) makes such a connection.

AST criticizes the technocentric and sociocentric views of technology by emphasizing their mutual interactions. In other words, AST recognizes that objective and subjective "worldviews" represent a duality rather than a dualism. Specifically, AST posits that groups/organizations, by using information technology to do their work, dynamically create their own perceptions of the role and utility of the technology, and determine how the technology can be applied to support their work. These perceptions, in turn, can vary widely across different groups/organizations and can influence the way technology is used (i.e., they mediate the impact of materiality on group/organizational outcomes). As such, AST examines the effect of the materiality of the IT artifact on appropriation behaviors from two vantage points: 1) the opportunities for, or constraints to human actions provided by the IT artifact, and 2) the opportunities or constraints that actually emerge in human action as people interact with the IT artifact (DeSanctis and Poole, 1994). Consequently, based on this dual understanding of IT appropriation, AST can explain a key paradox of the IS discipline: how identical technologies that provide similar opportunities and constraints can lead to different outcomes (DeSanctis and Poole, 1994). AST can thus be seen as a means of bridging the naturalist-humanist paradigms as it occupies an intermediate position on the objective-subjective continuum. As such, AST bridges the two paradigms concerned with the effect of the IT artifact's materiality on its appropriation.

3.4.2 Bridging the Technologist-Systemist paradigms

Similar to the challenge of bridging the naturalist-humanist transition zone, bridging the technologist-systemist transition zone implies that a connection must be made between two different conceptualizations of materiality. On one hand, technologists, who believe in an objective reality, conceptualize the materiality of the IT artifact as being constructed from the physical world. On the other hand, systemists, who believe in a subjective reality, conceptualize the materiality of the IT artifact as being constructed by the social world (Purao, working paper). If any bridge is to be drawn between these two paradigms, a connection must be made between these two different conceptualizations of materiality. Stamper's (1996) framework, which links the physical and the social worlds within a single six-level semiotic hierarchy, makes such a connection (see Figure 3.4).

Figure 3.4 Stamper's (1996) semiotic framework



Semiotics, the theory of signs, is concerned with the properties of things in their capacity as signs (Barron et al., 1999). A sign generally includes "numerical and alphabetical characters, words, sentences, messages, and all actions, which, through custom or convention, have acquired some recognizable interpretation (Barron et al., 1999, p. 4)". Because computers and humans require signs for representing, storing, processing and interpreting the inputs and outputs of computer-based information systems, an analysis of the properties of signs is essential to our understanding of information systems (Barron et al., 1999). Stamper (1996) divides the properties of signs into six levels: (1) physical world; (2) empirics; (3) syntactics; (4) semantics; (5) pragmatics; and (6) social world. At the first level of the hierarchy, the author posits that signs must have a physical presence in the real world. At the other end of the hierarchy, the social world represents the observed effects of signs or their capacity to produce some social change (Stamper, 1996). If signs are unable to foster a social change (i.e., change a person's values, beliefs or obligations), then they become

worthless since they are unlikely to dispose a person to act in some way (Stamper et al., 2000). For a physical act of signaling to result in the correct social consequence, the signs employed have to be organized correctly on each of the other four levels of the semiotic hierarchy (Stamper et al., 2000). At the level of empirics, a physical phenomenon is organized into predictable and recognizable patterns, such as alphabets, which allow us to reproduce signals reliably and to signal the changes that are happening in the world. Once these repertoires of reliable patterns are established, we may use them to build more complex sign structures, which form the syntactic properties of signs. From an information system standpoint, it is at this level that formal languages, logics, models, software, record syntax and database structures operate. As a whole, these first three levels – physical, empiric and syntactic – which relate mainly to issues of information systems efficiency have received the bulk of IS researchers' attention (Stamper et al., 2000). Researchers who normally think of information systems as essentially computer-based systems are likely to focus primarily on these levels of analysis. However, IS researchers who do not neglect the key role of users or actors in information systems will recognize the limit of these three levels of analysis as they do not take into account the handling of information by humans (Stamper et al., 2000). The semantic properties of signs, which deal with their meanings in the special sense of how they relate to reality, how they represent, designate and signify things, are key to understanding the handling of information by humans (Barron et al., 1999). As such, it is at the semantics level that signs acquire their meaning and what they may properly refer to. By being able to adequately express our own and understand other's meanings, the signs we use are then employed to express intentions, which compose the pragmatic level. Pragmatic properties of signs relate to their relationship with the behaviors of responsible agents (Barron et al., 1999). As Austin (1980) pointed out, signs that are used to get things done must comprise a signal of intention if they are to produce certain consequences or behaviors. As mentioned above, these consequences or behaviors are later observed at the social world level, which evaluates the capacity of signs to produce some social change. As a whole, these last three layers – semantics,

pragmatic and social – mainly relate to the socially constructed understanding of signs and their influence on human actions.

Hence, by linking the physical and the social worlds of signs, Stamper's (1996) semiotic framework not only offers a sound understanding as to how both tangible and intangible components of the IT artifact may interactively create its materiality but also explains how the materiality of the IT artifact can be both physically and socially constructed. Accordingly, Stamper's (1996) semiotic framework can be seen as a means of bridging the Technologist and Systemist paradigms as it occupies an intermediate position on the objective subjective continuum. As such, Stamper's (1996) semiotic framework bridges the two paradigms concerned with the creation of the IT artifact's materiality.

3.4.3 Bridging the Naturalist-Technologist paradigms

Bridging the naturalist and technologist paradigms is arguably less problematic than bridging the naturalist and humanist paradigms or the technologist and systemist paradigms. Indeed, differences across these two paradigms relate mainly to their respective theoretical concerns, rather than fundamental differences in "worldviews". As such, the main difference between the two paradigms has to do with reconciling technologists' interest for design and naturalists' concern for appropriation. Thus, if any bridge is to be drawn between these two paradigms, a connection must be made between studies that aim to create the materiality of the IT artifact and studies that aim

to evaluate its impact on human behavior. Action design research (ADR) developed by Sein et al. (2011) makes such a connection.

