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From Individual Cognition to Social Ecosystem: A Structuration Model of Enterprise Systems Use

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Abstract:

In this paper, we argue that one can understand the adoption and routine use of enterprise systems by examining the fit between the system and the social structures of the organization. We develop a model of the adoption and long-term use of enterprise systems based on sociological concepts (Lord Anthony Giddens' structuration theory) rather than the usual cognitive psychology concepts. We focus on the adoption and use of three versions of an enterprise KMS to support sales representatives at a multinational pharmaceutical firm. Our first study (a five-year case study of the KMS that went through one failed deployment and two successful ones) shows that the structures of signification, legitimation, and domination all influence loyal use, although domination may be less important. Our second study (a survey of 893 users at the firm) shows that the structures of signification, legitimation, and domination explain about 50 percent of the variance in ongoing loyal use but that their relative importance depends on the job experience of the users: signification and legitimation influence novices more, and signification and domination influence experts more. We believe that this parsimonious three-factor model offers a useful approach for future research and practice.

Keywords: Technology Adoption, Appropriation, Structuration, Routines, Signification, Domination, Legitimation, Loyal Use, Interpretive Schemes, Enacted Resources, Enacted Norms.

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1 Introduction

Understanding the factors that explain the adoption and long-term use of information systems is an important, long-standing, and active area of research (Benbasat & Barki 2007; Venkatesh & Thong, 2012). Studies of initial information system adoption and use using models such as the technology acceptance model (TAM) (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003) have been effective for explaining the initial adoption of single-user technologies but less powerful for explaining the ongoing routine use of enterprise systems over time as organizational routines develop and mature (Benbasat & Barki, 2007; Venkatesh & Davis, 2000). These models—and most prior research—have drawn heavily on cognitive psychology and social psychology (Abraham, Boudreau, Junglas, & Watson, 2013). They have become rather complex over time as researchers have added new factors (Straub & Burton-Jones, 2007). The hallmark of good theory is parsimony (i.e., using the fewest concepts and interactions to explain the most), but current theories are not parsimonious (Straub & Burton-Jones, 2007). UTAUT, for example, has more than 40 terms, including main effects and two-way, three-way, and four-way interactions, which can make it complicated to use and difficult to interpret the meaning of the interactions (Bagozzi, 2007).

We focus on the ongoing routine use of enterprise systems over time. One key difference between individual tools and enterprise systems is that “within the complex social settings that commonly constitute organizations, individuals don’t always have the opportunity to choose the systems they would prefer to use” (Lamb & Kling, 2003, p. 198). Models of adoption rooted in cognitive and social psychology, with what Lamb and Kling (2003) call a “thinly socialized concept of the user” (p. 198), focus on the individual user as a rational actor acting autonomously. Instead, the institution in which enterprise system users act often shapes their actions due to pressure “to perform legitimate actions and interactions within institutionalized arrangements” (Lamb & Kling, 2003, p. 202). This pressure does not refer only to “social norms” of TAM and UTAUT (Abraham et al., 2013) but rather to fundamentally different sociological forces that act to enable and constrain individual actions through the way in which the social system engages in signification, domination, and legitimation (Giddens, 1984).

An organization can develop an enterprise system internally, purchase and install one as-is with no development, or combine these extremes in some way (Haines, Goodhue, & Gattiker, 2006). In this paper, we study an enterprise system that was built using commercial enterprise software that enabled extensive configuration; thus, it fell between the two extremes. Such an enterprise system is much like a living thing that changes over time. The initial purchase and configuration of the system leads to the first implementation based on the developers’ understanding of users’ needs and the social structures in the organization. From that point on, an intricate dance of use/non-use and additional customization and redeployment occurs as the system evolves over time to meet the needs of the users or is abandoned.

In recent years, social enterprise systems such as collaborative technologies, enterprise social networking sites, and knowledge management systems have become more pervasive in organizations (DiMicco et al., 2008; Lamb & Kling, 2003; Orlikowski & Iacono, 2001; Wakefield, Wakefield, Baker, & Wang, 2011). Therefore, several authors have begun to call for new approaches and new theories to understand the adoption and routine use that move beyond cognitive psychology-based models that researchers originally developed for single-user tools (Abraham et al., 2013; Bagozzi, 2007; Benbasat & Barki, 2007; Ortiz de Guinea & Markus, 2009; Straub & Burton-Jones, 2007; Venkatesh, Davis, & Morris, 2007). Some authors have also suggested looking beyond the traditional roots in cognitive and social psychology to see new theoretical paradigms to understand and explain adoption (Abraham et al., 2013).

In this paper, we follow the lead of these researchers and propose a different approach to understanding the adoption and long-term use of enterprise systems. Rather than use individual cognitive factors developed for the adoption of single user tools, we instead focus on the social ecosystem surrounding the information system. We present a model based on Giddens’ (1984) structuration theory whose roots lie in sociology, not psychology. As such, the theory offers a different theoretical perspective for understanding social technologies.

In essence, we argue that one can understand the adoption and routine use of enterprise systems by examining the fit between the system and the social structures of the organization. This model differs in four distinct ways from prior models. First, we shift the focus from the individual-centric nature of prior cognitive-psychology-based models to a social-ecosystem view based in sociology—from an atomic individual using a tool to a social actor interacting with a system ensemble (Lamb & Kling, 2003; Orlikowski & Iacono, 2001). Therefore, we do not include any of the traditional cognitive factors such as

performance expectancy (perceived usefulness) or effort expectancy (perceived ease of use); these factors have been well established, and we do not revisit well-trodden ground but present an *alternative* theoretical lens that we believe is effective and parsimonious (three factors).

Second, we focus on enterprise systems (e.g., social media, knowledge management) and not single-user technologies because we believe the social ecosystem surrounding these systems strongly influences their use (Ke, Tan, Sia, & Wei, 2013; Maruping & Magni, 2012; Stafford & Turan, 2011; Wakefield et al., 2011). The social ecosystem may also influence the use of single-user technologies, which we discuss later.

Third, we focus on the *consistent, ongoing, and routine use* of an information system and not on the *intent to adopt* or *intent to continue to use*. Our dependent construct of interest is not “behavioral intent” or a quantitative measure of “use” as in prior theories but rather “loyal use”, which we draw from research on consumer behavior (Chow & Holden, 1997; Kim, Forsyth, Gu, & Moon, 2002; Nordstrom & Swan, 1976; Oliver, 1999; Tucker, 1964). The focus of loyal use is use which has become routinized as part of the normal everyday work practices that the system supports. It is akin to technology assimilation at the organizational level (Armstrong & Sambamurthy, 1999)

Finally, fit is an evolving concept that the duality of structure influences. Action creates structures, which enable and constrain action, which creates structures in an ongoing recursive dance (Giddens, 1984). Organizational social structures and enterprise systems influence each other as the structuration process unfolds over time, but one can examine a window in time to see how structures influence the development or adoption of systems and vice versa (Jones & Karsten, 2008).

We adopt a mixed-methods research approach (Mingers 2001; Venkatesh, Brown, & Bala, 2013) that combines two separate studies (one qualitative, one quantitative) in a sequential design to provide a more rounded understanding of the factors influencing the ongoing use of one social enterprise system (a KMS designed to support sales representatives) in one organization (a multinational pharmaceutical firm). Further, following Venkatesh et al.'s (2013) suggestion, for research that lacks prior theoretical work, we conducted a qualitative study first and a quantitative study second.

This paper proceeds as follows: in Sections 1.1 to 1.3, we briefly summarize prior research on technology adoption and use, prior research on the social enterprise system we studied (a knowledge management system), and structuration theory, respectively. In Section 2, we develop our model based on structuration theory. In Section 3, we describe the first study, a case study of the evolution of one system through three periods of development and use, and investigate how our model explains the patterns that emerge. In Section 4, we describe the second study (a survey) that enables us to examine the model more broadly. In Section 5, we discuss the results and the implications for research and practice.

1.1 Prior Research on Technology Use

The adoption and use of information technology is one of the most mature streams of information systems research (Benbasat & Barki, 2007; Venkatesh et al., 2003). TAM (Davis, 1989; Davis et al., 1989) and its descendants is the most widely employed models of technology adoption (Venkatesh et al., 2003). TAM was initially developed in the 1980s and has been extensively validated across a variety of settings and subjected to numerous theoretical extensions (e.g., UTAUT). It focuses on the initial adoption of new technologies, but researchers have extended it to examine continued use over time and to account for the confirmation or disconfirmation users' expectations (Bhattacharjee, 2001; Venkatesh, Thong, Chan, Hu, & Brown, 2011) and the habits that people develop (Limayem, Hirt, & Cheung, 2007). For reviews of this research, see Hsiao and Yang (2011) and Turner, Kitchenham, Brereton, Charters, and Budgen (2010).

We see two key themes in this prior research. First, most technology use theories (e.g., TAM, UTAUT) are firmly based in cognitive or social psychology (Abraham et al., 2013). They assume a rational individual actor who makes deliberate cognitive assessments of technology attributes (e.g., usefulness and ease of use), form an intention to use or not use the technology, and act on that intention (Lamb & Kling, 2003). However, research from consumer behavior concludes that cognitive assessments of product attributes (i.e., technology attributes) have the *weakest* impact on use (Oliver, 1999). Second, most technology use theories focus on initial adoption (Venkatesh et al., 2003). However, research shows that users' beliefs change over time, so models designed for initial adoption may not fit ongoing use (Bhattacharjee & Premkumar, 2004; Venkatesh, Davis, & Morris, 2000a; Venkatesh, Morris, & Ackerman, 2000b).

In this paper, we focus on enterprise systems. In contrast, researchers developed most theories of adoption and ongoing long-term use to focus on single-user technologies for labor substitution, enhancing productivity, and information processing (Orlikowski & Iacono, 2001), such as word processing software (Davis et al., 1989), presentation software (Davis, 1989), information-retrieval tools (Venkatesh et al. 2000a; Venkatesh et al., 2003), and computer-based training tools (Bhattacharjee & Premkumar, 2004). In the mid-1980s when Davis (1985) developed the original theoretical model, the Internet had 2,000 hosts (see https://commons.wikimedia.org/wiki/File:Internet_host_count_1988-2012_log_scale.png), a fast network was 56 Kbps, and desktop computers ran at 11 MIPS. Today, the Internet has more than one billion hosts, a fast network is 100 Gbps, and desktop computers are approaching 300,000 MIPS. Our mobile phones provide 3300 MIPS with network connections up to 12 Mbps: 200-300 times more power than the computers of the 1980s. Information technology today fundamentally differs from information technology in the 1980s.

Enterprise systems also differ from the single-user tools of the 1980s. Technologies as *systems* differ from that of *tools* because systems are embedded in a complex social context (Lamb & Kling, 2003; Orlikowski & Iacono, 2001). Technologies as systems require an understanding of the social factors that influence use because they are embedded in a wider system of staff, services, policies, and incentives (Orlikowski & Iacono, 2001; Stern & Stafford, 2006; Sykes, Venkatesh, & Gosain, 2009; Wakefield et al., 2011). We can only understand system use by understanding the larger ecosystem of use (Orlikowski & Iacono, 2001).

We could follow in the traditions of prior research and refine the existing cognitive-based models; however, instead, we follow the advice of Lamb and Kling (2003) and Abraham et al. (2013) who suggest that researchers should consider alternative theoretical views. Thus, we do not focus on extending existing models but on offering a new lens whose roots are sociological and not cognitive. We contend that such a new theoretical lens, which omits prior cognitive-based formulations, may prove effective in explaining routine technology use, particularly for the routine use of enterprise systems. Our empirical data come from our studying one enterprise system—a KMS used to support the sales representatives of a large multinational pharmaceutical firm. We do not know about any prior research in this context, so we develop our theory from fundamental theories rather than from prior research in this context.

1.2 Knowledge Management Systems

One important enterprise system is a knowledge management system (KMS) (Alavi & Leidner, 2001). A KMS is a computer-mediated system designed to help people create, store, organize, retrieve, share, transfer, and reuse knowledge (Alavi & Leidner 1999; Jennex, Smolnik, & Croasdell, 2012; Kankanhalli, Tan, & Wei, 2005; Wasko & Faraj, 2005). It is inherently a social technology because it focuses on capturing knowledge about work (knowledge work typically is a social activity), and the processes of sharing and learning knowledge are inherently social (Alavi & Leidner, 1999; Jennex, 2005). Many different software tools exist (e.g., Zoho, Bloomfire, and Lessons Learned Database). Many firms have implemented enterprise-wide KMS in recognition of the strategic importance of organizational knowledge management (Alavi & Leidner, 1999; Hansen, Nohira, & Tierney, 1999). Much research suggests that a KMS can help an organization manage its organizational knowledge processes (Alavi & Leidner 1999, 2001) although measuring the success and organizational impact of a KMS can be challenging (Jennex & Olfman, 2006; Jennex et al., 2012; Ko & Dennis, 2011; Kulkarni, Ravindrin, & Freeze, 2006).

One of the first decisions organizations make is the type of knowledge to store in the KMS (i.e., codified, personalized, or some combination of the two) (Grover & Davenport, 2001; Hansen et al., 1999). Codification-based knowledge, stored in documents, allows KMS users to consume it as needed, whereas personalization-based knowledge helps KMS users find individuals who have the needed knowledge. Most KMS contain both codification-based and personalization-based knowledge (Dennis & Vessey, 2005).

Using a KMS involves two distinctly different processes: 1) contributing knowledge and 2) acquiring and reusing knowledge in the KMS (Alavi & Leidner 1999; Watson & Hewett, 2006). In most KMS, however, only a small percentage of users routinely contribute knowledge; for most users, routine KMS use means reusing the knowledge that others have contributed (Ko & Dennis, 2011; Kulkarni et al., 2006; Marks, Polak, McCoy, & Galletta, 2008).

Empirical research shows that a KMS's characteristics, such as its ease of use and its support system and the quality of knowledge it contains affect its adoption and use (Kuo & Lee, 2009; Lee, Wang, Lim, &

Peng, 2009; Lin, 2014). Social influence can play an important role in KMS adoption and use, especially use by one's peers (Wang, Meister, & Gray, 2013). Support from top management may be important (Lee et al., 2009; Lin, 2014) as may be the organization's social and cultural values (Lee et al., 2009; Lin, 2014). We do not know whether social influences from one's direct superiors influences use or not (Wang et al., 2013), but empowering leadership that shares power with employees and motivates to act with increased autonomy can increase the adoption and use of a KMS (Kuo, Lai, & Lee, 2011; Singh, 2008).

