LOCAL ASSIMILATION OF AN ENTERPRISE SYSTEM: SITUATED LEARNING BY MEANS OF FAMILIARITY POCKETS[1]

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ABSTRACT

Once a new information system is introduced to the workplace, individuals confront it and struggle to make sense of it. Over time, it must be somehow learned and assimilated into everyday work practices. Enterprise systems, because they are complex and integrate work across functions and distance, pose special challenges to learning at the firm's periphery, where local users are distanced from both the centralized system and others elsewhere, and where a community of learning may be thin or lacking. The present study, using direct observations and interviews at a bank in which a new CRM system was introduced across small regional branch offices, explicates the local learning process. Findings suggest that in assimilating the system, bank representatives created familiarity pockets within which they routinely worked with it and outside of which they competently ignored it. Even within familiarity pockets, routine use of the system, while skilled, masked much that was not known by the bank reps. In short, in local assimilation of enterprise systems, knowing in practice may be constituted as much from what can be competently and routinely ignored by users, as from any deep knowledge of the system itself.

Keywords:

Enterprise systems, Customer relationship management (CRM), Technology assimilation, Situated learning, Work practices, Organizational routines, Familiarity pockets

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INTRODUCTION

As is well known, when a firm first introduces an information system, employees do not simply

begin using it. Rather they are often overwhelmed by the complexity (Brown & Newman, 1985),

unsure as to where provided information goes (Boudreau & Robey, 2005), and even worried

about breaking something (Carroll & Mazur, 1986). Still, most will eventually become so

competent as everyday users, that they put their hands to the system without much thinking about

it. This learning process has been termed "assimilation" (Meyer & Goes, 1988; Cooper & Zmud,

1990; Fichman & Kemerer, 1997; Armstrong & Sambamurthy, 1999; Purvis, et al., 2001;

Swanson, 2004; Gattiker & Goodhue, 2005; Huigang, et al., 2007) to suggest that the system and

its use must eventually be fused into everyday work practices and routines. But how is such

learning accomplished, and what is it that is actually learned, in particular for systems as

complex as enterprise systems?

Enterprise systems, such as Enterprise Resource Planning (ERP) and Customer

Relationship Management (CRM) systems, aim to support a whole enterprise, typically by means

of purchased packaged solutions (e.g., Davenport, 1998; Rigby, et al., 2002). By their complex

nature, they pose significant challenges for learning. First, a firm must configure its packaged

solution by selecting from an enormous number of optional features such that business processes

can be properly coordinated across multiple functions and locations. Second, the firm must take

an implementation approach that accomplishes an often complex and precarious transition to

what amounts to a revamped work system (Robey, et al., 2002). Third, the firm and its workers

must over time and across functions and locations gain familiarity, knowledge and new capabilities from use and assimilation of the system such that enterprise value is actually achieved. Interestingly, this third enterprise system challenge, in contrast to the first two, has to date received comparatively little attention from researchers, insofar as helping us understand the underlying learning process.

Nor have practitioners been fully cognizant of the assimilation challenge. Because enterprise system packages are commonly marketed as "solutions" in themselves, and because the software itself dictates much of the interaction with its users, some organizational adopters of these systems may see the challenge in overly simple terms, where users must simply grasp new set procedures. More sophisticated adopters will recognize that a new work system must be built around use of the enterprise software and that such a learning process will be substantially social, where users will learn much from each other in creatively fashioning new routines. Indeed, substantial research suggests that learning in work systems is greatly facilitated through a specialized "community of practice" (Brown & Duguid, 1991; Lave & Wenger, 1991; Wenger, 1998). But this in turn suggests a deep puzzle at the heart of enterprise system assimilation. Because these systems are intended to coordinate work across the firm, they are typically implemented to reach all of its diverse and far-flung units, many of them small, where supportive community may not only be different from that elsewhere (see, e.g., Rolland & Monteiro, 2002), but also thin or even lacking altogether. In such circumstances, how is the needed organizational learning accomplished? Operating at distances both from the central system and from each other, how do local units cope and learn, and eventually assimilate the enterprise system, with what broader consequences?

In the research reported here, we sought basic insight into this puzzle of enterprise system assimilation, through a case study focused at the local level, drawing on detailed observational and interview data collected in natural settings, paying close attention to situated practices. Specifically, we studied one bank's representatives and their use of several systems including a newly introduced CRM system in several local branch offices. We both interviewed selected reps and observed them actually working, i.e. interacting with customers, servicing accounts, and using the systems. We observed not only routine use but also various troubles encountered and the ways in which reps dealt with these. We arrived at several insights into the local assimilation process, including the role played by what we term the user's "familiarity pocket" within which he or she engages the larger global system, while otherwise ignoring most of its aspects. We discovered how situated learning in relatively isolated local offices could take place at significant physical and social distance.