ADR is a research methodology anchored on the premise that the design and appropriation contexts shape the materiality of the IT artifact. This method conceptualizes the research process as containing the inseparable and inherently interwoven activities of building the IT artifact, intervening in the organization, and evaluating it concurrently. Hence, this method recognizes that design outcomes are not final and that design and appropriation studies should not be conducted sequentially but rather iteratively. As such, ADR focuses on the development, intervention and evaluation of an IT artifact that reflect not only the theoretical precursors and intentions of the designers but also the influence of users during ongoing use. ADR can thus be seen as a means of bridging the naturalist-technologist paradigms as it occupies an intermediate position on the creation-appropriation continuum. Consequently, ADR bridges the two paradigms concerned with discovering universal principles that explain the creation and appropriation of the IT artifact's materiality

3.4.4 Bridging the Humanist-Systemist paradigms

Bridging the humanist and systemist paradigms is as simple as bridging the naturalist and the technologist paradigms as both paradigms also adopt the same subjective "worldview". Again, the main issue is to reconcile the diverging theoretical concerns related to the creation and appropriation of the IT artifact's materiality. Although not explicitly stated in the literature, there is no reason to believe that researchers espousing

a subjective "worldview" cannot apply the ADR method. For instance, Tremblay et al. (2010) propose a two-step focus group approach to both create and evaluate the use of the IT artifact from a "subjective" worldview. Anchored on traditional focus group methods, this approach allows for the development of a common understanding across focus group participants, for both the creation and the appropriation of the IT artifact. Hence, we believe that the combination of this two-step focus group approach and the ADR method represents a means of bridging the humanist and systemist paradigms since it occupies an intermediate position on the creation appropriation continuum. As such, the combination of the focus group and ADR methods bridge the two paradigms concerned with discovering social constructions that explain the creation or appropriation of the materiality of the IT artifact.

3.5 How to operationalize the proposed research guidelines: Two examples

Six theory development guidelines were proposed in the previous section to help IS researchers take advantage of the ideas put forth within this article (i.e., the IS discipline's domain of knowledge, paradigms and bridges) to develop their own IS indigenous theories. Using insights from our previous theorizing efforts, this study also provides two concrete examples as to how the set of six proposed guidelines may be operationalized in a single study (see Table 3.5). These two examples are two theory-building studies drawn from the doctoral thesis of one of the authors.

3.5.1 Theory-building study #1: Antecedents and impact of lock-in on IT user switching

Researchers' interest in post-adoption IT behaviors has recently spurred the development of a new and promising research stream focused specifically on IT switching (Bhattacherjee and Park, 2014; Bhattacherjee et al., 2012; Ye and Potter, 2011; Zhang et al., 2009). IT switching is defined as "users' partial reduction or full termination in usage of a specific technology product while substituting it with usage of an alternative product that satisfies identical needs (Ye and Potter, 2011; p. 587)". Past studies on this specific post-adoptive behavior have provided a sound framework to study IT user switching (i.e., the push-pull-mooring (PPM) model of migration) and identified switching costs as the dominant factor in explaining IT user switching. However, these efforts have yielded little knowledge on the mechanisms that create these switching costs or on how mindfulness, defined as a trait like characteristic that reflects a user's openness to novelty, alertness to distinction, awareness to multiple alternatives and presence in the moment (Butler and Gray, 2006; Thatcher, under review) may facilitate IT user switching. Recognizing these two important theoretical shortcomings in the understanding of IT user switching, the objective of this study was to develop and test a research model that extends the current PPM model of IT switching with path dependency theory (PDT) tenets to also take into account the mechanisms that create IT switching costs and the positive effect that mindfulness may have on IT user switching.

Our first concern was the characterization of the IT system at the heart of our theoretical efforts. As such, because IT user switching implies the substitution of an incumbent IT artifact with an alternate IT artifact, we needed to identify a task for which multiple IT artifacts are available. Also, both the incumbent and the alternate IT artifacts needed to be available for use (i.e., situations in which use of the incumbent or alternate IT artifact is not mandated, or in which the incumbent IT artifact cannot/will not be discontinued). Accordingly, we identified "sharing information with significant others" as an adequate task for this study since multiple freely available social network sites (SNS) such as Facebook and MySpace support information sharing amongst users. In addition, by

being volitional, freely available, and having multiple equivalent alternatives, the SNS is an IT artifact that complies with the underlying premises of our theoretical anchors. Based on these assertions, we described our phenomenon of interest as an IT system characterized by an incumbent SNS (i.e., IT artifact), an alternate SNS (i.e., IT artifact), an SNS user, (i.e., actor) and the activity of "sharing information with significant others" (i.e., task).

Although not explicit stated in our study, we selected the Naturalist paradigm to develop our theory. We chose this specific paradigm for two reasons. First, our phenomenon of interest can be classified as a problem of IT appropriation and thus amenable to behavioral research. Second, our search for universal mechanisms that create switching costs and a common psychological predisposition that foster IT user switching is congruent with the objective "worldview". Of course, choosing this specific IS research paradigm had important implications for the content and the steps adopted to develop our theory as well as the interpretation given to the criteria used to evaluate our theory. As such, the content of our theory took the form of universal principles that can be used to control or predict the switching behavior of IT users.

Our theoretical efforts relied on a deductive method that comprised four steps. In the opening work step, we first identified the two key unanswered research issues and formulated corresponding research questions. Anchored on a review of the literature, we then identified migration theory and PDT as relevant theories to frame our phenomenon of interest. Finally, based on these theoretical anchors we extended the push-pull-mooring model of IT switching and formulated a series of hypotheses. During the data collection step, students of a Canadian university enrolled in one compulsory undergraduate course in business administration were invited to answer a survey. Partial least square statistical analyses, as implemented in WarpPLS, were then used, during the data analysis step, to validate the measurement and structural models at the heart of our study. During the theory building step, we made a significant

theoretical contribution to the IS discipline by confirming some of the tenets of migration theory and PDT, as well as by extending the push-pull-mooring model of IT switching.