1.3 Structuration Theory and Information Systems

Structuration theory (Giddens, 1984) is a rich lens through which to study how social structures are created and, in turn, enable and constrain action (Giddens, 1979, 1987). Social structures are "rules and resources, organized as properties of social systems" (Giddens, 1984, p. 25). The fundamental premise of structuration theory is the duality of structure—that the underlying structures that shape social practices "are created by human action and then serve to shape future human action" (Orlikowski & Robey, 1991); action creates structures and then these structures enable and constrain future action. Structures are both the outcome of action and the medium of action because structures are drawn on when the modalities of structure are enacted and reproduced by action (Giddens, 1984; Jones & Karsten, 2008; Macintosh & Scapens, 1990; Orlikowski & Robey, 1991; Stones, 2005). Structures do not exist separately from action except as memory traces (Giddens, 1984). Social systems do not *have* structures per se as much as they *exhibit* structures as people act (Jones & Karsten, 2008; Orlikowski & Robey, 1991).

Human action creates structures so that, over time, structures evolve and change. Human actors can choose to enact existing structures or to modify and/or create new ones. Human actors sometimes do so deliberately and other times habitually or automatically (Gersick & Hackman, 1990). The extent to which other actors reproduce the existing modalities of structure or the new/modified modalities of structure will influence the extent to which structures change (Giddens, 1984; Jones & Karsten, 2008; Macintosh & Scapens, 1990; Orlikowski & Robey, 1991). Different actors have different abilities to influence the modification and reproduction of structures because of inherent power differences (Macintosh and Scapens 1990).

Different individuals—even those in the same social system—may have different conceptions of social structures (Giddens 1984). Actors do not need to agree on shared meaning; they may hold different versions of social structures (Boland 1996; Orlikowski 2000; Walsham, 2002). For example, consider the social system of a grocery store that has many aisles with different items (Giddens, 1984). We draw on and enact modalities of structure as we shop. Many of the modalities that different shoppers use may be similar (e.g., use of a shopping cart, payment), while others may not (e.g., selectively visit certain aisles based on a list versus visiting all aisles to determine need). Some aisles will be important for some shoppers while the same aisles may not exist in the social system of others. For example, a shopper with a pet may routinely visit the pet food aisle, while a shopper with no pets may never visit it; thus, for this latter shopper, the aisle and the items in it do not have a meaningful existence in the shopper's structures.

Giddens (1984) defines three modalities of structuration: signification, domination, and legitimation. One can analyze each separately, but, in practice, the three dimensions are inextricably linked. We discuss these in detail below, but Table 1 briefly defines them.

Table 1. Construct Definitions

Constructs	Definitions
Structures of signification	Interpretive schemes or stocks of knowledge that human actors draw on to communicate and derive meaning.
Structures of domination	Physical and human resources that human actors draw on as they exercise power.
Structures of legitimation	Rules, conventions, or norms that determine legitimate or appropriate behavior
Loyal use	Consistent, ongoing, and routine use behaviors that human actors perform in the presence of stable social structures, and the advocacy of such behaviors among others

One major point of contention in information systems research is how these three modalities of structuration play out in a technology-mediated context. Giddens (1984) argues that structures exist separate from human action only as memory traces; they have no material existence. Thus, some researchers contend that information systems cannot contain structures (Jones & Karsten, 2008). Other researchers point out that this assertion is observably false; in the same way laws codify structures and

use the written word to share them, information systems can codify structures and share them by controlling what users see on a screen (Poole, 2009) and, thereby, influence the actions they can perform. Giddens (1984) developed structuration theory in the early 1980s when the dominant form of human interaction was a two-way human-to-human interaction that simple technologies such as telephones or paper perhaps mediated. Today, much of human communication has changed from a dualistic human-to-human interaction into a triangular human-system-human interaction, so that the system is an integral part of the process and has the ability to shape how that interaction occurs—something not well understood when Giddens developed his theory. Regardless of whether information systems contain “structures” as Giddens (1984) defines them or “potential structures” (Orlikowski, 2000) that users can use to enact structures stored in their memory, most researchers would agree that systems enable and constrain user behaviors by the affordances they do (or do not) provide. Thus, systems also have the potential to shape the social structures that action mediated by the system enables.

Adaptive structuration theory (AST) (DeSanctis & Poole, 1994) examines how the potential structures in collaboration systems influence their adoption and use. DeSanctis and Poole argue that a system contains a set of structures that enable teams to work in a certain manner and a spirit—the set of values and goals underlying the specific structures. The structures in the system interact with the structures of the group, task, and organizational environment to enable and constrain the actions of team members. The resulting actions may be faithful or unfaithful to spirit of the system and its designers’ intent, and, over time, structures emerge, reform, and eventually stabilize, possibly into new structures. DeSanctis and Poole (1994) provide a detailed set of coding procedures to analyze the micro-level appropriation actions taken by members of a team as they move through the structuration process.

2 A Structuration View of Information System Use

Information systems, like human social systems, are both the outcome and medium of action (DeSanctis & Poole 1994; Jones & Karsten, 2008; Orlikowski, 1992, 2000). They are the product of human action, action by those who specify, design, develop, and ultimately use the systems, for it is only through use that the potential social structures embedded in the systems have a chance to exist (Orlikowski, 2000). When new systems are introduced into an organization, they contain features designed to enable and constrain the use of various structures in a manner in which their designers and the implementation team believe would be valuable (DeSanctis & Poole, 1994; Poole, 2009). These features are influenced by the structures that the designers and implementers enact.

As human actors adopt and use an information system, they draw on their existing social structures and the system’s features and the underlying potential modalities those features were intended to enable or constrain. They then enact new modalities that may or may not be what the designers intended (DeSanctis & Poole, 1994; Orlikowski, 2000). When the features of the system match the structures of the users, adoption is more likely. This enactment creates the information systems in practice (as contrasted with the information system as designed) and may differ from place to place in the same organization (Orlikowski, 2000).

An information system in practice may not be “ideal” from the perspective of the users or the organization, and the organization may develop a new version that has different features that better enable (or constrain) the modalities of structure that have emerged around the system. Thus, most of the cost of a system comes after its initial deployment as the system evolves over time (Jarzabek, 1993). This pattern of system development/customization and deployment, enactment of new modalities of structure, and more development and introduction of a new system can repeat indefinitely (Hung, 2004; Orlikowski, 1992, 2000). In many cases, this process will stabilize and result in a set of structures whose modalities are routinely enacted (DeSanctis & Poole, 1994), although there is always the potential for change whether endogenous or exogenous (Orlikowski, 2000). Figure 1 shows this structuration process.

Figure 1. The Structuration of Systems Development and Use

We focus on the structuration process that influences the use of the system rather than the structuration process that influences the development of the system, although understanding the former requires some understanding of the latter. Therefore, we begin by discussing what we mean by routine use and then examine how the three modalities of structure may influence this form of use.

2.1 Loyal Use

“The concept of *routinization*, as grounded in practical consciousness, is vital to the theory of structuration” (Giddens, 1984). It is this routinization that is key to the existence of social structures, for structures exist only as the humans who use the system enact them. Such routine enactment of structures may be deliberate or non-conscious (i.e., without deliberate thought) (Gersick & Hackman, 1990; Ortiz de Guinea & Markus, 2009).

In considering the adoption and use of an information system from a structuration viewpoint, we are primarily interested in the routine use of the system—use that has become internalized and habitual (i.e., part of the stable and ongoing social structures that users routinely act). The system is assimilated or infused into the organization (Armstrong & Sambamurthy, 1999). Such routinized behavior is common—and much sought after—in consumer behavior because consumers routinely choose to purchase and use the same products over and over again. Such consistent repetitive purchases that demonstrate a prolonged consistent pattern of behaviors and become a part of ongoing routines have been called *loyalty* in purchasing and using products (Chow & Holden, 1997; Kim et al., 2002; Nordstrom & Swan, 1976; Oliver, 1999; Tucker, 1964). The fundamental premise of consumer loyalty is that action (purchasing and use) creates loyalty (a structure), which, in turn, influences subsequent action (Oliver, 1999). This action-structure-action premise makes loyalty an ideal concept for a structuration view of information systems use.

Building on Oliver’s (Oliver, 1999) definition of loyal purchasing and use behavior, we define *loyal use* in the context of information systems as consistent, ongoing, and routine use behaviors that actors perform in the presence of stable social structures and advocate to others (Chow & Holden, 1997; Galletta, Henry, McCoy, & Polak, 2006; Kim et al., 2002; Nordstrom & Swan, 1976; Oliver, 1999; Saga & Zmud, 1994; Tucker, 1964). Loyal use is similar to behavioral intent and continuance intent from prior adoption and use research (Bhattacharjee, 2001; Venkatesh et al., 2003) in that they each predict future use. However, the nature of the use differs. Behavioral intent measures a respondent’s intent to perform a specific action (Fishbein & Ajzen, 1975). Continuance intent captures a respondent’s intent to repeat a specific action. In

contrast, loyal use is *consistent*, *ongoing*, and *routine* use when a set of stable social structures are enacted. Thus, loyal use refers to routinized use as opposed to the intent to use or the intent to continue to use. One may have an intention to use or continue to use a system in the future, but that system may not be part of one's standard routines for performing work.

Loyal use does not necessarily predict the frequency of use; rather, use is routine whenever one enacts those social structures. For example, I may display loyal use of my tax preparation software, but I may not use it very frequently at all—and even not statistically significantly more than a non-user of the same software. Likewise, I may have no behavioral intent to use the software in the next six months despite the fact that my loyal use is high. Thus, we agree with Benbasat and Barki (2007) in the need to go beyond a narrow, simplistic, “amount of use” view of system use.

Loyal use is not “extended use” in which “users extend the scope of functions that they use through post-adoptive learning” (Po-An Hsieh, Rai, Xin Xu, 2011, p. 2019). It is not “deep structure” use in which use is integrated richly into the task and supports the task's underlying structure (Burton-Jones & Straub, 2006). Loyal use may indeed be deep and rich, and users may learn and the scope of their use grow after adoption, but these indicators are not indicators of loyal use; one indicator for loyal use is routine use when one performs the activities that the information system supports however shallow and fixed that use may be. In this sense, loyal use is similar to habitual use (Jasperson, Carter, & Zmud, 2005; Kim & Malhotra, 2005; Limayem et al., 2007).

With that said, loyal use is more than habitual use. Consumer loyalty research has begun to move away from viewing purchasing behavior as a set of transactions to viewing it as a *relationship* between the consumer and the product (Agustin & Singh, 2005). Thus, consumer loyalty is more than simple repeat purchasing behavior—it also includes an attitude toward the product (Lewis & Soureli, 2006; Oliver, 1999). Thus, routine use behavior is necessary but not sufficient for loyal use of an information system. Loyal use also entails an attitude that supports the routine use of the system, an attitude that often includes advocating the system to others (Lewis & Soureli, 2006; Mercier, 2001). A loyal user is a “supporting user” in the terms of van Offenbeek, Boonstra, and Seo (2013); the user both uses the system and supports its use. In contrast, a “resisting user” (one uses the system but resists its use) (van Offenbeek et al., 2013) is not a loyal user despite even extensive routine use; mandatory use of a system does not constitute loyal use, which is compelled behavior and not loyal behavior.

Researchers have argued that many factors influence consumer loyalty in marketing (Lewis & Soureli, 2006; Oliver, 1999). Oliver (1999) argues that loyalty that derives from product superiority (usefulness and ease of use in information systems terminology) is the *weakest* form of loyalty. Thus, in looking for theoretical factors that influence loyal use, we need to look beyond the cognitive lens of usefulness and ease of use. Instead, the social system surrounding use has the ability to induce the strongest form of loyalty (Oliver, 1999).

2.2 Hypotheses: The Structures that Influence Loyal Use

Structuration theory argues that human action creates structures, which, in turn, enable and constrain subsequent action as actors enact the modalities of structure. This enactment then reinforces and/or revises the structures (Giddens, 1984; Jones & Karsten, 2008; Stones, 2005). Individuals in the same organization often hold different social structures for the same activities (Giddens, 1984; Heracleous & Barrett, 2001; Suchan, 2001), which includes systems use (Boland, 1996; Orlikowski, 2000; Walsham, 2002).

We propose that the structures individuals enact will influence their loyal use of an information system and, in turn, that that behavior (e.g., use or non-use) has the potential to influence those structures—and the system—over time. Thus, we posit a recursive relationship between social structures and system use. When an organization introduces a new system, the existing structures enable and constrain action so that users either use or do not use the system. Over time, that use may change the social structures so that they evolve to more strongly support system use. Non-use may have the opposite effect or no effect. Thus, the evolving fit between social structures and the system influences loyal use over time.

Giddens (1984) argues that one can analyze social structures along three dimensions (signification, domination, and legitimation). We consider each of these dimensions in turn.

The *structure of signification* refers to the way in which humans communicate meaning and is based on theories of coding (Giddens, 1984; Jones & Karsten, 2008; Macintosh & Scapens, 1990; Orlikowski &

Robey, 1991; Stones, 2005). For example, how do we know what a green traffic light means? Human actors draw on their *interpretive schemes* (the first modality of structure) to communicate meaning and derive meaning from communication (action). Interpretive schemes are the stocks of knowledge held in the minds of actors that they draw on to communicate and derive meaning. These interpretive schemes enable the actors to make sense of what is communicated but also constrain the way in which they communicate by imposing constraints on how the communication is performed. A city could, for example, change the color of its traffic lights, but doing so would likely impair meaning for people from other cities.

In the context of information systems use, we are interested in the extent to which these interpretive schemes (i.e., the modalities of structure) that actors enact as they communicate meaning and derive meaning from communication (i.e., performs actions) enable or constrain the use of the information system. The enacted interpretive schemes pertaining to the information system help users interpret and understand the system (DeSanctis & Poole, 1994). Thus, structuration theory would argue that, if the information system and the structures of signification it contains (DeSanctis & Poole, 1994) reinforce enacted interpretive schemes in the ecosystem around it and if those enacted interpretive schemes enable the use of the system to a greater extent than they constrain (i.e., inhibit) its use, then the use of the information system is more likely to become a routine part of the actions that the actor performs, and, consequently, the actor is more likely to become a loyal user of the system. In other words, the central thrust of our theoretical arguments is: if the enacted interpretive schemes in the ecosystem surrounding the system enable system use, then loyal use should be higher; conversely, if those enacted interpretive schemes constrain system use, then loyal use should be lower.