While our findings by no means resolve the broader learning puzzle, they do illuminate the local challenge. They contribute too to the nascent literature on learning in networks of practice where multiple communities prevail, as in the typical firm (Brown & Duguid, 2001). While research has begun to explore the problem of learning across communities (see, e.g., Pan & Leidner, 2003), it has given less attention to learning where community may be thin, or where work is coordinated by a distant centralized system. Whelan (2007), examining electronic networks of practice, concludes that relatively little is known about the dynamics of knowledge exchange in such networks. The research reported here examines assimilation of new centralized technology at the periphery of the firm. We find that in the case of working with enterprise systems, local learners must navigate a territory which for most will remain largely a realm of the unknown, even as they gain a certain competence, while sharing knowledge only thinly

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across localities. Local assimilation of enterprise systems apparently entails learning to live with something that remains at something of a distance, unrevealed in its broader aspects, even as comfort, if not mastery, is gained in its presence. Thus, relative to other recent research, we describe a rather different kind of situated learning and its ramifications.

In the balance of the article, we provide further background, describe the study we undertook, and present our findings and insights, together with their implications.

THE LOCAL ASSIMILATION PROBLEM

While organizational assimilation of any new IT can be problematic, that of enterprise systems presents special challenges, deriving from their centralized and integrative nature, and the fact that they are to be used locally among the firm's diverse and widespread units, where situated learning necessarily takes place. We elaborate on these special challenges next.

Enterprise systems

When firms adopt and implement enterprise systems, they undertake projects of remarkable scale and complexity, as is well known (Davenport, 1998; Markus & Tanis, 2000). The packaged software itself contains a myriad of functions from which the firm selects a subset to comprise its configured solution. A centralized business logic underpins this solution, as the purpose of the system is to coordinate business processes across functions and locations. The needs of individual units are accordingly subordinated to the larger purpose. A local unit may have relatively little input into the configuration decisions. The functionality it receives is likely to be both more and less than it might have wanted.

Too, when the firm implements the enterprise system, deploying it across units, it usually does so in stages which reflect a central plan. (In the "big bang" approach, it deploys the system all at once across units.) Whether a unit receives the system early or late relative to others, with

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all that implies for its own adaptation and learning, it must accommodate itself to the broader organizational interest. A local unit may have relatively little input into the implementation schedule. It may also have little say as to advance preparation and training.

As a consequence, when an enterprise system is received by a local unit, it frequently arrives as a very large and complex system to which the unit must adapt its work processes and fit them to those of others within an imposed time frame. The local unit may or may not see its own practices as benefiting from the new system, as the overall purpose is support of the enterprise as a whole. The local unit which previously had substantial flexibility in determining its own practices may now find itself required to provide new information to others, in particular, to enable more effective coordination across units. Too, the local unit may be expected to capitalize on new information made available to it, as with CRM systems that provide customer service personnel with a more complete view of the customer through a centralized data base.

Under these circumstances, it is not surprising that many implementations of enterprise systems have foundered, met resistance or been abandoned (Davenport, 1998; Scott & Vessey, 2002). Still, many more others have apparently been successfully accomplished, and enterprise systems are now widely deployed among firms. What is less clear is how firms gain value from their implementations. Research suggests that upon initial implementation, firm performance often drops, rather than improves, as units grapple with the transition (Ross, 1998; Markus & Tanis, 2000). Firms often underestimate the amount of learning needed to assimilate the enterprise system. They may underestimate in particular the problems of local assimilation.

Organizational learning and local assimilation

Following a long tradition (Cyert & March, 1963; Nelson & Winter, 1982), we take the perspective here that organizational learning and the achievement of capabilities entails

"encoding inferences from history into routines that guide behavior" (Levitt & March 1988, p. 320). Such organizational routines incorporate "repetitive, recognizable pattern(s) of interdependent actions, involving multiple actors" (Feldman & Pentland, 2003). Constituent individual actions have been termed "moves" (Pentland, 1992). Routines are theorized to have both "ostensive" aspects, which consist of the understandings of participants, as well as "performative" aspects, which consist of actual performances by participants, both aspects being mutually constituting in what amounts to a generative system (Pentland & Feldman, 2008). Notably, the distinction between these aspects derives from Giddens' and Bourdieu's practice-centered theory.[2] Routines have further been characterized by Pentland & Feldman (2008) as "live" in their generative capabilities, as opposed to the "dead" routines represented by artifacts such as computer software, which can be stored. This is not to say that software such as that of enterprise systems cannot be engaged within a live routine, however, as we will later illustrate.

While organizations can learn both from their own direct experience and that of others, their assimilation of new technologies ultimately requires development of their own routines, and on learning by doing, in particular, with trial and error experimentation in the early stages (Swanson, 2004). Such experimentation falls off with routinization, although through repeated performances, learning continues in sophisticated ways, with substantial improvisation (Feldman & Pentland, 2003; Pentland & Feldman, 2008). With the technology assimilated, routines can be performed without actors giving focal attention given to it; rather, attention can be focused on the task at hand (Swanson, 2004). In this way, capabilities are achieved, refined, and reinforced.

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[2] Feldman & Pentland (2003) remark that "This ontology builds on the idea that routines, like other social phenomena, embody a duality of structure and agency (Giddens,1984;Bourdieu,1977,1990)" (p. 95). Particularly for the performative aspects of routines, they draw on Bourdieu's theory of practice: "Practices are carried out against a background of rules and expectations, but the particular courses of action we choose are always, to some extent, novel" (p. 102). See also Barnes (2001) for a complementary description of the accomplishment of shared collective practices, including routines.