Lastly, to ensure that our theoretical efforts would be evaluated favorably, we followed the Naturalist interpretation of theory evaluation criteria while developing our theory. First, we were careful to consider all empirical data gathered during our literature review and collected through our survey (i.e., comprehensiveness). Second, we made sure from the get go that our theoretical efforts would reveal new mechanisms that create switching costs, as well as a new positive psychological factor that facilitates user switching from one IT to the other (i.e., originality). Third, we ensured that our findings would be useful in predicting the switching behavior of IT users (i.e., utility).

To foster the accumulation of knowledge within the IS discipline and facilitate the bridging of our research results, we made sure to detail the materiality of the SNS. First, anchored on an extensive literature review, we identified and developed a list of 8 functionalities core to all SNS. Second, our operationalization of PDT tenets at the IT user level, made us recognize that SNS may be subject to three unique forms of complementarity effects: device, functional and applicative. The identification of these three different forms of complementarity effects, as well as the core functionalities of SNS reveal the unique nature of the SNS's materiality and its distinctive ability to afford or constrain human action.

3.5.2 Theory-building study #2: A multi theory assessment of is change in organizations

This study focused on the importance of history in the evolution of IS in organizations and the need to understand why and how organizational IS changes unfold over time. To date, within the IS literature, the importance of history is most often conveyed via the concept of path dependence. Unfortunately, this usage is more metaphorical than theoretical in nature, devoiding path dependence of its meaning and making it easily confused with other conceptualizations such as imprinting and structural inertia that convey very different understandings of history and its influence in the evolution of IS in organizations. Considering the three conceptualizations used in the IS literature to portray the importance of history on the evolution of IS in organizations (i.e., path dependence, imprinting and structural inertia), as well as the need to understand why and how organizational IS changes unfold over time, the objective of this study was twofold: to clarify the concept of path dependence from similar conceptualizations, namely imprinting and structural inertia, and to elucidate and compare the explanatory merits of these three theories in order to identify the one that better explains why and how organizational IS changes unfold over time.

Key to our study of organizational IS change was the identification of the IT artifact that would serve as our unit of analysis. Following several rounds of prospective interviews with key respondents, we identified the MPI system supporting the management of patient information within a major university hospital located in Canada as our IT artifact of choice. The MPI system is a key component of the hospital's fundamental process of providing patient with individual care (PIC) since it keeps track of all relevant patient information in each of its key sub-processes: (1) Reception and Orientation; (2) Evaluation, coordination and planning; (3) Diagnostic, and (4) Therapy. The focus on this specific IT artifact and the very nature of

organizational IS change implied that our phenomenon of interest (i.e., the evolution of the MPI system) involved three different types of actors who each accomplish a different set of tasks: (1) the executives and board members of the hospital who govern the MPI system; (2) the administrative and healthcare personnel of the hospital managing patient information through the use of the MPI system; and (3) the IT personnel of the hospital who implement the different changes into the MPI system. Based on these assertions, we described our phenomenon of interest as an IT system characterized by the MPI system (i.e., IT artifact), the executives and board members of the hospital (i.e., actor), the administrative and healthcare personnel of the hospital (i.e., actor), the IT personnel of the hospital (i.e., actor), and the activities of "governing the evolution of the MPI system" (i.e., task), "managing patient information" (i.e., task) and "implementing changes into the MPI system" (i.e., task).

Although not explicitly stated in our study, we selected the Naturalist paradigm to develop our theory. We chose this specific paradigm for two reasons. First, our conceptualization of organizational IS change as a problem of adoption and assimilation of new IT artifact features made our research amenable to behavioral research. Specifically, we conceptualized organizational IS change as a combination of adoption and post-adoption behaviors from the executives and board members of the hospital, the administrative and healthcare personnel of the hospital, and the IT personnel of the hospital. Second, our objective to elucidate and compare the predictive power of three different theories is congruent with the objective "worldview". Of course, choosing this specific IS research paradigm had important implications for the content and the steps adopted to develop our theory, as well as the interpretation given to the criteria used to evaluate our theory. As such, the content of the theory took the form of basic principles that can be used to foster organizational IS change.

Our theoretical efforts relied on a deductive method that comprised four steps. In the opening work step, we first identified the key unanswered research issues and

formulated a corresponding research question: why and how organizational IS changes unfold over time? Anchored on a review of the literature we then identified Van de Ven and Poole's (1995) typology for illustrating and distinguishing change theories, as well as path dependency, imprinting and structural inertia as relevant theories to frame our phenomenon of interest. During the data collection step, we conducted a congruent case study to elucidate and compare the explanatory merits of these three theories in order to identify the one that better explains why and how organizational IS changes unfold over time. Active and retired employees of a major university hospital located in Canada were interviewed to establish a timeline of IS changes and gather narratives of each of the changes made to the MIP system between1967 and 2001. A thorough analysis of the hospital's annual reports for the corresponding period complemented these interviews to ensure data quality and accuracy. During the data analysis step, we first coded meaningful excerpts of the interview transcripts and annual reports with the help of the ATLAS-ti 7 software. Second, four complementary process data analysis strategies were used to organize and make sense of our data: temporal bracketing, narrative, alternative template, and visual mapping. Third, a pattern matching strategy was used to evaluate the level of congruence between the tenets of each theory and our observations in the field. During the theory building step, we made a significant theoretical contribution to the IS discipline by extending our knowledge of organizational IS change and the constraining effect of history that often accompanies it.

Lastly, to ensure that our theoretical efforts would be evaluated favorably, we followed the Naturalist interpretation of theory evaluation criteria while developing our theory. First, we were careful to consider all empirical data gathered during the literature review, interviews, and archival research (i.e., comprehensiveness). Second, we made sure from the get go that our theoretical efforts would reveal a new understanding of why and how organizational IS changes unfold over time (i.e., originality). Third, by identifying several cycles, motors, units and modes of change that give to history its

meaning, we ensured that our findings would help IS change agents to better control organizational IS changes and thus to better manage the evolution of the IS under their responsibility (i.e., utility).