Very little empirical research has examined how interpretive schemes influence intent to use, continuance of use, or loyal use. We know of only five studies that have touched on these concepts. Heracleous and Barrett (2001) found that the interpretive schemes that individuals used shaped their understanding of the features of an electronic trading system and the organization's rationale for implementing the system and, ultimately, loyal use of the system. Suchan (2001) found that the varied backgrounds of different stakeholders in a professional school shaped their interpretive schemes, which, in turn, shaped their conceptualization and use of IT. Liang, Peng, Xue, Guo, and Wang (2015) suggest that personalized training is important for organizations interested in helping their employees transition from use as exploration to extended use. Sherif and Vinze (2003) found that education and training programs that shape programmers' knowledge about software reuse can increase reuse. Caldeira and Ward (2003) found that a key determining factor in the successful adoption and use of enterprise systems in 12 Portuguese manufacturing firms was the development of in-house knowledge.

None of these empirical studies provide direct knowledge of how the interpretive schemes of KMS users will affect use, but they suggest that interpretive schemes are important in system adoption. Theory argues that the extent to which the interpretive schemes are aligned with technology use enables or constrains the use of the KMS (DeSanctis & Poole, 1994; Giddens, 1984). Interpretive schemes are the modality by which we derive meaning. Consider a structure from the 1980s that managers do not type; thus, if they use an information system, they are not a manager. Such an interpretive scheme would constrain the use of a system, which has nothing to do with the functionality of the system itself. Conversely, if a KMS held stocks of knowledge that employees found useful in understanding their job roles, then the interpretive schemes would enable use. Therefore, we argue:

H1a: The modality of signification (enacted interpretive schemes) enables and constrains the loyal use of an information system.

The *structure of domination* refers to the allocation of physical resources and human resources and is based on theories of economic resource allocation and political resource authorization (Giddens, 1984; Jones & Karsten 2008; Macintosh & Scapens, 1990; Orlikowski & Robey, 1991; Stones, 2005). Human actors draw on *resources* (the second modality of structure) to exercise power. Resources can be allocative resources (the capability to mobilize or transform objects, goods, or material entities) or authoritative resources (the capability to mobilize or command human actors). While some allocative resources can have a physical existence, the *capability to command* these resources constitutes the modality of structure, not the physical resource itself. These resources enable or constrain the exercise of power and are the medium through which actors exercise the power.

In studies of existing systems, researchers have found resource-facilitating conditions to be a factor that contributes to behavioral intention to use technology (Bhattacharjee, 2000; Bock, Kankanhalli, & Sharma, 2006; Lin, 2006; Rensel, Abbas, & Rao, 2006; Sabherwal, Keyaraj, & Chowa, 2006; Sherif & Vinze, 2003;

Taylor & Todd, 1995), including KMS (Lin, 2014). However, studies of initial adoption have concluded that facilitating conditions have little or no influence on intention to use (Venkatesh, 2000; Venkatesh et al., 2003).

We posit that, over time, the power to allocate resources becomes a salient *emergent* influence, which accounts for varied results in the importance of facilitating resources in past research. The extent to which these resources (i.e., modality of structure) that actors enact as they exercise power (i.e., perform actions) enable or constrain the use of the information system. Researchers have conceptualized the notion of resources and power along different dimensions, such as authority, influence, and politics. One conceptualization is that the development and implementation of a system is the result of a process in which stakeholders exert influence/power over the nature of the system by contributing or withholding resources (Backhouse, Hsu, & Silva, 2006; Jasperson et al., 2006). If the organization and those around the user enact structures to allocate resources that constrain use of the system (e.g., failing to provide sufficient technical support), then use is less likely to become routine. Conversely, if social structures enable use, then loyal use is more likely. Therefore, we argue:

H1b: The modality of domination (enacted resources) enables and constrains the loyal use of an information system.

The *structure of legitimation* refers to the moral constitution of interaction and is based on theories of normative and legal regulation (Giddens, 1984; Jones & Karsten, 2008; Macintosh & Scapens, 1990; Orlikowski & Robey, 1991; Stones 2005). Human actors draw on social *norms* (the third modality of structure) to sanction behavior. Norms are conventions or rules that determine legitimate or appropriate behavior (Lee & Ryu, 1995). Norms influence what is identified as a virtue or a vice, what is important and what is not, and what ought to happen and not happen. For instance, the behavior surrounding public use of mobile technology in Japan exhibits strong normative pressure (Srivastava, 2004). It is through sanctions (action), both positive and negative, that norms impact behavior and are created, reinforced, and revised.

Some empirical evidence suggests that social norms influence intent to use technology (Gallivan, Spitler, & Koufaris, 2005; Jasperson et al., 2005; Lucas & Spitler, 1999; Zhang, Prybutok, & Koh, 2006), including KMS peers (Wang et al., 2013). Most research suggests that norms have a fleeting effect (e.g., Stafford & Turan, 2011). Over time, social norms diminish in importance (or become not at all related to) the intention to use technology (i.e., once an individual forms a judgment about the effectiveness and effort of using a technology, the social norms of those around the individual have little influence except perhaps for some demographic groups such as older women) (Al-Gahtani, Hubona, & Wang, 2007; Bhattacharjee, 2000; Brown, Dennis, & Venkatesh, 2010; Gallivan et al., 2005; Hong, Thong, Chasalow, & Dhillon, 2011; Tan & Teo, 2000; Venkatesh & Davis, 2000; Venkatesh et al., 2000a; Venkatesh et al., 2003; Venkatesh & Thong, 2012).

The extent to which actors enact norms (i.e., the modality of structure) as they sanction behavior (i.e., performs actions) enables or constrains the use of the information system, which affects loyal use. Enacting norms tends to result in behaviors that are relatively stable (Stewart & Gosain, 2006). If the enacted norms constrain use (e.g., peer opinion is against use) then loyal use is less likely. Conversely, if enacted norms enable use (e.g., formal policies encourage use) then loyal use is more likely. Therefore, we argue:

H1c: The modality of legitimation (enacted norms) enables and constrains the loyal use of an information system.

3 Study 1: Structures Affecting the Development and Use of the KMS

We tested our structuration model in the context of an established knowledge management system (KMS) in one organization. We used a mixed research methodology that combined qualitative and quantitative research in a sequential research design (Mingers, 2001; Venkatesh et al., 2013). We began with a case study using qualitative methods because case research can capture the subtleties and nuances of behavior better than quantitative research (McGrath, Martin, & Kulka, 1982).

3.1 The Research Context

We conducted our research at one of the ten largest multinational pharmaceutical firms that specializes in prescription drugs, which we call Farmaco (a pseudonym). Specifically, we focused on the KMS the

organization used to support its U.S. sales representatives. Farmaco has offices, research centers, and manufacturing sites in more than a dozen countries, but its administrative heart and headquarters lies in the United States. The company conducts research and development, manufacturing, and sales. Farmaco is organized by both functional business units and geographic business units. Both the research and development function and the manufacturing function reside in a separate business unit that one executive manages. However, the company organizes sales by geographic region, the largest of which is the U.S. business unit, which has approximately 4,500 sales representatives. The U.S. business unit, in turn, has eight principal operating divisions that each focus on a different set of disease states for which the firm offers drugs (e.g., asthma, gastrointestinal disorders) or types of physicians (e.g., primary care physicians, specialist physicians, HMO administrators).

Because Farmaco focuses on prescription drugs, almost all of its revenue comes from a very small set of products—usually a few dozen individual drugs. The pressure to manage this select set of brands, each of which has only a limited life before generics arrive, is extremely important to the firm's success. As with other prescription-oriented pharmaceutical firms, it does not conduct sales activities with final consumers. Instead, sales representatives provide information to physicians to help them understand how the company's products can help patients with certain disease states. Physicians can prescribe the products to patients, who then purchase the drugs. Sales activities focus on physicians who make prescription decisions.

The pharmaceutical industry is a knowledge-intensive industry; medical research is inherently knowledge work, and the relationship between sales representatives and the physicians is intensely knowledge based. Farmaco directly hires most sales representatives from undergraduate programs (business, liberal arts) or masters programs (pharmacology), and they typically have little prior sales experience (on average, our participants were 32 years' old (mode 25) and had an average of 2.9 years of sales experience; 55% were female). Government regulations constrain a sales representative's role: they must follow many rules when interacting with physicians. Each sales representative receives six months of training in the sales rules and procedures, the firm's products, its technology, and other company-specific policies. This training continually evolves, which ensures that sales representatives have the current state of knowledge is challenging.

The firm assigns each sales representative to one division (e.g., family medicine, asthma, diabetes, mental health). In this division, the representative is responsible for the assigned physicians in that sales territory for a given set of drugs. Sales representatives do not compete for the same physicians, so they have no conflict of interest in sharing knowledge. Sales representatives' performance is tied to the number of prescriptions which are filled; meeting the sales quota drives their compensation. Because compensation and career progression are closely tied to an individual's sales performance, the company and the sales representatives have aligned interests. Some individuals spend their entire careers as sales representatives, but most receive promotions to sales management, move to other positions, or leave the company within five years. The average job tenure of a sales representative is three years.

3.2 Methodology

We worked with Farmaco and its knowledge management group over a three-year period. During this period, we visited Farmaco on nine occasions, not counting numerous telephone meetings. Data came from four sources. First, we were permitted to interact with the KMS on numerous occasions to understand its evolving nature. Second, we were given access to numerous design documents and announcements provided to KMS users. Third, we spent two days shadowing two members of the KMS team and observing their work and their interactions with others. Fourth, we interviewed 22 Farmaco employees, including those who had left the KMS staff and moved on to other positions both inside and outside Farmaco. Three employees were sales representatives. The remaining 19 employees were KMS staff members (all of the KMS management team plus six KMS analysts). Fourteen of these 19 KMS staff members also served as a sales representative or sales manager either before or after their term as a KMS staff member and, thus, had experience with the KMS both as a user and as a provider. Two authors participated in most interviews, although one author conducted some interviews and all three authors some others. We conducted most interviews in person, but we also did some via telephone. We did not record any interview because Farmaco did not permit recording.

We integrated the data from the different versions of the system, documents, observations, and interviews using open coding. We analyzed the qualitative data in an iterative process of repeatedly identifying elements of loyal use and the modalities of structure as they played out in the case (cf. Klein & Myers,

1999; Lee, 1989). We began by using loyal use and the three modalities of structure (signification, domination, and legitimation) as categories for this coding. Not all information was consistent across sources. We identified the conflicts and went back to our interviewees and had them reconcile the differences, sometimes through one-on-one interviews and sometimes in group discussions. We developed a revised understanding of the key issues and returned to Farmaco and discussed this understanding with our three key contacts (the KMS leadership team). We again revised our understanding of the events and then wrote the case “story” of the success and failure of the three KMS implemented by Farmaco. We sent this case story to our three key contacts who provided more revisions until they all agreed on its accuracy.

3.3 Analysis

The Appendix describes the case and the events that occurred over the deployment of the three KMS implemented by Farmaco. Table 2 provides a timeline.

Table 2. KMS Timeline

Time	Events
April T-3	VP US decides to implement a KMS. IT team selected to lead the project. Team members are Farmaco IT staff and KMS consultants from a leading consulting firm.
May T-2	First KMS (a knowledge community) deployed to sales force.
September T-2	First KMS recognized as a failure.
February T-1	District sales manager selected to lead KMS team. KMS team reformed so most members are expert sales representatives and sales managers. Consultants are fired.
January T0	Research team arrives on site.
May T0	Second KMS (knowledge hierarchy) deployed to sales force.
September T0	Second KMS recognized as a success.
January T+1	VP sales announces KMS will be official communication channel replacing email.
June T+1	Work begins on third KMS.
May T+2	Third KMS (knowledge hierarchy) deployed to sales force.
June T+2	Third KMS recognized as a success with 98% of sales representatives using it.

3.3.1 The First KMS

Table 3 summarizes the development and use of the first KMS (see the Appendix for more details). The senior vice president (SVP) of the U.S. business unit chartered the first LMS, so it had strong top management support (structures of domination (resource allocation)). The US unit’s IT group led the project with help from KMS consultants from a leading consulting firm. The team selected a knowledge community strategy (Brown & Duguid, 1998; Dennis & Vessey, 2005). The structures of signification (interpretive schemes) and legitimation (norms) of these IT and consulting professionals, not those of the sales group, shaped this choice. In this, the choice served as structure of signification that influenced the desired roles of the KMS team and the sales representatives: the sales representatives would develop, share, and reuse knowledge by themselves, while the KMS team would configure the KMS software, train the sales representatives, and provide support as needed. In short, the system was the responsibility of IT and KMS experts, while the knowledge was the responsibility of the sales representatives.

The first KMS was a failure because few sales representatives used it. Few understood what the KMS was intended to do and what “knowledge” was in their context. Sales representatives did not have a knowledge-sharing culture because most worked independently in their own territory with little contact with

other sales representatives. The structures of domination (power, resources) supported loyal use, but the structures of signification (interpretive schemes) did not; the structures of legitimation (rules, norms) provided mixed support in that senior sales leaders encouraged use but formal policies did not, and the support from first-level line sales managers varied from division to division (see Table 3).

Table 3. Development and Use of the First KMS

Construct	Evidence
Development	
Structures of signification	<ul style="list-style-type: none"> • Project led by IT manager • KMS team is IT experts and KMS consultants • Knowledge community strategy selected
Structures of domination	<ul style="list-style-type: none"> • U.S. business unit SVP is strong proponent • Budget for acquisition, customization, and deployment
Structures of legitimation	<ul style="list-style-type: none"> • IT group norms drive system design and development
Use	
Loyal use	<ul style="list-style-type: none"> • About 1% of sales representatives use KMS • Farmaco declares failure
Structures of signification	<ul style="list-style-type: none"> • KMS perceived as an IT initiative, another technology to support work • Following the knowledge community strategy, the KMS contained no knowledge at time of deployment, so there were no exemplars of what constituted “knowledge”
Structures of domination	<ul style="list-style-type: none"> • U.S. business unit VP is strong proponent • Led by IT group • KMS team provides knowledge coordinator to each community to support KMS • Online software tutorials available
Structures of legitimation	<ul style="list-style-type: none"> • Senior sales management encouraged use, but encouragement by first-level line sales managers varied by division • No recognition for those who contribute knowledge

3.3.2 The Second KMS

Table 4 summarizes the development and use of the second KMS (see the Appendix for more details). The failure of the first KMS triggered significant rethinking about the KMS and its development process. The U.S. SVP continued to support its development and provide resources, so the structures of domination (resource allocation) continued to support it, but he decided to adopt a very different approach to KMS development. He decided that the IT experts who led the development of the first KMS did not understand the needs of the sales representatives, so he shifted the leadership of KMS to sales experts. He appointed a district sales manager to lead the KMS development team. He replaced the previous KMS team with sales managers and sales representatives so that the structures of signification (interpretive schemes) for KMS development became those of the sales organization. He selected a knowledge hierarchy strategy (Dennis & Vessey, 2005) so that the knowledge became the responsibility of the KMS team. He assigned the development of sales knowledge to the sales management teams who had line authority over the sales representatives and development of drug knowledge to the brand management teams who had responsibility for each drug; the structures of legitimation (norms) for knowledge development matched the organization structure and, thus, strongly supported development. The KMS team managed the knowledge that the sales representatives contributed and developed a formal review process; this knowledge accounted for less than four percent of the total.