Where a new enterprise system is introduced, new routines must thus be developed, where users learn to interact in new ways not only with the system, but with each other. Ultimately, a kind of global learning is sought, across organizational functions, sub-cultures and locations, which is problematic to accomplish. Indeed, situated learning theory (Brown & Duguid,1991; Lave & Wenger,1991; Wenger, 1998) suggests that assimilation of new technology will be fundamentally local. That is, users will learn primarily through their locally situated practice and secondarily from their interactions with those located elsewhere, engaged in other practices. The theory suggests in particular that learning hinges on local communities of practice, where workers learn from each other in executing the tasks themselves. The extent to which the spatial reach of these communities can be extended through electronic communications is a subject of intense interest to researchers (Roberts 2006).

Regardless, many users of enterprise systems will work in small units distant both from the firm's headquarters and from each other. Many will work at the firm's periphery, interacting with customers or suppliers. These users must get their own daily work done and face various local exigencies. For those that interact with customers, in particular, these interactions will likely have priority over those with a computerized system. For them, carrying out the local work at hand may dominate whatever use they make of the systems. On the whole, then, remote users are likely to shape and interpret their interactions with enterprise systems according to their local practices, and to adapt these same practices to the systems only insofar as these practices can be bettered from their own local perspectives.

Still, enterprise systems will impose certain requirements on local work practices (Soh, et al., 2000; Rigby, et al., 2002; Robey, et al., 2002; Boudreau & Robey, 2005). In particular, because these systems are intended to integrate work across units of the firm (Kallinikos, 2004;

Gattiker & Goodhue, 2005; Ranganathan & Brown, 2006), users may be called upon to interact with a broader range of users located elsewhere. These interactions may also now be more formalized and automated through the system itself. For instance, users who formerly called their managers and colleagues on the phone to resolve work issues, may now be expected to enter these issues into the system for tracking purposes (Sachs, 1995). Management may also seek to standardize work practices across locations (Rolland & Monteiro, 2002).

However, local users of enterprise systems may find that their interactions with others in different functions and locations do not come so easily. They may never personally meet the others with whom their work is to be coordinated, or even know who these others are, let alone how they use the system. At their own remote locations, users may also be just a few doing the same work, furthering their isolation. Thus, while tight coordination across organizational units may be sought, communication and community in the use of enterprise systems, especially at the firm's periphery, may be thin. *In such circumstances, how is learning achieved, and what is it that will be learned?*

 Learning challenges at the periphery

Substantial prior research, in particular that which takes a practice perspective (e.g., Suchman, 1987; Brown & Duguid, 1991; Orlikowski, 2000, 2002) suggests several ways in which users learn about new IT and come to assimilate it. Drawing from this research, we should expect to observe much of this same learning even at the firm's periphery, although with greater challenges.

First, as already suggested, users of newly deployed IT typically engage the technology by experimenting or even playing around with it (Swanson, 2004). Such trial-and-error learning enables users to interpret and collectively make sense of a new technology (Edmondson et al.,

2001), and is facilitated where users are co-located and able to support each other (Rieman, 1996; Lim et al, 1997). At the firm's periphery, though, where community is thin, trail-and-error learning, insofar as it relies on collective sense-making, will likely be more problematic.

Second, users of newly deployed IT often find what they perceive as mismatches between the technology and the work they must accomplish. Where the system lacks pliancy, and is not easily adapted, users will often create their own workarounds, building these into their own preferred practices (Gasser, 1986; Sachs, 1995; Koopman et al., 2003). In some case, users may seek to work around a new system, so as to continue practices associated with the legacy system to be replaced, a reflection of their inertia (Boudreau & Robey, 2005). At the firm's periphery, where local users are distant from the logic of the centralized system, workarounds may well be particularly abundant.

Third, users often discover new and unanticipated ways to make use of new IT (Ciborra & Lanzara,1994; DeSanctis & Poole, 1994; Orlikowski, 2000). Some can be quite creative in finding "features" and in appropriating the technology to accommodate or even advance their own practices. They thereby create and are guided by their own frames of understanding (Orlikowski & Gash, 1994; Beaudry & Pinsonneault, 2005). Users are also sometimes said to "reinvent" the technology when they enact it in this way (Rice & Rogers, 1980). Researchers taking a human agency perspective have been much impressed with this phenomenon (see Boudreau & Robey, 2005). Still, at the firm's periphery, such reinvention may not diffuse much beyond the isolated local unit in which it originates.

Fourth, users may also rather quickly establish their own routines for working with new IT. In doing so, they may close down the "window of opportunity" for learning about a new system's many features, leaving these under-utilized (Tyre & Orlikowski, 1994; Robey et al.,

2000). Routinization is, however, necessary to assimilation (Swanson, 2004). It also allows for further incremental learning (Feldman & Pentland, 2003). But is routinization of enterprise systems use likely to be easier at the firm's periphery, where community may be thin, or might it prove to be more difficult?

In the research reported here, we had an opportunity to study how learning takes place, routine use is achieved, and an enterprise system is locally assimilated at one firm's periphery. The relative few studies of the use of enterprise systems to date (e.g., Boudreau & Robey, 2005; Wagner & Newell, 2006) include no comparable studies of local assimilation to our knowledge. As will be seen, findings from prior research as to ways of learning are largely consistent with those in our own study. But we find too that what local users learn in using and assimilating an enterprise system differs from what might be expected.