To foster the accumulation of knowledge within the IS discipline and facilitate the bridging of our research results we made sure to detail the materiality of the MPI system. To do so, we relied on the work of Wand and Weber (1995) who define an IS object as comprising three sets of distinctive characteristics: (1) the surface structure that refers to "the way the system appears to its users (Wand and Weber, 1995, p. 205)"; (2) the deep structure that "manifests the meaning of the real-world system the information system is intended to model (Wand and Weber, 1995, p. 20)"; and (3) the physical structure that "manifests the nature and form of the technology used to implement the system (Wand and Weber, 1995, p. 206). Based on this understanding, we conceptualized the materiality of the MPI system as the outcome of three interrelated components: the interface of the system (i.e., surface structure), its data and functionalities (i.e., deep structure), and its material infrastructure (i.e., physical structure). Interestingly, our results seem to indicate that path dependency theory better explains changes made to the deep structure of information systems while SIT and imprinting theory better explain changes made to the surface and physical structure of information systems.

Table 3.5 Operationalization of the proposed guidelines in our past research efforts

	Article #1	Article #2
Guideline #1: To develop an IS indigenous theory, IS researchers should study an IS phenomenon described as an IT system characterized by an IT artifact, actor(s) and task(s)	This study investigates the phenomenon of IT user switching described as an IT system characterized by an incumbent social network site (SNS) (i.e., IT artifact), an alternate SNS (i.e., IT artifact), a user (i.e., actor) and the activity of "sharing information with significant others" (i.e., task).	This study investigates the phenomenon of organizational IS change described as a an IT systems characterized by the MPI system (i.e., IT artifact), the executives and board members of the hospital (i.e., actor), the administrative and healthcare personnel of the hospital (i.e., actor), the IT personnel of the hospital (i.e., actor), and the activities of "governing the evolution of the MPI system", "managing patient information" (i.e., task) and "implementing changes into the MPI system" (i.e., task).
Guideline #2: To develop an IS indigenous theory, IS researchers must specify the paradigm chosen to develop the theory	Although not explicit stated in our study (because our typology has yet to be published), we selected the Naturalist paradigm to develop our theory. We choose this specific paradigm for two reasons. First, our phenomena of interest can be classified as a problem of IT appropriation and thus amenable to behavioral research. Second, our search for universal mechanisms that create switching cost and a common psychological predisposition that foster IT user switching is congruent with the objective "worldview".	Although not explicit stated in the study (because our typology has yet to be published), we selected the Naturalist paradigm to develop our theory. We choose this specific paradigm for two reasons. First, our conceptualization of organizational IS change as a problem of adoption and post-adoption of new IT artifact features by the executives and board members of the hospital, the administrative and healthcare personnel of the hospital, and the IT personnel of the hospital made our research amenable to behavioral research. Second, our objective to elucidate and compare the predictive power of three different theories is congruent with the objective "worldview".
Guideline #3: To develop an IS indigenous theory, IS researchers must align the content of their theory with the IS research paradigm chosen to develop the theory	In accordance with the paradigm chosen to develop our theory, the content of our theory takes the form of universal principles that can be use to control or predict the switching behavior of IT user.	In accordance with the paradigm chosen to develop our theory, the content of our theory takes the form of basic principles that can be use to control or predict organizational IS change.

Guideline #4: To develop an IS indigenous theory, IS researchers should use the appropriated steps as implied by the IS research paradigm chosen to develop the theory	In accordance with the paradigm chosen to develop our theory, we adopted a deductive method and followed the traditional steps of the Naturalist researcher. More precisely, we developed and tested a research model that extends the current push pull mooring migration model of IT switching with path dependency theory (PDT) tenets to also take into account the mechanisms that create IT witching costs and the positive factor that may facilitate IT user switching.	In accordance with the paradigm chosen to develop our theory, we adopted a deductive method and followed the traditional steps of the Naturalist researcher. More precisely, we first, clarified the concepts tied to three different theoretical perspectives (i.e., path dependence, imprinting, and structural inertia theories) that relate to organizational IS change and the constraining effect of history that often accompanies it. Second, we conducted a congruence case study compare and elucidate the explanatory merits of these three theories in order to identify the one that better explains why and how organizational IS changes unfold overtime.
Guideline #5: To evaluate an IS indigenous theory, IS researchers should use criteria and their appropriate interpretation as implied by the IS research paradigm chosen to develop the theory	In accordance with the paradigm chosen to develop our theory, we followed a Naturalist interpretation of theory evaluation criteria while developing our theory. First, we were careful to consider all empirical data collected through our survey (i.e., comprehensiveness). Second, we made sure from the get go that our theoretical efforts would reveal new mechanisms that create switching cost as well as a new positive psychological factor that can help users to switch from one IT to the other (i.e., originality). Third, we ensured that our findings would be useful in predicting the switching behavior of IT users (i.e., utility).	In accordance with the paradigm chosen to develop our theory, we followed a Naturalist interpretation of theory evaluation criteria while developing our theory. First, we were careful to consider all empirical data collected via interviews and archival files (i.e., comprehensiveness). Second, we made sure from the get go that our theoretical efforts would reveal a new understanding of why and how organizational IS changes unfold overtime (i.e., originality). Third, we ensured that our findings would help IS change agents to better control organizational IS changes (i.e., utility).
Guideline #6: To develop an IS indigenous theory that will foster the accumulation of knowledge within the IS discipline, IS researchers must detail the materiality of the IT artifact at the heart of their theory	Anchored on extensive review of the literature and our operationalization of PDT tenets at the IT user we defined the materiality of SNS as comprising 8 key functionalities and showed that this materiality is subject to three unique form of complementarity effects: device, functional and applicative.	Anchored on Wand and Weber's (1995) conceptualization of IS objects, we defined the materiality of the MPI system as the outcome of three interrelated component: the MPI system's interfaces (i.e., surface structure), the MPI system's data and functionalities (i.e., deep structure), and the MPI system's material infrastructure (i.e., physical structure).