Within four months after deployment, more than 90 percent of sales representatives used the system on a daily basis. At that point, Farmaco declared it a success and the sales VP eliminated the official paper and email updates; the company provided all official communication via the KMS. [Who?] perceived the KMS as a sales initiative (not an IT one) and rebranded “knowledge” as “best practices” so the structures of domination (resource allocation) continued to support use while the structures of signification (interpretive schemes) more strongly supported use. Three aspects of the structures of legitimation (norms) differed from the first KMS and strongly supported use. First, sales management uniformly encouraged use

because the knowledge it contained came from them or the brand teams. Second, the company changed the commission program to reward sales representatives who contributed knowledge. Third, the KMS became the default desktop on the sales representatives' laptops; they could access all applications (e.g., Word, Excel) through the KMS interface.

Table 4. Development and Use of the Second KMS

Construct	Evidence
Development	
Structures of signification	<ul style="list-style-type: none"> • Project led by district sales manager • KMS team is primarily sales managers and sales representatives with the support of a few IT experts • Continuing sales representative use behavior is seen as the key driver of success • Knowledge seen as a "product" to be marketed to the sales representatives • Knowledge hierarchy strategy continued
Structures of domination	<ul style="list-style-type: none"> • U.S. business unit SVP is strong proponent • Budget for redesign • Each sales district appoints a sales representative to be "KMS lead" to provide feedback to the KMS team to improve the KMS
Structures of legitimation	<ul style="list-style-type: none"> • Each division's sales management team designs the structure and organization of knowledge for each division • User interface changed to be more "Internet like"
Use	
Loyal use	<ul style="list-style-type: none"> • 98% of sales representatives use KMS • Farmaco declares success
Structures of signification	<ul style="list-style-type: none"> • KMS perceived as sales initiative • "Knowledge" rebranded as "best practices" • Each division's sales management team designs the structure and organization of knowledge for each division
Structures of domination	<ul style="list-style-type: none"> • U.S. business unit VP is strong proponent • Led by former district sales manager • Each sales district appoints a sales representative to be "KMS lead" to support sales representatives as they use the KMS • Online software tutorials available
Structures of legitimation	<ul style="list-style-type: none"> • All official sales communication is provided via KMS • Sales management encourages use because knowledge is written by themselves and the brand management teams • Recognition for those who contribute knowledge through the standard sales commission program

3.3.3 The Third KMS

Table 5 summarizes the development and use of the third KMS (see the Appendix for more details). The success of the second KMS meant the U.S. SVP saw no need for major changes. The structures of signification (interpretive schemes) and domination (resource allocation) were similar to those of the second KMS; however, he added a formal "KMS lead" role that each sales district appointed to provide feedback to the KMS development team. The structures of legitimation (norms) changed so that the user interface became more "Internet like" and each sales division designed its own knowledge structure; thus we conclude that the divisions supported the development. Within 1 month, 98 percent of the sales representatives had retrieved knowledge documents from the KMS, and the sales representatives, sales management, and the KMS team all considered it a success. As with the second KMS, the structures of signification (interpretive schemes), domination (resource allocation), and legitimation (norms) strongly supported use.

Table 5. Development and Use of the Third KMS

Construct	Evidence
Development	
Structures of signification	<ul style="list-style-type: none"> • Project led by district sales manager • KMS team is primarily sales managers and sales representatives with the support of a few IT experts • Changing sales representative behavior is seen as the key driver of success • Knowledge seen as a “product” to be marketed to the sales representatives • Knowledge hierarchy strategy selected
Structures of domination	<ul style="list-style-type: none"> • U.S. business unit VP is strong proponent • Budget for acquisition, customization, and deployment
Structures of legitimation	<ul style="list-style-type: none"> • Sales knowledge created by the sales management teams to which the sales representatives report • Drug knowledge created by brand management team for each drug • Visual user interface driven by project leader
Use	
Loyal use	<ul style="list-style-type: none"> • Most sales representatives use KMS on a regular basis • Farmaco declares success • Four months after deployment, the sales VP eliminates the official paper and email updates; all official communication provided via KMS
Structures of signification	<ul style="list-style-type: none"> • KMS perceived as sales initiative • “Knowledge” rebranded as “best practices” for sales
Structures of domination	<ul style="list-style-type: none"> • U.S. business unit SVP is strong proponent • Led by sales group • Online software tutorials available
Structures of legitimation	<ul style="list-style-type: none"> • Sales management encourages use because they and the brand management teams write the knowledge themselves • Those who contribute knowledge receive rewards through the standard sales commission program • KMS is the desktop; one can reach all applications through the KMS

3.4 Discussion

Based on this analysis, we found support for all of our hypotheses. We found evidence that the structures of signification, domination, and legitimation each influenced the loyal use—and non-use—of the KMS. When the structures of signification, domination, and legitimation present in the social ecosystem matched the potential structures in the system, use was more likely; when they did not, use was less likely.

As Giddens (2013) recommends, we treated the three structures as separate and distinct for the purposes of analysis even though the three are tightly linked in practice. Tables 3, 4, and 5 show that the structures of domination remained relatively consistent over the three system deployments: they enabled use for all three implementations. The structures of legitimation provided mixed support for use for the first implementation, more consistent support for use for the second, and strong support for the third implementation. The structures of signification provided no support for use for the first failed implementation and strong support for last two successful ones.

Our findings suggest two possible conclusions. First, structures of legitimation and signification may be more powerful in influencing use than the structures of domination. Alternatively, all three structures may need to be aligned in support in order to induce loyal use. As DeSanctis and Poole (1994) note, a system’s spirit or its underlying general intent shapes the specific features that it contains and how the users understand it. It may be that the spirit of the first system (a knowledge community that promoted sharing among peers) did not fit the social structures of a hierarchically managed, regulation-intensive pharmaceutical firm. Case studies are useful in providing a rich understanding of a phenomenon, but they often lack the precision to separate out the individual effects of key factors as is the case here; we cannot

draw definitive conclusions for one alternative over the other. We need more research to better understand the individual effects of the three modalities of structure on loyal use.

4 Study 2: Structures Affecting Loyal Use

While Study 1 helped to explain how the three modalities of structure influenced the development and use of the KMS, it presents the views of the individuals we interviewed and the events we observed, which our choice of case study research method naturally limits: we could only interview and observe a small sample of the overall population. Thus, in the second study, we sought to provide a broader viewpoint by enabling more users to voice their beliefs and to better tease out the individual effects of the three modalities of structure. One of the advantages of survey research is that it can include more participants and, therefore, is more likely to be more representative of viewpoints than qualitative research (McGrath et al., 1982). Thus, we used quantitative survey research to, in the terminology of Venkatesh et al. (2013), “expand upon on the understanding obtained from” (p. 26) Study 1.

Researchers have historically examined structuration theory has historically using qualitative analyses (Jones & Karsten, 2008). We believe, as do others, that structuration theory does not inherently contain anything that inhibits one from testing it with other methods (Chin, Gopal, & Salisbury, 1997; Poole, 2009; Poole & DeSanctis, 2004). Giddens himself argues that one should not bound structuration theory to any one methodological tradition:

I do not believe there is anything in either the logic or substance of structuration theory which would somehow prohibit the use of some specific research technique, such as survey methods, questionnaires or whatever. (Giddens, 1984, p. XXX)

In this quantitative study, we focused on understanding how the three modalities of structure influenced use rather than understanding how they also influenced the development of the system as we did in the first case study. Thus, we chose to focus on one half of structuration theory (how structures enable and constrain action) at one point in time, which is a deliberate and selective use of structuration theory. We acknowledge this approach is not a normal one in applying structuration theory in Information Systems research (Jones & Karsten, 2008). However, Giddens himself argues that researchers should selectively use pieces of the theory that are most relevant to their research (Giddens, 1987, 1991; Jones & Karsten, 2008; Stones, 2005); indeed, he has openly criticized research that uses structuration theory in its entirety (Giddens, 1991; Jones & Karsten, 2008). Thus, by adopting only one half of structuration theory for our quantitative study, we follow Giddens’ advice.

From Study 1, we found evidence that the structures of signification and legitimation influence the loyal use of KMS. The evidence is less clear for the structures of domination because, although they supported the loyal use of the first KMS, it was a failure. Our hypotheses about these three structures remain the same as in the first study. We hypothesize that each of the modalities of structure influences use:

H1: The modalities of a) signification, b) domination, and c) legitimation enable and constrain the loyal use of an information system.

4.1 The Role of Experience

Since we conducted a quantitative study using the voices of many more users than we could interview, we could more deeply understand how individual user characteristics influence the relative strength of the three modalities of structure. Prior research has concluded that experience often plays an important role in adoption and use in that users have different experiences and react in different ways to a technology (Venkatesh et al., 2003). Prior research using a cognitive psychology lens has examined *experience with technology* because these theories focus on technology perceptions (performance expectancy and effort expectancy) as key drivers of adoption and use (e.g., Venkatesh et al., 2003). As technology experience increases, the impact of effort expectancy on behavioral intent decreases, and facilitating conditions affect usage only for more experienced workers (Venkatesh et al., 2003).

Given that past research suggests that technology experience influences adoption and use, we can ask how such influence might play out in a structuration model of enterprise system use. We focus on the structures enacted in the social ecosystem that surround the system, not the technology itself. Thus, instead of examining experience with technology, we focus on *experience in the job role*. Past research has shown that individuals in the same organization can and do enact different structures (Heracleous & Barrett, 2001; Suchan, 2001). Structures in general and those that surround technology use take time to

develop and evolve before they settle into a somewhat stable state (DeSanctis & Poole, 1994), although the potential for change always exists (Giddens, 1984). Because structures take time to develop, highly experienced workers have commonly developed different structures than novices, especially for knowledge tasks (Chi, Glaser, & Farr, 1988; Morris, Speier, & Hoffer, 1999; Sternberg, 1997).

By definition, novices have less knowledge than their more experienced counterparts (Ko & Dennis, 2011; Markus, 2001). They lack the deep job-related knowledge (i.e., structures of signification) that experienced employees have developed over time that helps them understand their job (Ko & Dennis, 2011; Markus & Robey, 1988). Individuals develop their own structures of signification based on their life history, but we focus on the *job-related* structures of signification, which will be less developed for novices than for other employees. Thus, structures of signification should be less important in influencing use for novices.

This lack of knowledge means that novices have the greatest need for knowledge (Ko & Dennis, 2011). They primarily use KMS to obtain knowledge rather than contribute to it (Ko & Dennis, 2011). In their quest for knowledge, they will be more likely to use the KMS or other sources that they view as a legitimate source of knowledge (Jennex, 2008). Thus, novices are more likely to adopt the structures that their training, their managers, or senior employees recommend (i.e., structures of legitimation) because they do not have a good sense of what is and is not relevant (Nelson, Nadkarni, Naratnan, & Ghods, 2000; Repenning & Sterman, 2002; Shanteau, 1988). Thus, structures of legitimation should be more important to novices.

Novices also are motivated by a desire to fit in (Tsai & Bagozzi, 2014). They spend time trying to understand what behaviors are appropriate and not appropriate. They strive to first understand and then conform to the norms of the organization (Tsai & Bagozzi, 2014). Thus, structures of legitimation are doubly important in guiding their behavior.

Individual responses to structures of domination (i.e., power and resources) may be driven more by personality or power gains and losses than by job experience per se (Markus 1983), although novices usually have little power (Tost, Gino, & Larrick, 2012). We focus not on how the KMS alters power relationships, although it can be important (Markus, 1983). Instead, we focus on how the structures of domination, the ability to command resources to support the KMS, enable or constrain use of the KMS. Novices have less power than experts (Tost et al., 2012), so they tend to be less attentive to and influenced to adopt a system by the provision of resources to support system implementations than experts (Venkatesh et al. 2003). Therefore, structures of domination will have less effect on use than structures of legitimation.

Taken together, we hypothesize that, for novices, the modality of legitimation as experienced through norms will have the strongest effect on their loyal use:

- H2:** For those with little job experience, the modality of legitimation has a stronger effect on the loyal use of an information system than a) the modality of domination or b) the modality of signification.

As individuals work and gain experience, they integrate their growing experiential knowledge from performing their work with their training and the advice of others and gradually evolve the structures they enact (Kolodner, 1983; Van Overschelde & Healy, 2001). As these structures evolve over time, the impact of the three modalities should also change.

Experts have different knowledge needs than novices because they have more knowledge (Ko & Dennis, 2011; Markus, 2001). The longer employees work in their job role, the more job-specific knowledge they gain (Ko & Dennis, 2011; Markus, 2001). They develop deeper and more detailed structures of signification that they can draw on (Ko & Dennis, 2011; Markus, 2001). Thus, experts are more likely to seek knowledge for unusual situations that they have not previously encountered rather than basic knowledge (Ko & Dennis, 2011; Markus, 2001). Experts are more likely to contribute to knowledge to the KMS (Markus, 2001).

As employees develop deeper structures of signification, they are more likely to use these structures in guiding their actions rather than seeking external knowledge (Ko & Dennis, 2011; Markus, 2001). Thus, experts are more likely to form their own judgments and develop more understanding of the work and their role in it independently of others (Venkatesh & Davis, 2000; Venkatesh et al., 2000a; Venkatesh et al., 2003). Advice and norms from others has less of an effect on the behavior of experts than does their own knowledge (Venkatesh & Davis, 2000; Venkatesh et al., 2000a; Venkatesh et al., 2003). Thus, for experts, their own knowledge (the structures of signification) has a stronger impact on their use of a KMS than the

norms they encounter in their workplace (the structures of legitimation) (Venkatesh & Davis, 2000; Venkatesh et al., 2000a; Venkatesh et al., 2003).