RESEARCH DESIGN

Aiming to explore the assimilation challenge in an actual work setting, and taking advantage of a local business contact, we arranged to undertake a "revelatory" case study in which a well-known firm had introduced a new enterprise system across multiple sites (Yin, 1984). Our subject was a fast-growing bank that had recently implemented a packaged CRM solution provided by a leading vendor. We first interviewed several senior managers, including one who oversaw CRM implementations in the parent company, and another who led the bank's CRM initiative. From documents provided, we learned that the strategic vision for CRM entailed a "unified approach for managing customer data" in support of the bank's growth. The new system was targeted in particular for use in the bank's call centers and local branch offices, where contact with the customer was direct.

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We concluded that local offices where customers come and interact with representatives would be promising to study because we could observe multiple sites similar in almost all aspects. We were introduced to a manager who supervised the entire local office operations. In discussion with him, we identified five offices as potential sites, mixing those where CRM was used heavily with ones where it was not – hoping that we could probe variations in assimilation. We then talked with two field managers who supervised the five locations, to explain our study. With their approval, we carried out the study at the five sites over about a one-month period, making nine separate visits totaling more than 26 hours.

The five offices studied were identically organized. Each was staffed primarily by a pair of representatives. One was senior and licensed to sell financial products such as stocks, bonds and annuities, and possessed 16 years of banking experience on average. The other, a junior rep, typically was not licensed, but also had substantial industry experience, more than 20 years on average. Notwithstanding this experience, the bank studied is relatively new and most of the reps were newly employed within the last few years.

Our planned study consisted of repeated fieldwork at the five locations. To capture the embodied, situated practices, we chose to observe the work closely in the work setting. Because of an unexpected policy change within the firm, we could not complete the planned longitudinal fieldwork—we were limited to two visits each to four sites and but one to the fifth.   We had to abandon our plans for a longer-term ethnographic study. Still, in the shorter time frame, we were able to obtain rich observational data on use of the system, as well as interview data and documents that enabled us to obtain prior history important to understanding the assimilation process then underway. Too, by studying multiple sites we observed varied ways of using the same technology during a one month period in the spring of 2004. Nevertheless, our

observational frame was a limited one. It did not include use of the CRM system in the central office, or its use by managers, for instance.

At each branch office, we began with an extensive interview with both representatives. We asked about their backgrounds in banking, in this particular bank, and in using IT systems. We asked as to the training they received, the difficulties they faced in using the CRM and other systems, and how they learned how to use them. We sought to obtain concrete details of recalled events more than abstract thoughts and opinions, taking care to obtain what actually had happened in each situation described (Spradley, 1979). Audio recordings were made and all were transcribed. We did not simply accept what reps said as somehow objective and correct accounts, but rather treated these as part of the situation itself. We analyzed what participants said carefully, trying to understand how and why they said what they said and how their understanding manifested itself in both the speech and the situation described.

When the interview was concluded, we undertook work observations. With the reps' cooperation, we shadowed them, sitting or standing next to or behind them. They began by showing us how the system worked and how they typically used it. Customers could of course walk in at any time. Because of obvious privacy and security concerns, we could not audio record interactions between the reps and their customers. Nor could we obtain documents. Yet we could jot down various things observed in a notebook while excluding personal information. We were able to create detailed vignettes from these jottings. We further asked the reps questions to clarify and confirm our understandings. Recognizing that our observations and interview data might be vulnerable to the well-known Hawthorne effect, we were sensitive to inconsistencies (or even unlikely consistencies) that might arise from such effects. We found none.

Because of the similar arrangement across local offices, we were able to observe and compare the same aspects of system use and learning across multiple sites. If reps in one site used a particular system feature in a creative way, we could see whether reps in other offices did the same. We could even ask reps why they were not using a certain feature or using it in a different way from others. Such comparison enabled us to see the fuller picture as opposed to noting only what happens in a particular office. In fact, comparison confirmed much similarity in the reps' work across sites, while highlighting certain differences.

With our interview and observational data collection completed, we then immersed ourselves in its review, analysis and interpretation. We chose not to attempt to build theory through a categorization of our data as typifies a grounded approach. Rather, we capitalized on the early emergence of one particular concept in discussing and interpreting our findings, the notion of "familiarity pockets[3]." This abstraction greatly facilitated subsequent interpretation, which is acknowledged to be inherently subjective however it is undertaken (Spiggle, 1994). We were able to toggle back and forth between our data and the concept, gradually clarifying, refining and augmenting it. For instance, while we initially used the familiarity pocket notion to describe how reps interacted with the system and certain features, when we reviewed the data in its light we found that reps' interactions with others could be explained in the same way, leading us to extend the concept. Similarly, while we initially saw double checking work practices as

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[3] This notion of familiarity pocket came to the first author when he took a 22 hour train ride in India. During the busy Christmas season, he could not reserve a seat, and alternative transportation was not available. Holding a ticket without a seat, he jumped on the train nonetheless, as he needed to reach Mumbai to catch a flight the next day. He was stressed not knowing whether he would be allowed on the train, where he could sit, how he could get food, and so on. Yet, he could quickly find a small area between cars where he could sit and keep his baggage safely. He got to know some people who then knew that he was there not to cause any trouble. He felt like he was in a comfortable pocket, though he knew little about the train system beyond it. This experience gave him the inspiration for understanding the data of this study.

interesting but only partially relevant to familiarity pockets, we were later able to see these to be of significant importance.