3.6 Conclusion

We set out to answer three research questions critical to our understating of IS indigenous theory development: (1) What is the IS discipline domain of knowledge?; (2) What are the IS discipline research paradigms?; and (3) How to bridge between the different IS Research paradigms? As a result, we have defined the IS discipline's domain of knowledge as IS phenomena which are described as IT systems that each comprise three essential constituents: an IT artifact, an actor and a task. In addition, we have identified four different IS research paradigms, as well as how to bridge between these four paradigms in order to facilitate the adaptation and integration of the diverse IS knowledge required to develop IS indigenous theories. Taken as a whole, these answers reveal the idiosyncrasies of theory development within the IS discipline. Lastly, by providing six clear guidelines and two concrete examples of how they can be operationalizated, this article provides much needed guidance to IS researchers who wish to develop their own IS indigenous theories. We hope that this paper can serve as a launching pad for more IS indigenous theory development and that revealing the particularities of IS theory development will foster the accumulation of knowledge within the IS discipline.

3.7 References

Agarwal, R., and Henry C. Lucas, J. (2005) "The Information Systems Identity Crisis: Focusing on High-Visibility and High-Impact Research", MIS Quarterly, Vol. 29, No. 3, pp. 381-398.

Alter, S. (2003a) "18 Reasons Why IT-Reliant Work Systems Should Replace "The IT Artifact" as the Core Subject Matter of the IS Field", Communication of the AIS, Vol. 12, No. 1, pp. 366-395.

Alter, S. (2003b) "The Core XI: Sorting Out Issues About the Core, Scope and Identity of the IS Field", Communication of the AIS, Vol. 12, No. 1, pp. 607-628.

Austin, J.L. (1980) "How to Do Things with Words", Oxford University Press, Oxford, United Kingdom.

Bacharach, S.B. (1989) "Organizational Theories: Some Criteria for Evaluation", Academy of Management Review, Vol. 14, No. 4, pp. 496-515.

Barron, T.M., Chiang, R.H.L. and Storey, V.C. (1999) "A semiotics framework for information systems classification and development", Decision Support Systems, Vol. 25, No. 1, pp. 1-17.

Bhattacherjee, A. (2001) "Understanding Information Systems Continuance: An Expectation-Confirmation Model", MIS Quarterly, Vol. 25, No. 3, pp. 351-370.

Bhattacherjee, A., Limayem, M. and Cheung, C.M.K. (2012) "User Switching of Information Technology: A Theoretical Synthesis and Empirical Test", Information & Management, 49(7-8), pp. 327-333.

Bhattacherjee, A. and Park, S.C. (2014) "Why End-Users Move to the Cloud: A Migration-Theoric Analysis, 23(3), pp. 357-372.

Becker, J. and Niehaves, B. (2007) "Epistemological Perspectives on IS Research – A Framework for Analysing and SystemisingEpistemological Assumptions", Information Systems Journal, Vol. 17, No. 2, pp. 197-214.

Benbasat, I. and Weber, R. (1996) "Research Commentary: Rethinking "Diversity" in Information Systems Research", Information Systems Rsearch, Vol. 7, No. 4, pp. 389-399.

Benbasat, I. et Zmud, R.W. (2003) "The Identity Crisis Within the IS Discipline: Defining and Communicating the Discipline's Core Properties", MIS Quarterly, Vol. 27, No. 2, pp. 183-194.

Boland, R.J. and Day, W.F. (1989) "The Experience of System Design: A Hermeneutic of Organizational Action", Scandinavian Journal of Management, Vol. 5, No. 2, pp. 87-104.

Bostrom, R.P., and Heinen, J.S., (1977a) "MIS problems and failures: A socio-technical perspective: Part I : The Causes", MIS Quarterly, Vol. 1, No. 3, pp. 17-32.

Bostrom, R.P., and Heinen, J.S., (1977b) "MIS problems and failures: A socio-technical perspective: Part II : The Application of Socio Technical Theory", MIS Quarterly, Vol. 1, No. 3, pp. 17-32.

Brooks, F.P. Jr. (1987) "No Silver Bullet: Essence and Accidents of Software Engineering", IEEE computer, Vol. 20, No. 4, pp. 10-19.

Burrell, G. and Morgan G. (1979) "Sociological Paradigms and Organizational Analysis", Heinemann Educational Books, Portsmouth, NH.

Burton-Jones, A. and Straub, D.W. (2006) "Reconceptualizing System Usage: An Approach and Empirical Test", Information System Research, Vol. 17, No. 3, pp. 228-246.

Burton-Jones, A. and Gallivan, M.J. (2007) "Toward a Deeper Understanding of System Usage in Organizations: A Multilevel Perspective", MIS Quarterly, Vol. 31, No. 4, pp.657-679.

Butler, B.S. and Gray, P.H. (2006) "Reliability, Mindfulness, and Information Systems", MIS Quarterly, 30(2), pp. 211-224.

Chai, S. and Kim, M. (2012) "A socio-technical approach to knowledge contribution behavior: An empirical investigation of social networking sites users", International journal of information management, Vol. 32, No. 2, pp. 118-126.

Chen, W. and Hirschheim, R. (2004) "A Paradigmatic and Methodological Examination of Information Systems Research from 1991 to 2001", Information Systems Journal, 14(3), pp. 197-235.

Corley, K.G. and Gioia, D.A. (2011) "Building theory about theory building: what constitutes a theoretical contribution", Academy of Management Review, Vol. 36, No. 1, pp. 12-32.

Daft, R.L., and Lengel, R.H. (1984) "Information Richness: A New Approach to Managerial Behavior and Organizational Design," in Cummings, L.L. and Staw, B.M. (Eds.), Research in Organizational Behavior, JAI Press, Homewood, IL.

Daft, R.L., and Lengel, R.H. (1986) "Organizational Information Requirements, Media Richness and Structural Design," Management Science, Vol. 32, No. 5, pp. 554-571.

Daft, R.L., Lengel, R.H., and Trevino, L.K. (1987) "Message Equivocality, Media Selection, and Manager Performance: Implications for Information Systems," MIS Quarterly, Vol. 11, No. 3, pp. 355-366.

Deetz, S. (1996) "Describing Differences in Approaches to Organization Science: Rethinking Burrell and Morgan and their Legacy", Organization Science, Vol. 7, No. 2, pp. 191-207.

DeSanctis, G. and Poole, M.S. (1994) "Capturing the complexity in advanced technology use: Adaptive structuration theory", Organization Science, Vol. 5, No. 2, pp. 121-147.