Structures of domination refer to power and resources. Experts are more likely to have power and control over resources than novices (Tost et al., 2012), so they are better able to understand how the ability to command resources reflects power (Markus, 1983). Thus, the provision of resources that support a system (or lack thereof) (i.e., structures of domination) will have a stronger effect on experts than novices (Venkatesh et al., 2003).

Taken together, we argue that, for experts, the structures of signification and domination will have stronger influence than structures of legitimation. Thus:

H3: For those with greater job experience, the modalities of a) signification and b) domination have stronger effects on loyal use of an information system than the modality of legitimation.

4.2 Methodology

We conducted the survey in March of T+2, two months before the deployment of the third KMS (see Table 2). The KMS manager emailed an invitation to approximately 4,500 sales representatives and a follow-up email two weeks later. The email provided a link to the Web-based survey, hosted on a university-owned server. The survey included multiple choice and open-ended questions developed for this study and questions for the company's internal use; the final survey was four pages long. We received 1,053 responses (a 22.8% response rate). This response rate is typical for Web surveys with email invitations that an organization sends to its members (Kaplowitz, Hadlock, & Levine, 2004; Ladik, Carillat, & Solomon, 2007). We could not include every question in the analysis since not everyone answered every one; thus, the final sample size was 893.

4.2.1 Measures

Our research focuses on four primary constructs (loyal use, domination, signification, and legitimation) and job experience. One can measure job experience in different ways (McEnrue, 1988). Because we care about the development of job-specific structures, which occurs from performing the same job over time, we focused on job tenure (i.e., how long one has worked in their current job and organization (McEnrue, 1988)). Therefore, we measured experience as the number of months an employee had worked for the firm as a sales representative, which we asked about via a single question on the survey. Most sales representatives had served for less than five years before moving to a position elsewhere in the firm, although some sales representatives had spent their entire career as a sales representative. Thus, the experience data are highly skewed (mean = 2.95 years, standard deviation = 3.77 years). We split the sample into three subgroups based on their experience as a sales representative. The first group comprised novices (i.e., those with less than one year of experience working in sales). The second group comprised those with more than one but less than five years of experience. The third group comprised the most experienced sales representatives—those with five or more years of experience.

Little quantitative research has examined our four primary constructs, so we needed to develop scales for each of them. We developed the question items through iterative collaboration that involved ourselves and two members of the participating organization. We based the pool of questions for loyal use on Oliver (1999). Loyal use involves system use as a regular, routine part of behavior and advocacy of its use to others. We developed a pool of questions for the three structuration constructs of signification, domination, and legitimation based on Giddens (1984), Orlikowski and Robey (1991), Mathieson, Peacock and Chin (2001), and Macintosh and Scapens (1990). We also used Karahanna, Straub and Chervany's (1999) work on social norms for legitimation. We measured all items on a seven-point Likert scale (1 = "strongly disagree"; 7 = "strongly agree").

We iteratively discussed and revised the questions to develop content validity. Two established structuration researchers unrelated to this study helped ensure content validity. Once we developed the initial set of question items, four other academics unrelated to the study participated in a sorting process to help establish construct validity of the scales. Each sorted the question items into groups of similar questions without an indication of the number or nature of the constructs of interest. The results of the sorting process indicated that the question items matched the *a priori* theoretical classifications. We interviewed these four academics and discussed the clarity of question items. As a result, we reworded several items and dropped others. We then conducted a pilot study using a sample of 31 Farmaco

employees experienced in using the KMS. Subsequently, we dropped several items. Table 6 shows the final items. We excluded the employees who participated in the pilot from the final study.

Table 6. Survey Constructs and Models

Item	Question	Loading	t
Loyal use			
Loy1	Use of the Field KM has become a part of my normal routine.	0.844	19.88
Loy2	I will continue using the Field KM.	0.880	31.85
Loy3	I recommend the Field KM to coworkers.	0.847	22.58
Signification			
Signi1	The Field KM helps me understand what is important in my job.	0.910	35.78
Signi2	The Field KM helps me better understand the role of being a better sales representative.	0.905	36.84
Signi3	Use of the Field KM has influenced how I accomplish my tasks.	0.827	15.91
Signi4	The Field KM has significantly impacted the way in which I communicate with my customers.	0.896	31.68
Domination			
Domin1	I am provided the resources necessary to use the Field KM.	0.833	19.11
Domin2	The company provides the necessary technology to use the Field KM.	0.842	19.33
Domin3	I can access technical help on how to use the Field KM.	0.786	12.61
Domin4	Use of the Field KM is supported by the company.	0.783	11.9
Legitimation			
Legit1	Using the Field KM is an appropriate use of my time.	0.811	19.68
Legit2	Top management thinks that I should use the Field KM.	0.726	8.392
Legit3	My coworkers think that I should use the Field KM.	0.818	18.91
Legit4	My immediate supervisor thinks that I should use the Field KM.	0.831	14.68
Note: "Field KM" was the name of the information system.			

4.2.2 Analytical Technique

We tested the model using SmartPLS, a components-based approach to structural equation modeling, because PLS is particularly well suited for exploratory research (Gefen, Rigdon, & Straub, 2011). We followed established procedures to assess convergent and discriminant validity (Gefen et al., 2011; Gefen & Straub, 2005); to ensure that the items used to measure each construct exhibited sound psychometric properties. While convergent validity deals with ensuring that items sufficiently capture the construct of interest, discriminant validity deals with whether items are more closely associated with items that are theoretically related than with other items. One can assess convergent validity by examining the outer model loadings (Table 6). The outer model loadings were all highly significant, which suggests convergent validity. We evaluated discriminant validity by examining both the pattern of inter-construct correlations and the square root of AVE (Table 7) and the factorial validity (Table 8) (Gefen et al., 2011). The factorial validity loadings between the items and their assigned latent constructs were at least one order of magnitude (.10) greater than the cross-loadings (Gefen & Straub, 2005). The inter-construct correlations and the square root of AVE demonstrated a clear pattern of discrimination between the constructs.

Common method variance (CMV) is a potential a threat to statistical findings in the behavioral sciences (Lindell & Whitney, 2001; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Consistent with Podsakoff et al. (2003), we used a combination of procedural and statistical remedies. We assured the respondents of complete confidentiality, a key component in reducing evaluation apprehension and social desirability. Additionally, we took great care to reduce question complexity and ambiguity, which minimizes the impetus for respondents to rely on implicit theories of meaning. Together, these procedural remedies serve to reduce the effect of CMV (Podsakoff et al., 2003). Once we had collected the data, we performed Harman's single-factor test. Using a confirmatory factor analysis, the unrotated solution resulted in four distinct factors. The variance was split across all four factors, and all of the factor loading for the first factor were below 0.80 (Nunnally & Bernstein, 1994), which indicates that no single factor accounted for a

preponderance of the variance in the data. In conjunction with the procedural remedies, this result suggests that CMV was not a significant risk.

Table 7. Construct Correlations

Construct	Mean	Std. Dev.	CR	LU	SIGNI	DOMIN	LEGIT
Loyal use	5.178	1.408	0.892	0.857			
Signification	4.712	1.487	0.935	0.588	0.885		
Domination	5.067	1.425	0.885	0.514	0.465	0.812	
Legitimation	5.347	1.284	0.874	0.633	0.611	0.533	0.797

CR: composite reliability; LU: loyal use; SIGNI: signification; DOMIN: domination and LEGIT: legitimation; the square root of AVE for each construct is in bold on the diagonal.

Table 8. Factorial Validity

	Loyal use	Signification	Domination	Legitimation
LOY1	0.844	0.508	0.405	0.529
LOY2	0.880	0.463	0.467	0.555
LOY3	0.847	0.540	0.449	0.542
SIGNI1	0.587	0.910	0.411	0.602
SIGNI2	0.531	0.905	0.412	0.565
SIGNI3	0.490	0.827	0.457	0.486
SIGNI4	0.458	0.896	0.362	0.494
DOMIN1	0.463	0.440	0.833	0.443
DOMIN2	0.440	0.367	0.842	0.405
DOMIN3	0.327	0.322	0.786	0.344
DOMIN4	0.416	0.364	0.783	0.524
LEGIT1	0.635	0.623	0.521	0.811
LEGIT2	0.339	0.309	0.326	0.726
LEGIT3	0.500	0.522	0.381	0.817
LEGIT4	0.465	0.407	0.426	0.831

4.3 Results

H1 posits that the modalities of signification, legitimation, and domination influence loyal use of the KMS. Figure 2 presents the results of our testing the structural model. The model explained 49 percent of the variance in loyal use. Cohen's f^2 is one measure of effect size with values greater than .35 considered large effects. The Cohen's f^2 in our study was .96. All three antecedents of loyal use were significant. We found the modalities of domination (.193, $p < .05$), signification (.279, $p < .05$), and legitimation (.360, $p < .001$) to all have a positive relationship with loyal use. Thus, we found support for H1a, H1b and H1c. In testing H1, we included all levels of employee experience. Thus, we can conclude that the structuration model is an appropriate model for explaining the consistent, ongoing, and routine loyal use.

H2 and H3 posit that the impact of these three factors differs between novices and highly experienced employees. We tested these hypotheses by spitting our sample into three groups and running the model separately on each group (see Table 9). We focused on novices (less than one year of experience) and highly experienced employees (five or more years of experience). The results for those with less than one year of job experience show that the modalities of legitimation and signification but not domination influenced loyal use. The beta for legitimation was significantly greater than the beta for domination ($t(212) = 5.48$, $p < .001$), but the beta for legitimation did not significantly differ from the beta for signification ($t(212) = 1.54$, $p = .120$). Thus, we found support for H2a but not H2b.

For those with five or more years of job experience, the modalities of signification and domination but not legitimation influenced loyal use. The beta for signification was significantly greater than the beta for legitimation ($t(133) = 3.19, p = .003$), but the beta for domination did not significantly differ from the beta for legitimation ($t(133) = 1.74, p = .088$). Thus, we found support for H3a but not H3b.

As an aside, we note that the results for those with moderate experience (1-4 years) show that the modalities of domination and legitimation but not signification influenced loyal use.

Figure 2. Survey Results

Table 9. The Impact of Job Performance

Structure and modality		Job performance		
		<1	1-4	5+
Signification (interpretive schemes)	beta	0.344	0.220	0.418
	t	3.789***	1.877	4.063***
Domination (resources)	beta	0.102	0.206	0.314
	t	1.074	2.129*	2.816**
Legitimation (norms)	beta	0.435	0.383	0.177
	t	4.324***	3.909***	1.541
Loyal use (R^2)		0.565	0.472	0.524
N		214	544	135

Note: * $p < .05$; ** $p < .01$; *** $p < .001$.

5 Discussion and Conclusions

We developed a structuration model of enterprise system use and tested it through two studies. The model argues that the fit between social structures and the enterprise system influences use and that this use (or non-use), in turn, influences social structures and the system as they both evolve over time. Our first study, a qualitative case study, suggests that the structuration model is useful in explaining the loyal use of a KMS and the evolution of the system and social structures over time. All three modalities of structure influenced use, although the structures of signification and legitimation may have been more influential than the structures of domination. Our second study, a quantitative survey of almost 900 users, showed that the structuration model explained 49 percent of the variation in loyal use (a very large effect size) and that all three modalities of structure had significant effects on use at one or more points in time. The modalities of signification and legitimation were significant for novices, while the modalities of signification and domination were significant for experts. We conclude that the social ecosystem surrounding an enterprise system plays a meaningful role in explaining its loyal use distinct from the individual and system characteristics of traditional cognitive psychology-based models.

The structures of signification include the stores of knowledge that influence interaction by enabling and constraining the way in which actors create meaning. Signification, and its interpretive schemes that influence action, was an important factor influencing loyal use in Study 1. In Study 2, it influenced loyal use for those with less than one year of job experience and those with five or more; it was non-significant for those with one to four years of experience. The information system we studied may have partially affected this result. This KMS, like many KMS, stores knowledge that users can reference, use, and act on in performing their work roles. The KMS provides knowledge that enables users to draw meaning by appropriating its content. The repeated appropriation of knowledge content itself reinforces the existing shared meaning through the reapplication of shared frames of reference. Because new sales representatives have to learn about being a sales representative, the meaning that they ascribe to the KMS likely varies from that of more experienced sales representatives. Sales representatives with five or more years of job experience have mastered their role of sales representative and they ascribe different meaning to the KMS: not as a tool to help them become a sales representative but to become a better sales representative.

The structures of legitimation encompass the social norms of legitimate or acceptable behavior. Social norms encourage acceptable behavior, while social sanctions constrain unacceptable behavior. Study 1 indicates that the structure of legitimation was useful in explaining loyal use. We found that the structures of legitimation were significant in explaining loyal use for novices and those with less than five years of experience. Prior research with cognitive models of use have observed that social norms are important in the initial adoption decision but that their impact fades away (usually to insignificance) the longer one uses an information system (Venkatesh et al., 2000b). The initial test of UTAUT, for example, found no significant effects of norms three months after system implementation except for four-way interactions with gender, age, and voluntariness (see time period T3 in Venkatesh et al., 2003). The same process likely occurred in our study. Our analysis shows that, for sales representatives with less than five years of job experience, the structures of legitimation were significantly associated with loyal use. Yet, as job experience increased, its importance decreased and became non-significant for those with five or more years of experience.

The structure of domination refers to the users' ability to marshal organizational resources (both physical (e.g., software, hardware) and human (e.g., staff members)) to accomplish their tasks. Users need hardware, software, training, and technical help resources for most information systems. Interestingly, Study 1 shows that the structures of domination alone were not sufficient to induce loyal use. Study 2 shows that dominance had no significant effect on novice users who comprised about 25 percent of our sample but did have significant effects on the remaining 75 percent who had more than one year of experience. The subjects had varying degrees of training and they used multiple hardware configurations (laptop, desktop) and networks to connect to the KMS (wired, wireless, and mobile). Overall, resources had a significant impact on loyal use but had a much smaller impact than the other two structures.

Our structuration model explains 49 percent of loyal use with a very large effect size. Structuration theory (Giddens 1984) draws from sociology and focuses on social structures and human action. This model provides a unique lens that we can use to study the ongoing routine use of information systems over the years following the initial adoption. The structuration model is parsimonious in that it has only three terms. We view the structuration model as a useful alternative to cognitive-based models.

Prior research in information systems that has used structuration theory has almost exclusively used qualitative methods (Jones & Karsten, 2008; Pozzebon & Pinsonneault 2005). Structuration theory is inherently a process theory (Jones & Karsten, 2008; Pozzebon & Pinsonneault, 2005) in which time plays a critical role, which makes it difficult to study using quantitative methods (Markus & Robey 1988; Pozzebon & Pinsonneault, 2005).