As this toggling between the concept and the data solidified our findings, we began to toggle too between the concept and the literature. While we were clear about the concept at the intuitive level, we wanted to work toward a more precise articulation. Among various frameworks, we eventually settled on the theory of routines for our primary foundations, as it was in accord with earlier groundwork (Swanson, 2004) and offered a rich language to explain familiarity pockets more precisely. The research findings provided below are developed around this notion of a familiarity pocket, delineating its role in the learning process, while reserving broader theoretical discussion for later. We set the stage for these findings by describing the work of the bank representatives.

WORK OF THE BANK REPRESENTATIVES

At each local office, each representative has his or her own personal computer, connected to the corporate network, and loaded with or with access to four main applications. One is the bank account management system (hereafter Bank System) with which reps can open accounts, service accounts, look up activity history, and so on. All account data are managed in this system although reps in local offices have limited access to them. A second system is the CRM system, which records all data regarding each customer so as to provide a "360 degree view." After a customer contacts a call center on some matter, he or she may walk into a local office and ask for an update. The CRM system can help reps to understand what has been done and thus supports timely and reliable service. A third system is Lotus Notes, which reps use mainly for email, typically receiving a few messages each day from their manager, who supervises several offices and works in the region's central office. The fourth application is a Daily Activity Report

compiled within Microsoft Excel files. All newly opened accounts are recorded in the Excel file, which is saved on a network drive accessible to the bank's managers, who can thus monitor how many accounts are opened when and where, to help them create an effective marketing strategy.

The representatives' work has a similar pattern across the offices. Reps serve customers who walk in to ask questions, open an account or buy financial goods. Typically, two to six new customers open an account each day at each office. Reps also service existing accounts. For example, they follow up on newly opened accounts to see whether they are properly funded after deposits are made. Existing customers also call in to inquire into their balances or the status of a requested service.

When a new customer walks in, he or she is greeted by a rep, who initiates the interaction, asking what the customer wants to accomplish by the visit. If the customer wants to open an account, the rep solicits specific information such as the duration, amount, etc. and also provides an application form. The rep makes copies of necessary documents and helps the customer prepare the form. Then, the rep logs onto the Bank System to open the account, and copies information from the form into the system. Lastly, the rep prints out a shipping card with which to send necessary documents and a check funding the account to the deposit center.

After an account is opened and the customer leaves, the rep enters information about the interaction into the CRM system. He or she opens a page for "communication records" and fills in the fields. Typically, the rep types the customer's last and first names, an activity category such as opening an account, a marketing code such as local newspaper, and some comments. Even if an account is not opened, the rep is to record all interactions with those who walk or call in, as communication records. Where the rep receives a phone call from someone who does not

identify him or herself, casually inquiring into rates, the rep identifies the caller as "unknown" in the record. After opening an account, the rep also needs to make a Daily Activity Report entry.

To send special requests to the back office, for instance, issuing a check in case of the account holder's death or changing the account type, the reps fill out service requests on the CRM system. They indicate the account number and name, who to assign the request to, the type of the request, a brief explanation, and so on. The CRM system enables the reps to keep track of service requests they have sent out as well as the ones they are assigned to.

LEARNING PROCESSES

In this section, we present our findings, drawing on selected data to describe the learning processes observed, ranging from gaining initial familiarity with systems to achieving routine use. We also provide brief interpretations and introduce the concept and role of the user's *familiarity pocket* in achieving this learning. We limit these interpretations to single sub-sections in each of five learning process sections, so as to also allow the reader to absorb the findings in their more basic form. We reserve broader theoretical discussion for later.

Gaining initial familiarity

When new employees joined the bank, they were sent to a training center for one week, where they were taught the job. In half of one day, the new reps learned both the Bank System and the CRM system. Typically only an hour or so was spent on the CRM system. Reps were introduced to basic tasks such as opening an account and servicing it. Instructors lectured and had participants do some hands-on exercises. Several reps complained that they were given too little training. Reps were then sent back to their own offices to begin work using the system.

Several reps told us that once in their office they could gain a good sense of the system by "playing around with" it for a while, i.e. using it while not facing a customer in an actual

business situation. In this way, the rep explored the functionality of the system apart from actual work. Additionally, several reps said they were "walked through" the system by a colleague, which was clearly helpful to their gaining familiarity with the technology. One said:

> I didn't feel that I got enough training on Service Request to know
> what I was doing, once we had to do it, but once I was walked through
> it, if I did a couple of them it was fine. They're very easy programs.

We specifically asked reps about their experiences in using the systems in their work for the first time. Reps described an initial period of confusion when faced with the systems. Although they had already been introduced to the systems, when facing them within the work environment, they needed to re-familiarize themselves. Particularly, the CRM system was very complicated because there were many ways to do the same thing and various unused functions were available without being disabled. One rep said:

> It was brand new for me. It can be **confusing**, this is not the easiest
> system in the world. **There's many doors, there's many windows**, as
> that's how I put it, to go through to get to accomplish a certain thing,
> but once you learn how to do it, it's easy, **there's not a lot to it**.
> [emphases added]

Another rep said a similar thing.