Dickson, G.W., Chervany, N.L. and Senn, J.A. (1977) "Research in MIS: The Minnesota Experiments", Management Science, 28(9), pp. 913-923.

Ein-Dor, P. and Segev, E. (1993) "A Classification of Information Systems: Analysis and Interpretation", Information Systems Research, Vol. 2, No. 2, pp. 166-204.

Gioia, D.A. and Pitre, E. (1990) "Multiparadigm Perspectives on Theory Building", Academy of Management Review, 15(4), pp. 584-602.

Goles, T. and Hirschheim, R. (2000) "The Paradigm is Dead, the Paradigm is Dead... Long Live the Paradigm: The Legacy of Burrell and Morgan", Omega, 28(3), pp. 249-268.

Gregg, D.G., Kulkarni, U.R. and Vinzé, A.S. (2001) "Understanding the Phylosophical Underpinnings of Software Engineering Research in Information Systems", Information Systems Frontiers, 3(2), pp. 169-183.

Gregor, S. (2006) "The Nature of Theory in Information Systems", MIS Quarterly, 30(3), pp. 611-642.

Gregor, S. and Hevner, A.R. (2013) "Positioning and Presenting Design Science Research for Maximun Impact", MIS Quarterly, 37(2), pp. 337-355.

Gregor, S. and Jones, D. (2007) " The Anatomy of a Design Theory", Journal of the Association for Information Systems, 8(5), pp. 312-335.

Grover, V. (2013) "Muddling Along to Moving Beyond in IS Research: Getting from Good to Great", Journal of the AIS, Vol. 14(special issue), pp. 274-282.

Grover, V., Lyytinen, K. Srinivasa, A. and Tan, B.C.Y. (2008) "Contributing to Rigorous and Forwar Thinking Explanatory Theory", Journal of the AIS, Vol. 2, No. 1, pp. 40-47.

Guba, E. and Lincoln, Y.S. (1994) "Competing paradigms in Qualitative Research", In Denzin, N.K. (Eds.), Handbook of Qualitative Research, Sage, Thousand Oaks, CA.

Hassan, N.R. (2011) "Is Information Systems a Discipline?, Foucauldian and Toulminian insights", European Journal of Information Systems, Vol. 20, No. 4, pp. 456-476.

Hevner, A.R., March, S.T. and Park, J. (2004) "Design Science in Information Systems Research", MIS Quarterly, 28(1), pp. 75-105.

Hirschheim, R. and Klein, H.K. (1989) "Four Paradigms of Information Systems Development", Communication of the ACM, Vol. 32, No. 10, pp. 1199-1216.

Ivari, J. (2003) "The IS Core VII: Towards Information Systems as a Science of Meta-Artifacts", Communicatoin of the AIS, Vol. 12, No.1, pp. 568-581.

Kallinikos, J. (2002) "Reopening the Black Box of Technology Artifacts and Human Agency", Twenty-Third International Conference on Information Systems, Barcelona, Spain.

Kallinikos, J., Aaltonen, A. and Marton, A (2013) "The Ambivalent Ontology of Digital Artifacts", MIS Quarterly, 37(2), pp. 357-370.

Kuhn, T.S. (1977) "Objectivity, Value Judgment, and Theory Choice", The Essential Tensions, p. 356-367.

Kuechler, W. and Vaishnavi, V. (2012) "A Framework for Theory Development in Design Science Research: Multiple Perspective", Journal of the AIS, Vol. 13, No. 6, pp. 395-423.

Langley, S. (1999) "Accademy of Management", Vol. 24, No. 4, pp. 691-710.

Lee, A.S. (1991) "Integrating Positivist and Interpretive Approaches to Organizational Research", Organization Science, 2(4), pp. 342-365.

Lee, A.S. (1994) "Electronic Mail as a Medium for Rich Communication: An Empirical Investigation Using Hermeneutic Interpretation", MIS Quarterly, Vol. 19, No. 2, pp. 143-157.

Lee, A.S. (2001) "Editor's Comments: Research in Information Systems: What We Haven't Learned", MIS Quarterly, 25(4), pp. v-xv.

Leonardi, P.M. (2010) "Digital Materiality? How Artifacts Without Matter, Matter", First Monday, Vol. 15, No. 6-7.

Leonardi, P.M. (2011) "When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies", MIS Quarterly, Vol. 35, No. 1, pp. 147-167.

Leaonardi, P.M. and Barley, S.R. (2008) "Materiality and Change: Challenges to Building Better Theory about Technology and Organizing", Information and Organization, Vol. 18, No. 3, pp. 159-176.

Lewis, M.W. and Grimes, A.J. (1999) "Metatriangulation: Building Theory from Multiple Perspective", Academy of Management Journal, 24(6), pp. 672-290.

Limayem, M., Hirt, S.G. and Cheung, C.M.K. (2007) "How Habit Limits the Predictive Power of Intention: The Case of Information Systems Continuance", MIS Quarterly, 31(4), pp. 705-737.

Lyytinen, K. and King, J.L. (2004) "Nothing at the Center?: Academic Legitimacy in the Information Systems Field", Journal of the Association for Information Systems, Vol. 5, No. 6, pp. 220-246.

Lyytinen, K. and Newman, M. (2008) "Explaining Information Systems Change: A Punctuated Socio-Technical Change Model", European Journal of Information Systems, Vol. 17, No. 6, pp. 589-613.

March, S.T. and Smith, G.F. (1995) "Design and Natural Science Research on Information Technology", Decision Support Systems, Vol. 15, No. 4, pp. 251-266.

Markus, L.M. and Saunders, C. (2007) "Editor's Comments : Looking for a Few Good Concepts...and Theories...for the Information Systems Field", MIS Quarterly, Vol. 31, No. 1, pp. iii-vi.

Myers, M.D. (2003) "The IS Core IV: IS Research a Third Way", Communication of the AIS, Vol. 12, No. 1, pp. 582-587.

Nevo, S., Nevo, D. and Ein-Dor, P. (2009) "Thirty Years of IS Research: Core Artifacts and Academic Identity", Communication of the AIS, Vol. 25, No. 1, pp. 221-242.