We argue that one can use our model predict behavior, which we believe is a major step forward in the use of structuration theory. Giddens has openly criticized positivism (Giddens, 1984; Jones & Karsten, 2008) but has expressed support for the use positivist methods (see Giddens, 1984, 1991; Jones & Karsten 2008)). We agree with Giddens (1984) that every action contains the seeds of change, so that structures do not "cause" behavior in a deterministic manner (individuals always have the choice to do otherwise). Nonetheless, many structures in everyday life are *temporarily stable* routines—habitually enacted rules and resources that re-occur time and again (Giddens, 1984; Jones & Karsten, 2008). We argue that we can understand the routine structures likely to be enacted at a point in time and to understand how those structures are likely to enable and constrain behavior. We conclude that one can predict the action that agents are likely, but not certain, to perform when there are no exogenous changes.

Our model uses a different lens to examine use. Rather than “intention to use” or some quantitative measure of use, we focus on loyal use, the extent to which the system has been incorporated into an individual’s routine behavior and that that individual would advocate its use (i.e., use is not coerced) (Abraham et al., 2013). The modality of signification is clearly distinct from constructs in prior research on adoption and use. It focuses on the extent to which an individual’s interpretive schemes that an individual uses to understand a situation influence loyal use. In contrast, one might argue the modality of domination (resources) is similar to facilitating conditions and the modality of legitimation (norms) is similar to social norms. A comparison of definitions between these concepts (see Table 1) shows some differences (e.g., structures of legitimation include rules, while social norms from UTAUT focuses only on the beliefs of others), but they do share some commonality at their core.

So what’s new and different here? We argue that our research makes three contributions. First and foremost, at a theoretical level, our study presents a theoretically consistent set of three constructs from sociology’s structuration theory theorized to influence the adoption and loyal use of an information system. Prior research has individually examined constructs related to this set of three constructs, but Giddens (1984) argues that, while it is possible to separate the three constructs analytically, it makes little sense to use one or two of them without the other(s) because they are inextricably linked. Thus, traditional models of IT adoption, which have come from different roots in cognitive psychology and have retroactively incorporated concepts related to two of structuration theory’s three constructs (facilitating condition and social norms), lack a key theoretical construct: the modality of signification (interpretive schemes).

Second, at an empirical level, our study draws different and more parsimonious conclusions about what factors matter to long term use. The three constructs of structuration theory explained 49 percent of the variance in loyal use—a very large effect size compared to UTAUT that required about 40 terms to explain 36-44 percent of the variance in use over time in the Venkatesh et al. (2003) study (see time period T3 in Tables 17 and 21). Using structuration and its focus on loyal use leads to different conclusions than those of prior research that has focused on intentions and use around the initial adoption of a new technology. All three structures had significant effects overall, but the modalities of legitimation and signification were most important for novices, while the modalities of signification and domination were most important for those with five or more years of experience. In contrast, research with UTAUT concludes that facilitating conditions and social norms have little impact except for specific demographic groups.

Third, our study shows that job experience (not technology experience) is an important moderating factor in how the three modalities of structure influence the adoption and use of enterprise systems. The relative importance of the three modalities differed by job experience. For novices, interpretive schemes and norms had the strongest impact on loyal use; for junior sales representatives, it was resources and norms; for experts, resources and interpretive schemes. All participants held the same job role with the same responsibilities and reward structure; thus, we can attribute the differences to their stocks of knowledge as they gained more experience over the years. For novices with little knowledge, their interpretive schemes and the norms of those around them influenced behavior; resources played a smaller role because they had little control over them. With modest knowledge, the ability to command resources (i.e., power) replaced interpretive schemes, while norms remained influential. With five years of knowledge, the individual’s own interpretive schemes replaced the norms of others, and power remained influential.

We focused on the structures that affected use rather than those that affected development, but, in order to understand use, we also examined the structures that affected development in Study 1. One of the interesting aspects of this was the way in which the structures of signification influenced the development of the system. The first KMS was conceived of as a knowledge community, and this decision strongly shaped the first system and the features it offered, which we believe suggests that the structures of signification that are missing from cognitive-based models are more important than they at first appear.

5.1 Limitations

This study has several limitations. We conducted the study in one organization with a focus on a single system with a single population of users. A KMS used by pharmaceutical sales representatives may or may not be representative of other enterprise systems, other types of enterprise system users, or other industries. As is common, in our qualitative study, we could only interview only a small number of respondents, so of the study may or may not reflect the entire organization. As is common with quantitative studies, we focused on a larger set of respondents but only at one point in time.

One theoretical limitation of the structuration model is that it focuses on adoption and use behavior after routines in the social ecosystem have been established. So, while it may still be useful for studying adoption of new technologies, it will be less useful for research on newly formed organizations or organizational units that do not have well-formed social structures. Following the advice of Giddens (1984), we separated the modalities of structure into three separate structures (signification, legitimation, domination) for the purposes of analysis and draw conclusions for each, although the three are inextricably linked in practice.

5.2 Implications for Research

Notwithstanding these limitations, we believe that our work suggests six important implications for future research. First, we believe our structuration model is a viable alternative to the traditional cognitive psychology-based models of technology adoption. We simply initially test the model in this paper. Although it proved useful in explaining loyal use, we need to test the structuration model in different organizations using different information systems to understand its boundaries. KMS are inherently social technologies because they capture, share, and influence work processes. Would the structuration model explain the loyal use of technologies targeted at individual use, such as decision support systems or individual use consumer computing devices such as FitBits, tablets, or remote sensing drones?

Second, social structures appear to be as salient as the characteristics of the system itself in explaining loyal use. Perhaps social structures are more salient than system characteristics given that the structuration model explained about half the variance in loyal use, which implies that the remaining results from the combined effects of system and user characteristics. We need more research to understand the impacts of system and individual characteristics in the presence of the social structures in the ecosystem.

Third, one of the strengths—or weaknesses depending on one's point of view—of our structuration model is that it is agnostic toward the technology of interest; it applies to KMS or other enterprise systems without considering the specific characteristics of the system itself. Much research has examined factors that influence the adoption and/or use of the focal system in this study (i.e., a KMS) (e.g., Kankanhalli et al., 2005; Wasko & Faraj, 2005). This research shows that certain context specific factors influence the use of KMS, such as social capital, organizational rewards, knowledge self-efficacy, and a desire to help others. Future research should link these context specific factors to the three constructs in our model in much the same way Wixom and Todd (2005) added antecedent system and information characteristics to TAM.

Fourth, the temporal perspective has been an important impact in understanding use. With the cognitive models of use, there are theoretical differences between the initial intent to adopt an information system and its continued use (e.g., TAM, continuance), which is not true for the structuration model because the same set of three theoretical structuration modalities affect loyal use whether the system is new or not, although the exact nature of the structures and their relative impact may differ over time. Both Study 1 (which looked at the adoption of new systems) and Study 2 (which looked at routine use) show that all three structuration modalities are important. We need more research to better understand if the impacts of these modalities change over time from initial adoption to ongoing long-term use. Technologies enable and constrain actions, so they have the ability to change the social structures that those actions create. We saw changes to social structures when the official communication channels were changed from paper to the KMS at T+1 and updates could be prepared simply and cheaply; thus, regular updates to knowledge became an institutionalized practice. We need more research on how systems change structures.

Fifth, loyal use is a nuanced type of system use, one that suits social systems such as KMS well. It goes beyond traditional perspectives of use that build on the frequency of use of and the breadth of features used to use that is a part of a consistent, habitual routines of use and where the users advocates for use by others.

Finally, we found all three modalities of structure to influence loyal use but to have different impacts for employees with different job experience. One key difference from prior research is our use of job experience rather than technology experience. Job experience was particularly relevant in our structuration view of technology because of our focus on performing work with technology rather than on adopting technology for work—a subtle but important distinction. The three modalities of structure had different effects for employees with different job experience. It may be that these impacts are fundamental and that they could be found with other settings, participants, and systems. We need more research to

understand the relative impacts of the three modalities on loyal use for employees with different job experiences.

5.3 Implications for Practice

We believe that this study has important implications for practice. The advice to managers from prior research would be to improve the usefulness and ease of use of the system and to emphasize one over the other depending on the user's gender, age, and technology experience (Venkatesh et al., 2003). In the era of packaged systems, such advice may not prove terribly helpful because organizations cannot easily change the characteristics of packaged systems they purchase. Prior system acceptance research concludes that facilitating conditions and social norms are *not* important factors influencing the intent to use a system for most segments of the user population (Venkatesh et al., 2003).

In contrast, our research suggests three quite different actions that managers can take to increase the likelihood of loyal use. First, managers need to focus on power and the organizational resources provided to users in support of the system (e.g., hardware, software, training and support staff). Aside from the direct effects that these resources provide, the ability to allocate resources indicates the power of the system and the resources its proponents command in the organization. The provision of resources is important for employees with more job experience but is less likely to have an impact on novices.

Second, managers should help create social norms that legitimize use of the system. Managers can create norms that demonstrate that management values system use and that its use is an appropriate way for employees to spend their time. It is harder for managers to shape norms that peers enact but they are also important. Norms are important for novices and those with moderate job experience but are less likely to influence experts.

Third, managers can shape the role the system plays in the interpretive schemes that individuals use in creating meaning for their work. Users typically do not think of themselves as system users (Lamb & Kling, 2003); instead, they see themselves as professionals, workers, managers, and so on. In their capacity as professionals and so on, users draw on interpretive schemes to create meaning. To the extent that use of the system helps users understand and interpret their work and create meaning in performing it, system use will more likely to become a routine part of that work. Interpretive schemes are important for novices and highly experienced employees but less important for those with moderate job experience.

In conclusion, an enterprise's system fit to the social ecosystem around it shapes the loyal use of it. By actively engaging the modalities of signification (interpretive schemes), domination (resources), and legitimation (norms) and attempting to shape them to better enable the use of the system, it may be possible to understand the successful and unsuccessful deployment of enterprise systems and to engender greater loyal use of them.

References

- Abraham, C., Boudreau, M.-C., Junglas, I., & Watson, R. (2013). Enriching our theoretical repertoire: The role of evolutionary psychology in technology acceptance. *European Journal of Information Systems*, 22(1), 56-75.
- Agustin, C., & Singh, J. (2005). Curvilinear effects of consumer loyalty determinants in relational exchanges. *Journal of Marketing Research*, 42(1), 96-108.
- Al-Gahtani, S. S., Hubona, G. S., & Wang, J. (2007). Information technology (IT) in Saudi Arabia: Culture and the acceptance and use of IT. *Information & Management*, 44(207), 681-691.
- Alavi, M., & Leidner, D. (1999). Knowledge management systems: Issues challenges and benefits. *Communication of AIS*, 1, 1-37.
- Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, 25(1), 107-136.
- Armstrong, C. P., & Sambamurthy, V. (1999). Information technology assimilation in firms: The influence of senior leadership and IT infrastructures. *Information Systems Research*, 10(4), 304-327.
- Backhouse, J., Hsu, C., & Silva, L. (2006). Circuits of power in creating de jure standards: Shaping an international information systems security standard. *MIS Quarterly*, 30(1), 413-438.
- Bagozzi, R. (2007). The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems*, 8(4), pp. 244-254.
- Benbasat, I., & Barki, H. (2007). Quo vadis tam? *Journal of the Association for Information Systems*, 8(4), 211-218.
- Bhattacharjee, A. (2000). Acceptance of e-commerce services: The case of electronic brokerages. *IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Humans*, 30(4), 411-420.
- Bhattacharjee, A. (2001). Understanding Information Systems Continuance: An Expectation-Confirmation Model. *MIS Quarterly* (25:3), 351-370.
- Bhattacharjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: A theoretical model and longitudinal tests. *MIS Quarterly*, 28(2), 229-254.
- Bock, G., Kankanhalli, A., & Sharma, S. (2006). Are norms enough? The role of collaborative norms in promoting organizational knowledge seeking. *European Journal of Information Systems*, 15, 357-367.
- Boland, R. (1996). Why shared meanings have no place in structuration theory: A reply to Scapens and Macintosh. *Accounting Organizations & Society*, 21(7/8), 691-697.
- Brown, J. S., & Duguid, P. (1998). Organizing knowledge. *California Management Review*, 40(3), 90-11.
- Brown, S. A., Dennis, A. R., & Venkatesh, V. (2010). Predicting collaboration technology use: Integrating technology adoption and collaboration research. *Journal of Management Information Systems*, 27(2), 9-54.
- Burton-Jones, A., & Straub, D. W. (2006). Reconceptualizing system usage: An approach and empirical test. *Information Systems Research*, 17(3), 228-246.
- Caldeira, M. M., & Ward, J. M. (2003). Using resource-based theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises. *European Journal of Information Systems*, 12(2), 127-141.
- Chi, M. T. H., Glaser, R., & Farr, M. J. (1988). *The nature of expertise*. London: Lawrence Erlbaum Associates.
- Chin, W., Gopal, A., & Salisbury, W. (1997). Advancing the theory of adaptive structuration: The development of a scale to measure faithfulness of appropriation. *Information Systems Research*, 8(4), 342-367.