> As far as the CRM System, it was **a little confusing** at first. Because I
> **didn't really know what the tabs meant**. I mean, I had some training on
> it, but I wasn't really sure. (omitted) So I would click on all the
> tabs and just kind of **get a feel**. And just kind of, I guess, **play
> around with it**, just to understand what exactly it entailed. And even
> now **there's just a few things on there that I'm not too familiar with**,
> but basically, whatever functions I need on the CRM System, **I know how**

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        to use. (omitted) As I started using it, it was just kind of like it

        kinda flowed, began to flow.  But now it's really easy to use.
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However, we found that "easy to use" did not necessarily mean that reps had learned that

much about the system. When we questioned them about various parts of the systems, they often

could not explain what they were and how to use them, even at the most basic level, for parts

such as text fields and buttons they readily used. Thus, when reps say, "There's not a lot to it," it

does not necessarily mean that they learned most of the things they were initially confused about.

Still, they were able to overcome the confusion and perceived the system as if it "flowed."

Interpretation

We found it striking that a kind of familiarity with a complex system was seemingly so

easily and quickly gained by the bank reps. Apparently, this familiarity was gained not by

progressively learning the parts of the system but by learning a few parts and ignoring the rest,

tabs representing doors and windows that would remain closed to the reps. Importantly, the parts

that were learned were through the reps' initial *interactions* with the system, which, while they

hardly sufficed to provide for substantial routines, did allow for the development of moves and

limited move sequences constituent to routines (Pentland, 1992), enough to give the reps a

certain sense of command. We will call what is learned here a *familiarity pocket*, implying that

users create certain spaces within which they can competently act on their knowledge, while

competently ignoring that which lies outside it. This initial familiarity pocket, anchored in

interactive experience, can then be leveraged and built out in subsequent learning.

Coping with troubles

We found that simply following a procedure did not work in general and troubles were

necessary to learning. Using a system required knowing typical troubles. For example, most reps

mentioned the same difficulty with a query function, for locating a particular customer in the database. Query by a common name gave multiple matches and scrolling through the list was not as smooth as reps liked. In fact, management was frustrated because reps didn't find existing customers and created new entries, resulting in duplicates. Similarly, a particular function "Service Requests" was quite complicated. When we asked about it, the reps said that the service requests were confusing. There were little things they needed to know. For instance, when reps went to the "Service" tab to create a new request, they found the form already filled in – one said it was a "dummy account." They did not know where this data came from. Instead of revising this form, they clicked the "New" button to open up a blank form. Similarly, a service request was left unchanged even after the submit button was pushed, causing confusion as to whether it was really sent. Some reps returned to the original screen to double check, closing the request screen each time. The same trouble happened with the "Communication Record," which remained on the screen even when the rep pressed the submit button. These issues were not difficult once known. But initially, the rep wonders what was done wrong.

A more important problem is that reps are often not sure whether a service request has been acted upon, even if they confirm it was submitted. One said, "You send it off and then you wonder what happens to it." Even if a rep saw a service request "closed," it was unclear whether it had been taken care of as intended by the back office. This sometimes causes trouble because a customer may not receive an interest check, an address may not be updated, and so on.

One representative described how she identified the problem and tried to solve it.

```
The service request is closed but it's not done. (omitted) I can see
who it was assigned to, well what did they do?  And then I look at the
notes, well a lot of times they'll say completed and that's it, well
when I look at the account, it's not completed, so then I have to go
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back in, reopen it, (omitted) and I'll put a little note saying, "I

opened it because when I check the account, I notice that it has not

been completed, please complete."
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Here, the rep was trying to negotiate the ways she and others should work together with the system. She did try to do so within the system, writing on the note field. But then, she could not resolve this issue and saw similar problems multiple times.

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And when I've taken it upon myself and I've called the people I've

assigned and I say, "So what are you doing?  Why did you close this?"

She says, "Oh well I saw it and I know I had to do it, so then I closed

it." So she said she was thinking of it as a communication record, and

I said, "Well no, when it's a service request, you keep it open until

it's done."
```

Even with such clarifications, the rep's uncertainty remained.   As a result, she double-checked to see if requests were handled by repeatedly looking at the account status on the Bank System; e.g., to see whether an interest check had been cut, she could check whether the interest amount was withdrawn. Here, we see that reps' understandings are not necessarily clarified through coping with troubles. Reps did not trust the people in the back office even when they clarified the issue by talking to them. Two reps even said that they specifically tried to avoid using service requests as much as possible, by trying to resolve issues over the phone.