Niederman, F. and March, S.T. (2012) "Design Science and the Accumulation of Knowledge in the Information Systems Discipline", ACM Transactions on Management Information Systems, Vol. 3, No. 1, pp. 1-15.

Niehaves, B. (2007) "On Epistemological Diversity in Design Science – New Vistas for Design-Oriented IS Research?", Proceedings of the Twenty Eight International Conference on Information Systems, Montreal, Canada.

Orlikowski, W.J. (1993) "CASE Tools as Organizational Change: Investigating Incremental and Radical Changes in Systems Development", MIS Quarterly, 17(3), pp. 309-340.

Orlikowski, W.J. (2000) "Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations", Organization Science, Vol. 11, No. 4, pp. 404-428.

Orlikowski, W.J. and Baroudi, J.J. (1991) "Studying Information Technology in Organizations: Research Approaches and Assumptions", Information Systems Research, 2(1), pp. 1-28.

Orlikowski, W.J. and Iacono, C.S. (2001) "Research Commentary: Desperately Seeking the "IT" in IT Research – A Call to Theorizing the IT Artifact", Information Systems Research, Vol. 12, No. 2, pp. 121-134.

Popper, K.R. (1959) "The Logic of Scientific Discovery" Routledge, New York.

Power, D.J. (2003) "The IS Core II: The Maturing IS Discipline: Instutionalizing our Domain of Inquiry", Communication of the AIS, Vol. 12, No. 1, pp. 539-545.

Purao, S. (working paper) "Design Research in the Technology of Information Systems:Truth or Dare".

Robey, D. (1996) "Research Commentary: Diversity in Information Systems Research: Threat, Promise, and Responsibility", Information Systems Research, Vol. 7, No. 4, pp. 400-408.

Robey, D. (2003) "Identity, Legitimacy and the Dominant Research Paradigm: An Alternative Prescription for the IS discipline: A Response to Benbast and Zmud's Call for Returning to the IT Artifact", Journal of the AIS, Vol. 4, No. 7, pp. 352-359.

Sein, M.K., Henfridsson, O., Purao, S., Rossi, M. and Lindgren, R. (2011) "Action Design Research", MIS Quarterly, Vol. 35, No. 1, pp. 37-56.

Serres, M. (2007) "Les nouvelles technologies: révolution culturelle et cognitive", 40th anniversary INRIA presentation.

Shepherd, D.A. and Sutcliffe, K.M. (2011) "Inductive Top-Down Theorizing: A Source of New Theories of Organization", Academy of Management Review, Vol. 36, No. 2, pp. 361-380.

Sidorova, A., Evangelopoulos, N., Valacich, J.S. and Ramakrishnan, T. (2008) "Uncovering the Intellectual Core of the Information Systems Discipline", MIS Quarterly, Vol. 32, No. 3, pp. 467-482.

Stamper, R.K. (1996) "Signs, Information, Norms and Systems", in Holmqvist, P., Andersen, P.B., Klein, H. and Posner, R. (Eds.), Signs of Work: Semiotics and Information Processing in Organisations, Walter de Gruyter, Berlin, Germany.

Stamper, R.K., Liu, K., Hafkamp, M. and Ades, Y. (2000) "Understanding the Roles of Signs and Norms in Organizations", Journal of Behaviour & Information Technology, Vol. 19, No. 1, pp. 15-27.

Straub, D. (2012) "Editor's Comments: Does MIS have Native Theories?", MIS Quarterly, 36(2), pp. iii-xii.

Thatcher, J.B. (working paper) "Mindfulness in Information Technology Use: A Conceptual and Operational Definition".

Tremblay, M.C., Hevner, A.R. and Berndt, D.J. (2010) "Focus Group for Artifact Refinement and Evaluation in Design Research", Communications of The Association for Information Systems, 26(1), pp. 599-618.

Tsang, E.W.K. and Ellsaesser, F. (2011) "How Contrastive Explanation Facilitates Theory Building", Academy of Management Review, Vol. 36, No. 2, pp. 2011.

Van Maanen, J. (1988) "Tales of the Field: On Writing Ethnography", University of Chicago Press, Chicago, IL.

Venkatesh, V., Brown, S.A. and Bala, H. (2013) "Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems", MIS Quarterly, Vol. 37, No. 1, pp. 21-54.

Wacker, J.G. (1998) "A definition of theory: research guidelines for different theory-building research methods in operations management", Journal of Operations Management, Vol. 16, No. 4, pp. 361-385.

Wand, Y. and Weber, R. (1995) "On the Deep Structure of Information Systems", Information Systems Journal, 5(3), pp. 203-223.

Watson, R. (2001) "Editor's Comments: Research in Information Systems: What We Haven't Learned", MIS Quarterly, 25(4), pp. v-xv.

Weber, R. (2003a) "Editor's Comments: Theoretically Speaking", MIS Quarterly, Vol. 27, No. 3, pp. iii-xii.

Weber, R. (2003b) "Editor's Comments: Still Desperately Seeking the IT Artifact", MIS Quarterly, Vol. 27, No. 2, pp. iii-xi.

Weber, R. (2004) "Editor's Comments: The Rhetoric of Positivism Versus Interpretivism: A Personal View", MIS Quarterly, Vol. 28, No. 1, pp. iii-xii.

Weber, R. (2012) "Evaluating and Developing Theories in the Information Systems Discipline", Journal of the Association for Information Systems, 13(1), pp. 1-30.

Weick, K.E. (1989) "Theory Construction as Disciplined Imagination", Academy of Management Review, Vol. 14, No. 4, pp. 516-531.

Whetten, D.A. (1989) "What Constitute a Theoretical Contribution?", Academy of Management Review, Vol. 14, No. 4, pp. 490-495.

Wu, Y.A. and Saunders, C. (2003) "The IS Core VI: Further Along the Road to the IT Artifact", Communication of the AIS, Vol. 12, No. 1, pp. 562-567.

Ye, C. and Potter, R. (2011) "The Role of Habit in Post-Adoption Switching of Personal Information Technologies: An Empirical Investigation", Communications of the Association for Information Systems, 28(35), pp. 585-610.