- Chow, S., & Holden, R. (1997). Toward an understanding of loyalty: The moderating role of trust. *Journal of Managerial Issues*, 9(3), 275-298.
- Davis, F. (1989). Perceived usefulness perceived ease of use and user acceptance of information technology. *MIS Quarterly*, 13(3), 318-340.
- Davis, F., Bagozzi, R., & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982-1002.
- Dennis, A. R., & Vessey, I. (2005). Three knowledge management strategies: Knowledge hierarchies, knowledge markets, and knowledge communities. *MIS Quarterly Executive*, 4(4), 399-412.
- DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity of advanced technology use: Adaptive structuration theory. *Organization Science*, 5(2), 121-147.
- DiMicco, J., Millen, D. R., Geyer, W., Dugan, C., Brownholtz, B., & Muller, M. (2008). Motivations for social networking at work. In *Proceedings of the ACM Conference on Computer Supported Cooperative Work* (pp. 711-720).
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior*. Reading, MA: Addison-Wesley.
- Galletta, D. F., Henry, R. M., McCoy, S., & Polak, P. (2006). When the wait isn't so bad: The interacting effects of website delay, familiarity, and breadth. *Information Systems Research*, 17(1), 20-37.
- Gallivan, M., Spitler, V., & Koufaris, M. (2005). Does information technology training really matter? A social information processing analysis of coworkers' influence on IT usage in the workplace. *Journal of Management Information Systems*, 22(1), 153-192.
- Gefen, D., Rigdon, E., & Straub, D. (2011). An update and extension to SEM guidelines for administrative and social science research. *MIS Quarterly*, 35(2), iii-xiv.
- Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-graph: Tutorial and Annotated example. *Communication of the Association for Information Systems*, 16, 91-109.
- Gersick, C., & Hackman, J. (1990). Habitual routines in task-performing groups. *Organizational Behavior and Human Decision Processes*, 47(1), 65-97.
- Giddens, A. (1979). *Central problems in social theory: Action, structure and contradiction in social analysis*. London: Macmillan.
- Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. London: Macmillan.
- Giddens, A. (1987). *Social theory and modern sociology*. Cambridge: Polity Press.
- Giddens, A. (1991). *Modernity and self-identity: Self and society in the late modern age*. Cambridge: Polity Press.
- Giddens, A. (2013). *The constitution of society: Outline of the theory of structuration*. New York: John Wiley & Sons.
- Grover, V., & Davenport, T. (2001). General perspectives on knowledge management: Fostering a research agenda. *Journal of Management Information Systems*, 18(1), 5-21.
- Haines, M. N., Goodhue, D. L., & Gattiker, T. F. (2006). Fit between strategy and IS specialization: A framework for effective choice and customization of information system application modules. *Information Resources Management Journal*, 19(3), 34-47.
- Hansen, M., Nohira, N., & Tierney, T. (1999). What's Your Strategy for Managing Knowledge. *Harvard Business Review*. Retrieved from <https://hbr.org/1999/03/whats-your-strategy-for-managing-knowledge>
- Heracleous, L., & Barrett, M. (2001). Organizational change as discourse: Communicative actions and deep structures in the context of IT implementation. *Academy of Management Journal*, 44, 755-778.
- Hong, W., Thong, J. Y. L., Chasalow, L. C., & Dhillon, G. (2011). User acceptance of agile information systems: A model and empirical test. *Journal of Management Information Systems*, 28(1), 235-272.
- Hsiao, C. H., & Yang, C. (2011). The intellectual development of the technology acceptance model: A co-citation analysis. *International Journal of Information Management*, 31(2), 128-136.

- Hung, S. (2004). Explaining the process of innovation: The dynamic reconciliation of action and structure. *Human Relations*, 57(11), 1479-1497.
- Jarzabek, S. (1993). Domain model-driven software reengineering and maintenance. *Journal of Systems and Software*, 20(1), 37-51.
- Jasperson, J., Carte, T., Saunders, C., Butler, B., Croes, H., & Zheng, W. (2006). Power and information technology research: A metatriangulation review. *MIS Quarterly*, 26(4), 397-459.
- Jasperson, J., Carter, P. E., & Zmud, R. W. (2005). A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems. *MIS Quarterly*, 29(5), 525-557.
- Jennex, M. E. (2005). What is knowledge management? *International Journal of Knowledge Management*, 1(4), i-iv.
- Jennex, M. E. (2008). Exploring system use as a measure of knowledge management success. *Journal of Organizational and End User Computing*, 20(1), 50-63.
- Jennex, M. E., & Olfman, L. (2006). A model of knowledge management success. *International Journal of Knowledge Management*, 2(3), 51-68.
- Jennex, M. E., Smolnik, S., & Croasdell, D. (2012). Where to look for knowledge management success. In *Proceedings of the 45th Annual Hawaii International Conference on System Sciences*.
- Jones, M., & Karsten, H. (2008). Review: Giddens's structuration theory and information systems research. *MIS Quarterly*, 32(1), 127-157.
- Kankanhalli, A., Tan, B. C. Y., & Wei, K. K. (2005). Contributing knowledge to electronic repositories: An empirical investigation. *MIS Quarterly*, 29(1), 113-143.
- Kaplowitz, M. D., Hadlock, T. D., & Levine, R. (2004). A comparison of Web and mail survey response rates. *Public Opinion Quarterly*, 68(1), 94-101.
- Ke, W., Tan, C. H., Sia, C. L., & Wei, K. K. (2013). Inducing intrinsic motivation to explore the enterprise system: The supremacy of organizational levers. *Journal of Management Information Systems*, 29(3), 257-289.
- Kim, J., Forsyth, S., Gu, Q., & Moon, S. (2002). Cross-cultural consumer values needs and purchase behavior. *The Journal of Consumer Marketing*, 19(6), 481-502.
- Kim, S. S., & Malhotra, N. K. (2005). A longitudinal model of continued IS use: An integrative view of four mechanisms underlying postadoption phenomena. *Management Science*, 51(5), 741-755.
- Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, 23(1), 67-94.
- Ko, D. G., & Dennis, A. R. (2011). Profiting from knowledge management: The impact of time and experience. *Information Systems Research*, 22(1), 134-152.
- Kolodner, J. L. (1983). Towards an understanding of the role of experience in the evolution from novice to expert. *International Journal of Man-Machine Studies*, 19, 497-518.
- Kulkarnin, U. R., Ravindrin, S., & Freeze, R. (2006). A knowledge management success model: Theoretical development and empirical validation. *Journal of Management Information Systems*, 23(3), 309-347.
- Kuo, R.-Z., Lai, M.-F., & Lee, G.-G. (2011). The impact of empowering leadership for KMS adoption. *Management Decision*, 49(7), 1120-1140.
- Kuo, R.-Z., & Lee, G.-G. (2009). KMS adoption: The effects of information quality. *Management Decision*, 47(10), 1633-1631.
- Ladik, D. M., Carrillat, F. A., & Solomon, P. J. (2007). The effectiveness of university sponsorship in increasing survey response rate. *Journal of Marketing Theory and Practice*, 15(3), 263-271.
- Lamb, R., & Kling, R. (2003). Reconceptualizing users as social actors in information systems research. *MIS Quarterly*, 27(2), 197-235.

- Lee, A. S. (1989). A scientific methodology for MIS case studies. *MIS Quarterly*, 13(1), 33-50.
- Lee, O.-K., Wang, M., Lim, K., & Peng, Z. (2009). Knowledge management systems diffusion in Chinese enterprises: A multistage approach using the technology-organization-environment framework. *Journal of Global Information Management*, 17(1), 70-84.
- Lee, R., & Ryu, Y. (1995). Dx: A deontic expert system. *Journal of Management Information Systems*, 12(1), 145-169.
- Lewis, B., & Soureli, M. (2006). The antecedents of consumer loyalty in retail banking. *Journal of Consumer Behavior*, 5(1), 15-31.
- Liang, H., Peng, Z., Xue, Y., Guo, X., & Wang, N. (2015). Employees' exploration of complex systems: An integrative view. *Journal of Management Information Systems*, 32(1), 322-357.
- Limayem, M., Hirt, S. G., & Cheung, C. M. K. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quarterly*, 31(4), 705-737.
- Lin, H.-F. (2014). Contextual factors affecting knowledge management diffusion in SMEs. *Industrial Management & Data Systems*, 114(9), 1415-1437.
- Lin, H. (2006). Understanding behavioral intention to participate in virtual communities. *CyberPsychology & Behavior*, 9(5), 540-547.
- Lindell, M., & Whitney, D. (2001). Accounting for common method variance in cross-sectional designs. *Journal of Applied Psychology*, 86(1), 114-121.
- Lucas, H., & Spittler, V. (1999). Technology use and performance: A field study of broker workstations. *Decision Sciences*, 30(2), 291-311.
- Macintosh, N., & Scapens, R. (1990). Structuration theory in management accounting. *Accounting Organizations and Society*, 15(5), 455-477.
- Mathieson, K., Peacock, E., & Chin, W. (2001). Extending the technology acceptance model: The influence of perceived user, *The Data Base for Advances in Information Systems*, 32(3), 86-113.
- Marks, P., Polak, P., McCoy, S., & Galletta, D. (2008). Sharing knowledge. *Communications of the ACM*, 51(2), 60-65.
- Markus, M., & Robey, D. (1988). Information technology and organizational change: Causal structure in theory and research. *Management Science*, 34(5), 583-598.
- Markus, M. L. (1983). Power, politics, and MIS implementation. *Communications of the ACM*, 26(6), 430-444.
- Markus, M. L. (2001). Toward a theory of knowledge reuse: Types of knowledge reuse situations and factors in reuse success. *Journal of Management Information Systems*, 18(1), 57-93.
- Maruping, L. M., & Magni, M. (2012). What's the weather like? The effect of team learning climate, empowerment climate, and gender on individual's technology exploration and use. *Journal of Management Information Systems*, 29(1), 79-113.
- McEnrue, M. P. (1988). Length of experience and the performance of managers in the establishment phase of their careers. *Academy of Management Journal*, 31(1), 175-184.
- McGrath, J. E., Martin, J., & Kulka, R. A. (1982). *Judgment calls in research*. Beverly Hills: Sage.
- Mercier, S. (2001). Gotta keep the customer satisfied. *Journal of Banking and Financial Services*, 114(1), 36-37.
- Mingers, J. (2001). Combining IS research methods: Towards a pluralist methodology. *Information Systems Research*, 12(3), 240-259.
- Morris, M. G., Speier, C., & Hoffer, J. A. (1999). An examination of procedural and object-oriented systems analysis methods: Does prior experience help or hinder performance? *Decision Sciences*, 30(1), 107-136.
- Nelson, K. M., Nadkarni, S., Narayanan, V. K., & Ghods, M. (2000). Understanding software operations support expertise: A revealed causal mapping approach. *MIS Quarterly*, 24(3), 475-507.

- Nordstrom, R., & Swan, J. (1976). Does a change in customer loyalty occur when a new car agency is sold? *Journal of Marketing Research*, 13(2), 173-177.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. New York, NY: McGraw-Hill.
- Oliver, R. (1999). Whence consumer loyalty. *Journal of Marketing*, 63, 33-44.
- Orlikowski, W. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3(3), 398-427.
- Orlikowski, W., & Robey, D. (1991). Information technology and the structuring of organizations. *Information Systems Research*, 2(2), 143-169.
- Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science*, 11(4), 404-428.
- Orlikowski, W. J., & Iacono, C. S. (2001). Desperately seeking the IT in IT research—a call to theorizing the IT Artifact. *Information Systems Research*, 12(2), 121-134.
- Ortiz de Guinea, A., & Markus, M. L. (2009). Why break the habit of a lifetime? Rethinking the roles of intention, habit, and emotion in continuing information technology Use. *MIS Quarterly*, 33(3), 433-444.
- Po-An Hsieh, J. J., Rai, A., & Xin Xu, S. (2011). Extracting business value from IT: A sensemaking perspective of post-adoptive use. *Management Science*, 57(11), 2018-2039.
- Podsakoff, P., MacKenzie, S., Lee, J., & Podsakoff, N. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
- Poole, M. S. (2009). Response to Jones and Karsten. *MIS Quarterly*, 33(3), 583-587.
- Poole, M. S., & DeSanctis, G. (2004). Structuration theory in information systems research: Methods and controversies. In M. E. Whitman & A. B. Wozzyczynski (Eds.), *The Handbook of information systems research* (pp. 206-249). Hershey, PA: Idea Group.
- Pozzebon, M., & Pinsonneault, A. (2005). Challenges in conducting empirical work using structuration theory: Learning from IT research. *Organization Studies*, 26(9), 1353-1376.
- Rensel, A., Abbas, J., & Rao, H. (2006). Private transactions in public places: An exploration of the impact of computer environment on public transactional web site use. *Journal of the Association for Information Systems*, 7(1), 19-51.
- Repenning, N. P., & Sterman, J. D. (2002). capability traps and self-confirming attribution errors in the dynamics of process improvement. *Administrative Science Quarterly*, 47(2), 265-295.
- Sabherwal, R., Jeyaraj, A., & Chowa, C. (2006). Information system success: Individual and organizational determinants. *Management Science*, 52(12), 1849-1864.
- Saga, V., & Zmud, R. W. (1994). The nature and determinants of information technology acceptance, routinization and infusion. In L. Levine (Ed.), *Diffusion, transfer and implementation of information technology* (pp. 67-86). New York: North-Holland.
- Shanteau, J. (1988). Psychological characteristics and strategies of expert decision makers. *Acta Psychologica*, 68, 203-215.
- Sherif, K., & Vinze, A. (2003). Barriers to adoption of software reuse: A qualitative study. *Information & Management*, 41(2), 159-175.
- Singh, S. K. (2008). Role of leadership in knowledge management: A study. *Journal of Knowledge Management*, 12(4), 3-15.
- Srivastava, L. (2004). Japan's ubiquitous mobile information society. *The Journal of Policy Regulation and Strategy for Telecommunications*, 6(4), 234-251.
- Stafford, T. F., & Turan, A. H. (2011). Online tax payment systems as an emergent aspect of governmental transformation. *European Journal of Information Systems*, 20(3), 343-357.

- Stern, B. B., & Stafford, M. R. (2006). Individual and social determinants of winning bids in online auctions. *Journal of Consumer Behaviour*, 5(1), 43-55.
- Sternberg, R. J. (1997). Cognitive conceptions of expertise. In P. J. Feltovich & K. M. Ford (Eds.), *Expertise in context: Human and machine* (pp. 149-162). Cambridge, MA: MIT Press.
- Stewart, K., & Gosain, S. (2006). The impact of ideology on effectiveness in open source software development teams. *MIS Quarterly*, 30(2), 291-314.
- Stones, R. (2005). *Structuration theory*. New York, NY: Palgrave Macmillan.
- Straub, D., & Burton-Jones, A. (2007). Veni vidi vici: Breaking the TAM logjam. *Journal of the Association for Information Systems*, 8(4), 223-229.
- Suchan, J. (2001). The effect of interpretive schemes on videoteleducation's conception, implementation and use. *Journal of Business and Technical Communication*, 15(2), 133-163.
- Sykes, T. A., Venkatesh, V., & Gosain, S. (2009). Model of acceptance with peer support: A social network perspective to understanding employees' system use. *MIS Quarterly*, 33(2), 371-393.
- Tan, M., & Teo, T. S. H. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for Information Systems*, 1(5), 1-42.
- Taylor, S., & Todd, P. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, 6(2), 144-177.
- Tost, L. P., Gino, F., & Larrick, R. P. (2012). Power, competitiveness, and advice taking: Why the powerful don't listen. *Organizational Behavior & Human Decision Processes*, 117(1), 53-65.
- Tsai, H. T., & Bagozzi, R. P. (2014). Contribution behavior in virtual communities: Cognitive emotional, and social influences. *MIS Quarterly*, 38(1), 143-163.
- Tucker, W. (1964). The development of brand loyalty. *Journal of Marketing Research*, 1(3), 32-35.
- Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature review. *Information and Software Technology*, 52(5), 463-479.
- van Offenbeek, M., Boonstra, A., & Seo, D. (2013). Towards integrating acceptance and resistance research: Evidence from a telecare case study. *European Journal of Information Systems*, 22(4), 434-454.
- Van Overschelde, J. P., & Healy, A. F. (2001). Learning of nondomain facts in high- and low-knowledge domains. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 27(5), 1160-1171.
- Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control intrinsic motivation and emotion into the technology acceptance model. *Information Systems Research*, 11(4), 342-365.
- Venkatesh, V., Brown, S. A., & Bala, H. (2013). Guidelines for conducting mixed methods research in information systems. *MIS Quarterly*, 37(1), 21-54.
- Venkatesh, V., & Davis, F. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204.
- Venkatesh, V., Davis, F., & Morris, M. (2000a). Why don't men every stop to ask for directions? Gender social influence and their role in technology acceptance and usage behavior. *MIS Quarterly*, 24(1), 115-139.
- Venkatesh, V., Davis, F., & Morris, M. (2007). Dead or alive? The development trajectory and future of technology adoption research. *Journal of the Association for Information Systems*, 8(4), 267-286.
- Venkatesh, V., Morris, M., & Ackerman, P. (2000b). A longitudinal field investigation of gender differences in individual technology adoption decision making processes. *Organizational Behavior and Human Decision Processes*, 83(1), 33-60.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.