The one rep then continued,

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It's a lack of training or you know maybe I was trained wrong, maybe

they don't want us to keep them open, maybe they do, it could be just a

difference of opinion as well. But in something like this that's a

pretty big difference of opinion so, it needs to be, you know, everyone

needs to be taught the same thing for something like this.
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Note that the rep did not mean that she was right and people in the back office were wrong. She was only guessing for the practical purpose of getting the work done. Although many reps complained about parts of the systems and how others used them, when asked, they could not explain to us how exactly a system worked and how others were supposed to use it. Particularly, the behavior of the CRM system remained a mystery, as to how it handled service requests and communication records when the submit button was pressed, what the data populated in the forms when tabs were opened were, and so on. Nonetheless, reps could eventually competently use the system by building double-checking and workarounds into their repertoire of actions.

There were other examples of implicit guessing and assuming. When one rep was using the filter function to obtain the service requests assigned to her or her colleague in the same office, using "My team's request," she had assumed that "My team" meant herself and her colleague. She found, however, that she had retrieved all the requests assigned to everybody. Another rep was confused about the "new" column of service requests listed in the Service tab. She had thought that "new" (as indicated by asterisks in the column) meant that the request was "open." When she found that some "new" ones were actually "closed," she became confused and tinkered around to learn more about it without ever successfully figuring it out. We also observed other examples of double-checking. For instance, whenever a rep created a new communication record, she went back to the "Home" tab and confirmed that the record was submitted and not left open. By this practice, she took control of the records as needed.

Interpretation

After gaining initial familiarity, reps struggled in building routines for themselves, encountering troubles in their interactions and learning new moves largely out of necessity. Their troubles were manifested in interactions both with the system and with other users, whose

own routines required articulation with those of the reps. From their comments to us, it was apparent that the reps initially had very fragile understandings with which to enable competent performances of needed routines. That is, the ostensive aspects of needed routines (Feldman & Pentland, 2003, 2008) were largely undeveloped. Reps' familiarity pockets held a surfeit of implicit and often mistaken assumptions and guesses as to how the system and other users were interacting with them. Through troubles and unexpected events, some of these assumptions were surfaced and reworked, resulting in more elaborated and deeper understandings and familiarities. Yet, much unclear understanding of the behaviors of the system and other users, particularly those located elsewhere at a distance, remained. Workarounds were frequently used to patch over such difficulty. Instead of acquiring knowledge of how things are really done, reps developed practices to work around what they did not know. That which was "known" within the familiarity pockets was accompanied by much that was unknown.

Asking for help

When facing troubles, reps typically sought help. We observed reps asking colleagues questions and also teaching others. In one case, a customer phoned to ask a question about retirement accounts services. Not knowing the answer, the rep put the customer on hold for a few seconds and asked her nearby colleague a question. Told "no," she then provided an answer to the customer. Another rep had learned the same thing in a different context, as in his first job with the bank he was a back-up person in a call center. He was able to ask colleagues questions in the middle of calls by putting the customer on hold. Now, he found that, in a local office where a customer is sitting in front, it is difficult to put the customer "on hold." Still, being able to question a co-located peer in the middle of having trouble is obviously an effective way to learn how to use a system.

Simply asking around is one way to seek help from colleagues. We found that reps tried to seek help from various sources. They contacted the training instructor who had said that he would be available on whatever questions they might have. They also contacted the regional operations assistant who centrally manages all service requests and is knowledgeable as he or she has been through a wide variety of work activities. Said one rep[4]:

> Like if we had a question about something, like of the personal loan
> and line, (omitted) You usually can't get anybody on the phone so you
> might as well not try to call anybody. So you email. **I emailed Ince**
> **who's the trainer** pretty much for Bank and he's a pretty busy guy. He
> writes the manuals and he's done all the sales training and they have
> him going to different states. (omitted) So he always said, "If you
> have any questions just email me". So he's out of town and so then **I**
> **email like Ashley** and I try not to bug her because she's like the
> **assistant supervisor** and then she's always filling in at these
> different branches. She's got a lot of work on her plate so I emailed
> her and then she didn't know and so then she said she was going to
> **email Mandy**, who's her boss, which is **my boss** and I guess she's not
> feeling well. So meanwhile you don't, you know, you just have to wait I
> guess. (omitted) I **talked to Lea**, she doesn't know.

In this particular case, the rep was tapping into various levels of support. She tried to contact the trainer who gave the formal training, the regional assistant, her manager and her colleague at a different location. Still she could not figure out the problem.

We observed several such instances of asking for help. In one, Sandra, a rep, needed to open a trust account of a special customer, a friend of the bank's top executive. Although the

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[4] All names are changed here and elsewhere in the paper, as are a few contextual details, to protect the privacy of our research participants.

customer's wife was a trustee, she was in San Diego and not present as required. Sandra called her manager asking what to do. The manager called back and said that she should make an exception. Sandra then began opening the account on the Bank System. When she entered the wife's name as a trustee, it appeared before that of her husband. Sandra tried to fix this by deleting the wife entry and adding it back in, and also starting all over again. She printed the shipping card to see if the order would be corrected on the paper but found it the same. She then asked her colleague on site, but he didn't have an answer and actually had his own problem with his system. Sandra tried a few other things, becoming frustrated. She finally phoned Lea in another location, in an adjacent town: "Hey Lea, how are you doing?" She continued,

```
I'm doing uh trust for that one little big big customer (omitted).
(pause) And I put the wife's information (omitted) And it keeps
printing (emphasis) the wife's name first (emphasis)! (pause) Oh.
(pause) Oh. (long pause, listening) Yeah, yeah. It's Arlene with an A.
(pause) Dumb. (pause) Oh.
```

After hanging up, Sandra then remarked to her colleague, "Lea told me that it prints in the alphabetical order. Isn't that stupid." Again, here, we can see that Sandra used the feature without anticipating trouble, implicitly assuming that the account owner name she typed in first should be printed first. She was already familiar with the system, but through such implicit assumptions. Through this interaction with Lea, she turned the implicit into the explicit.