Zhang, K.Z.K., Lee, M. K.O., Cheung, C.M.K. and Chen, H. (2009) "Understanding the Role of Gender in Bloggers' Switching Behavior", Decision Support Systems, 47(4), pp. 540-546.

Zhang, P., Scialdone, M. and Ku M.-C. (2011) "IT Artifacts and the State of IS Research", Thirty Second International Conference on Information Systems, Shanghai, China.

Zmud, B. (1998) ""Pure" Theory Manuscripts ", MIS Quarterly, Vol. 22, No. 2, pp. xxix-xxxi.

CONCLUSION

At the beginning of this thesis we set out to understand the impact of history on individual and organizational IT post-adoption behaviors. To do so, we conducted two distinct empirical studies that focused on different post-adoption behaviors at two different levels of analysis. Anchored on the tenets of the PDT and the push-pull-mooring migration model, our first empirical study (article #1) found that (1) the self-reinforcing mechanisms identified by PDT can cause IT switching costs, and (2) mindfulness may be understood as an antecedent of IT switching costs. As such, our findings indicate that IT users may become locked-in on certain software applications because their past actions may have triggered self-reinforcing mechanisms that generate perceptively insurmountable switching costs. Furthermore, our results show that cultivating certain psychological dispositions may allow an IT user to switch more easily from one software application to the next. Hence, this study reveals why self-reinforcing mechanisms give to history its meaning and how it impacts IT post-adoption behavior at the individual level.

Anchored on Van de Ven and Poole's (1995) typology for illustrating and distinguishing change theories, our second emprical study (article #2) used a congruence case study to show that (1) the concept of path dependence, imprinting and structural inertia rely on different combinations of cycle, motor, unit and mode of change to explain organizational IS change and the constraining effect of history that often accompanies it; (2) no single concept or theory could account for the various changes characterizing the evolution of the IS under study; (3) PDT is better suited to explain changes made to IS functionalities while SIT and imprinting theory best explain changes made to either the interface, hardware and/or the architecture of IS;

(4) the number of IS changes made to an IS tends to diminish over time; and (5) organizational IS changes following a path dependent dynamic can lead to positive outcomes. In sum, our results show why multiple dynamics give to history its meaning and how it impacts IT post-adoption behavior at the organizational level.

Lastly, by defining the IS discipline domain of knowledge, identifying the four IS research paradigms and identifying IS bridges, the third article of this thesis revealed the idiosyncrasies of indigenous theory development within the IS discipline. Anchored on these findings, we provided a set of six theory development guidelines that can help IS researchers develop their own theory. We must reemphasize here that it is by following these guidelines that we were able to develop an appropriate research design for both the first and second article of this thesis.

REFERENCES

Arthur, W.B. (1989) "Competing Technologies, Increasing Returns, and Lock-in by Historical Events", Economic Journal, 99(394), pp. 116-131.

Benbasat, I. and Weber, R. (1996) "Research Commentary: Rethinking "Diversity" in Information Systems Research", Information Systems Rsearch, Vol. 7, No. 4, pp. 389-399.

Butler, B.S. and Gray, P.H. (2006) "Reliability, Mindfulness, and Information Systems", MIS Quarterly, 30(2), pp. 211-224.

Dunphy, D. (1996) "Organizational Change in Corporate Settings", Human Relations, 49(5), pp. 541-552.

Gregor, S. (2006) "The Nature of Theory in Information Systems", MIS Quarterly, 30(3), pp. 611-642.

Grover, V. (2013) "Muddling Along to Moving Beyond in IS Research: Getting from Good to Great", Journal of the AIS, Vol. 14(special issue), pp. 274-282.

Jasperson, J.S., Carter, P.E. and Zmud, R.W. (2005) "A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated with Information Technology Enabled Work Systems", MIS Quarterly, 29(3), pp. 525-557.

Kelly, D. and Amburgey, T.L. (1991) "Organizational Inertia and Momentum: A Dynamic Model of Strategic Change", Academy of Management Journal, 34(3), pp. 591-612.

Kim, S.S. (2009) "The Integrative Framework of Technology Use: An Extension and Test", MIS Quarterly, 33(3), pp. 513-537.

Lu. Y. and Ramamurthy, K. (2011) "Understanding the Link Between Information Technology Capability and Organizational Agility: An Empirical Examination", MIS Quarterly, 35(4), pp. 931-954.

Markus, M.L. (1983) "Power, Politics, and MIS Implementation", Communication of the ACM, 26(6), pp. 430-444.

Markus, L.M. and Saunders, C. (2007) "Editor's Comments : Looking for a Few Good Concepts...and Theories...for the Information Systems Field", MIS Quarterly, Vol. 31, No. 1, pp. iii-vi.

Marquis, C. and Tilcsik, A. (2013) "Imprinting: Toward a Multilevel Theory", The Academy of Management Annals, 7(1), pp. 193-243.

Polites, G.L. and Karahanna, E. (2012) "Shackled to the Status Quo: The Inhibiting Effects of Incumbent System Habit, Switching Costs, and Inertia on New System Acceptance", MIS Quarterly, 36(1), pp. 21-42.

Thatcher, J.B. (under review) "Mindfulness in Information Technology Use: A Conceptual and Operational Definition".

Van de Ven, A.H. and Poole, M.S. (1995) "Explaining Development and Change in Organizations", Academy of Management Review, 20(3), pp. 510-540.

van Oosterhout, M., Waarts, E., van Hillegersberg, J. (2006) "Change Factors Requiring Agility and Implications for IT", European Journal of Information Systems, 15(2), pp. 132-145.

Weber, R. (2003) "Editor's Comments: Theoretically Speaking", MIS Quarterly, Vol. 27, No. 3, pp. iii-xii.

Weber, R. (2012) "Evaluating and Developing Theories in the Information Systems Discipline", Journal of the Association for Information Systems, 13(1), pp. 1-30.

Ye, C. and Potter, R. (2011) "The Role of Habit in Post-Adoption Switching of Personal Information Technologies: An Empirical Investigation", Communication of the Association for Information Systems, 28(35), pp. 585-610.