- Venkatesh, V., & Thong, J. K. L. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157-178.
- Venkatesh, V., Thong, J. Y. L., Chan, F. K. Y., Hu, P. J.-H., & Brown, S. A. (2011). Extending the two-stage information systems continuance model: Incorporating UTAUT predictors and the role of context. *Information Systems Journal*, 21(6), 527-555.
- Wakefield, R. L., Wakefield, K. L., Baker, J., & Wang, L. C. (2011). How website socialness leads to website use. *European Journal of Information Systems*, 20(1), 118-132.
- Walsham, G. (2002). Cross-cultural software production and use: A structuration analysis. *MIS Quarterly*, 24(4), 350-380.
- Wang, Y., Meister, D. B., & Gray, P. H. (2013). Social influence and knowledge management systems use: evidence from panel data. *MIS Quarterly*, 37(1), 299-313.
- Wasko, M., & Faraj, S. (2005). Why should i share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29(1), 35-57.
- Watson, S., & Hewett, K. (2006). A multi-theoretical model of knowledge transfer in organization: Determinants of knowledge contribution and knowledge reuse. *Journal of Management Studies*, 43(2), 141-173.
- Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research*, 16(1), 85-102.
- Zhang, X., Prybutok, V., & Koh, C. (2006). The role of impulsiveness in a TAM-based online purchasing behavior model. *Information Resources Management Journal*, 19(2), 54-68.

Appendix A: KMS Evolution at Farmaco

5.4 The First KMS

The development of the sales KMS began in the April three years prior to our first interview (year T-3). The senior vice president responsible for the U.S. business unit recognized the need to improve knowledge sharing among the sales force. Because of the knowledge-intensive nature of the drug selling process and the fact that many of the sales representatives were new college hires with no prior experience, he decided it was important to provide key knowledge that sales representatives needed through the KMS.

An IT manager led the team that developed the initial KMS with specialists from the IT group. They began by developing a knowledge management strategy for the sales force. The team worked closely with consultants from a leading consulting firm with an expert knowledge management practice to design the initial strategy and the KMS itself. Together, they concluded that a knowledge community strategy best fit the needs (Brown & Duguid, 1998; Dennis & Vessey, 2005).

With this strategy, the organization chooses to treat knowledge as a communal good shared among members of communities who have a common interest (Dennis & Vessey, 2005). With this strategy, the sales representatives would create, share, and reuse knowledge as they saw fit. Separate communities were created for different clusters of drugs since each had slightly different needs. Each community had a coordinator (a member of the KMS team) who assisted knowledge contributors and knowledge seekers and ensured that the knowledge and its structure were useful and appropriate. The organization provided online tutorials as guides to help users learn the KMS software.

The organization deployed the first version of the KMS in May of T-2. It deployed the system by division as the sales representatives attended the annual sales meetings held by each division. During the meeting, the IT group installed the software on the sales representatives' laptops and the KMS team trained sales representatives on how to use the KMS software. Following the knowledge community strategy in which the community (i.e., the sales representatives) had responsibility over creating knowledge, the KMS contained no initial knowledge. Sales management supported the deployment, but the sales representatives perceived KMS as an IT initiative not a sales initiative; some sales divisions supported it more than others.

The organization completed the rollout to all sales representatives before the end of the May, and they began using the KMS. The results were disappointing. After six months, the several thousand sales representatives had contributed a total of only 35 items across the entire KMS. The KMS had been built with a belief that "if you build it, they will come", but, unfortunately, after it had been built, the sales representatives did not come; less than one percent contributed knowledge. It was clearly a failure; there was no knowledge community.

5.5 The Second KMS

In February of T-1, the organization appointed a new KMS manager—a district sales manager with many years of field experience. He began by hiring several experienced sales representatives and brand marketing associates from both inside and outside the firm into his KMS group. He retained a few of the prior KMS team with IT experience in the KMS group, but most moved on to other IT groups in the firm. He fired the consultants.

The KMS manager adopted a very different approach from the previous system. To him, the success of a KMS was "75 percent behavior change among the target users, 20 percent business process change, and 5 percent technology; however, that 5 percent better work". He and the rest of the KMS team went throughout the U.S. business unit to talk with sales representatives, sales managers, and key opinion leaders to learn what they needed from the KMS and to sell the idea of knowledge sharing. Based on these discussions, they came to understand that the knowledge community strategy failed because it was the wrong strategy for an organization with the multiple divisions and thousands of sales representatives.

Instead, the KMS manager came to see knowledge as *product* and the sales representatives as potential consumers. Once in this mindset, the KMS team set about to develop and sell the KMS product as they would any other product; after all, they were experienced sales managers and brand managers with many

years of experience, so designing and selling consumer products was their expertise. They changed the KMS mission from one of promoting the sharing of knowledge among sales representatives to one of designing and building both *the knowledge content* and *the KMS structure* to deliver it.

They shifted from a knowledge community strategy to a knowledge hierarchy strategy (Dennis & Vessey, 2005). With a knowledge hierarchy strategy, an organization chooses to treat knowledge as a product that it formally creates, develops, and distributes to achieve a specific organizational goal (Dennis & Vessey, 2005). The knowledge in the KMS is designed to fit the specific mission of the organizational unit for which it is developed and is intended to be the single source of most relevant knowledge in its scope. Providing knowledge becomes a formal process in the same way that the firm provides IT support, communications support, and other key organizational resources. A KMS based on a knowledge hierarchy strategy is intended to formalize and embed organizational routines and practices that govern the way the unit conducts its business (Dennis & Vessey, 2005). Embedding an organizational practice in a KMS is a way of ensuring that all individuals in the unit perform work according to accepted practices.

The new KMS team “branded” the KMS in a new way and shifted its key focus to provide best practice guidelines for how sales representatives should conduct sales, accompanying concepts that explained the guidelines, and a set of underlying values and beliefs. The KMS team itself would identify and package useful knowledge and develop a formal, sustainable means to maintain that knowledge over the long term without relying on the volunteer efforts of the sales representatives themselves. The KMS would enable the sharing of knowledge among sales representatives, but this sharing would be secondary.

The KMS team worked closely with key managers in the headquarters and sales districts to develop a taxonomy of knowledge that the sales representatives needed. It became apparent that, while all sales representatives needed a core set of knowledge, the knowledge needed about individual drugs differed depending on which division the sales representative worked for. Sales representatives who sold asthma drugs, for example, had no use for knowledge pertaining to drugs intended to treat gastrointestinal disorders. Therefore, the team developed a new knowledge taxonomy to separately organize that knowledge about each of the firm’s drugs. Sales representatives would only have access to knowledge about the drugs they sold.

The next step involved creating the knowledge itself needed to populate these taxonomies. In this case, the KMS team turned to the managers and associates in sales operations and the brand management team responsible for each drug. These non-KMS experts would develop initial drafts of the knowledge content, which they would provide to the KMS team. The KMS team would format the documents and put them in the proper locations in the KMS.

The system was intended to be the primary knowledge repository used by the sales representatives and the sales managers. All knowledge communication with the sales representatives would occur through the sales system. Instead of mailing paper marketing materials and advisories, for example, managers would now create them in Word and PowerPoint and post them into the sales system. Thus, the KMS became the formal conduit for all official communication with the sales representatives.

The KMS contained three types of knowledge:

- 1) Knowledge about the drugs that representatives sell that the brand team (or the medical organization through brand team) wrote. This knowledge included basic knowledge (e.g., chemical processes by which drugs work, side effects) and competitive sales information (e.g., analyses of competitors’ drugs, selling messages against those competitors, process templates for handling common questions).
- 2) General sales knowledge that sales management developed (e.g., selling techniques, rules for good promotional practices, legal guidelines for conducting continuing medical education). The general sales knowledge was common to all divisions, but the knowledge about the drugs was customized for each division so that sales representatives only saw the knowledge they need. For example, users could only see knowledge about the drugs they sold. Originally, all knowledge about drugs was common across divisions that sold the same drugs. However, based on experience with KMS use and discussions with the sales representatives using the knowledge, the KMS team determined that it had to customize the knowledge to the individual needs of each division. Each division serves different types of doctors, so much of the knowledge differs even though the drugs are the same (e.g., the knowledge to interact with a specialist differs than that for a primary care physician).

- 3) Best practices, lessons learned, and “stories” submitted by sales representatives. The KMS team included this information in the KMS because it realized the sales representatives needed to be able to contribute their knowledge for other representatives to use. However, because of strict government regulatory control over communication with the physicians, the firm's legal department needed to approve all such information. A peer review panel of expert sales representatives first evaluated all knowledge items submitted from the field to ensure the submitted item was both relevant and new. Subsequently, the legal department, sales management, and the brand team reviewed it before adding it to the KMS. The KMS manager worked with the sales vice president who changed the commission structure so that the company rewarded sales representatives for each accepted contribution (about US\$60).

At the same time, the team designed an entirely new user interface for the KMS. The team designed the new interface to better match the structure of the knowledge and to be much more user-friendly than the original Lotus Notes interface. The interface was very graphical: it contained images and icons for key tasks rather than the text-based interface of the old system.

Although the graphic design was important, it was not the key technical difference between the first and second KMS. The key difference lied in rethinking the users' desktops. In the first version, one could access the KMS on the desktop through Lotus Notes, but it required several mouse clicks to reach. In the new design, the KMS was the users' desktops. The first screen the users saw after turning on their computers was the KMS. All other tools (email, expense accounts, status reports, Word, Excel) were links available from in the KMS. Thus, the KMS was always present and easy to access. It became a part of the user's work environment the moment they used their computers.

The company deployed second version of the KMS in May of T0 (after our research project began). Once again, the company deployed it division by division as the sales representatives attended the annual sales meetings. During the meeting, the KMS group installed the software on the sales representatives' laptops and then conducted a training session on how to use the KMS. This training focused on the *knowledge* in the KMS and how to find it (in contrast to the training for the prior KMS that focused on using the *software*).

Sales representatives began to use the KMS, and, very slowly, knowledge contributions started to be received from the field. Within four months, the KMS was firmly established in the U.S. business unit: most sales representatives used it on a regular basis.

Based on this success, the sales vice president chose to use the KMS as the official conduit for critical knowledge, which replaced email and paper binders. Several times a month, sales management leadership (not the KMS team) “pushed” this critical knowledge to the representatives and instructed them to read a specific document within 24 hours. The representatives had to read, internalize, and act on this pushed knowledge, and their line managers sanctioned them if they did not. For example, when a newspaper published an article that erroneously implied that one of Farmaco's drugs was not effective, the firm used the KMS to ensure that all its sales representatives had the firm's official, marketing-oriented, scientifically based, legally vetted response by the start of the next day.

5.6 The Third KMS

By June of T+1, the KMS team realized that the initial knowledge taxonomies were not ideal and the user interface needed rework. As such, the team sought to streamline and improve the fundamental knowledge taxonomies and to use a more standard “Internet-like” user interface to replace the graphical user interface. The team changed the taxonomies so that each division had its own taxonomy.

Each district sales manager appointed one sales representative as the “KMS lead” or primary point of contact for KMS for each district. The lead supported the sales representatives in that district in using the KMS and served as the voice of the district to the KMS team to ensure the KMS meet the needs of the district. The KMS team met with all KMS leads to solicit feedback for the KMS redesign. The team also met with many sales representatives, district sales managers, and brand management teams during the design of the new knowledge structure and user interface. The team started by focusing on the largest division in the U.S. business unit, and it deployed a pilot version of the system at the end of T+1 for beta testing.

The team designed the knowledge structure for the system in what it called a “T-structure”, which had two distinct parts. Across the top of the “T” (presented horizontally near the top of the screen) was the general

sales knowledge designed to be pertinent to all sales divisions. This part contained knowledge on topics such as rules and guidelines for sales promotions, templates for sales processes, forms for sales functions, and directories with phone numbers of key experts in the U.S. business unit.

Down the middle of the “T” (and presented vertically near the left edge of the screen) was the division-specific knowledge that typically pertained to drugs that that division sold. This part contained knowledge such as fundamental sales knowledge about the drugs sold by the sales representatives, competitive analysis, results in recent drug trials, and letters from expert physicians. Tips and best practices submitted by the sales representatives would either fit across the top or down the side of the screen depending on whether they focused on general sales knowledge or on product-specific knowledge.

The KMS team quickly adjusted the knowledge structure and lessons learned from designing this pilot system for the next division, and the system began its regular deployment in May of T+2. Once again, the company deployed the system division by division as the sales representatives attended each division’s annual sales meeting.

The KMS was heavily used. Within one month, 98 percent of the sales representatives had retrieved knowledge documents from the KMS, and the sales representatives, sales managers, and KMS team considered it a success. Each division received one to two new knowledge postings per day (excluding the unusual flurry around the launch of a new drug). Approximately 40,000 to 60,000 knowledge documents were read per month. Approximately 250-300 new knowledge documents were created each month. A typical knowledge document had a lifespan of six months and a half-life of one to two months (the length of time it takes for the knowledge to receive half of its reads). More fundamental knowledge documents (e.g., clinical trials, side effects) had much longer lifespans and half-lives.

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