It is important to note that while the rep relied on her colleagues for help with the trouble, she did not resolve it this way. What she found was that the order of names was by design. She discovered no way to print the names in the order wanted. Still, she gained some satisfaction in finding that there was nothing she could do. She could blame the system as "stupid," confident that she was not doing anything wrong.

Interpretation

Not surprisingly, we found asking for help to be an important aspect of coping with troubles, resolving anomalies, and extending situated learning. But we found too that in the relative isolation of their local offices, reps needed to creatively build avenues for pursuing help into their familiarity pockets. Beyond their local office counterparts, it was not initially obvious to whom reps should turn. While necessity often forced their hands in seeking help, some reps were more creative than others and the social networks reps built for themselves varied significantly. Learning within the reps' community of practice was accordingly uneven across locations, although misunderstandings were relatively few, compared to those resulting from reps' contacts with those in the back office, who constituted another community altogether.

Developing personal tools and methods

Reps constantly invented new and unanticipated ways to better accomplish the work. For example, one improved her work by a small change in the process. When a new account is opened in the Bank System, the customer's birth date is entered. The Bank System then calculates and shows the age of the customer. Routinely this rep writes down the age on the top left margin of the paper application form so that when she later adds an entry to a Daily Activity Log, she can just copy the age rather than calculating it anew. This makes the work both more efficient and more reliable, avoiding calculation mistakes. Another example is that one rep opens a communication record entry page as soon as she begins talking with a customer, when she picks up a phone or a customer walks in. The system automatically filled in the beginning time of the communication, which the other reps typically jotted down on paper for later entry.

One rep made a series of inventions. When creating a communication record for an exchange with an existing customer, reps were required to "query" the database and locate the

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customer's information. Because the "last name" was the search field listed on top, most reps typed in the last name and clicked the query button. Yet, there were occasions where reps did not know how to spell the last name or what the last name was. Too, common last names could produce a long list of customers, from which a rep needed to find the first name. Problematically, the system was not designed to allow easy scrolling, showing only ten customers in one page. This rep found she could query by the customer's first name where the last name was common. While this was only a small invention, we saw others simply use the last name and scroll through a number of pages – in one case, a rep gave up and selected the "unknown" category.

While we were observing the inventive rep, she also discovered a way to query by a phone number. In many cases, she wrote down the number because customers called and she had to call them back. She could find the customer easily this way because phone numbers are unique. She was visibly proud of this discovery. She had also used the service request function in a way that was not only unexpected, but also came to be discouraged, keeping track of her to-do's by submitting requests to herself and later going through these to manage her own work. She was subsequently told not to use the function that way because it was not designed for that purpose.

We found that a system's breakdown can be a good occasion to trigger sensemaking. This rep told us one episode. When she received an inquiry from an existing customer about his account, the Bank System was down. She proudly explained to us that she found a way to obtain certain account information within the CRM system, which downloaded data from the Bank System every night. Inventions such as this were largely made out of necessity, either when the system was down or when system functionality was limited.

Interpretation

The development of personal tools and methods appeared to be integral rather than adjunct to the learning process and the building of the reps' routines.   Lacking certain moves needed to complete a routine or perform it in a satisfactory manner, reps creatively originated their own, drawing from various means. Notably, many of the tools and methods reps devised and employed were fashioned out of features of the enterprise system itself, demonstrating how appropriation of a technology can be highly personalized. Reps in effect reach into the system, tapping new features and finding new methods of using known ones, all in support of bringing "routine" use to life. They do this not in a vacuum, but through the refinement and extension of their familiarity pockets, adding new, clever and subtle moves in support of routine performance. At the same time, much of what the reps come to know through their routines masks that which they do not know about the system and other actors outside their familiarity pockets. While reps did share some of their personal tools and methods across locations, notwithstanding the thinness of their community, this practice was not pervasive. Variation in tool use was substantial.

Achieving routine use

We were able to observe a number of instances of routine system use achieved by the reps, where the technology was employed without the reps much thinking about it. Consistent with expectations, we found that in their performances of routines, reps were often able to extend their learning. We offer one example.

Eric and Rick worked in the same financial center. One day, Eric received a phone call from a customer who had opened an account the week before. The customer said that the check she had submitted for deposit needed to be held for a while because her other bank was holding another of her checks prior to cashing it. Eric said that he would try to stop the check. He asked

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Rick to call their manager Manny. Rick could not reach him, but immediately began to enter a service request. Eric then said that he was going to call Manny on his cell phone because he also had another thing to discuss. When reached, Manny told Eric to call a regional operations assistant Aster and ask her to call the deposit operations department. Eric informed Rick of this and started calling Aster. In the meantime, Rick sent the service request. In the phone call with Aster, Eric asked, "Has Rick sent you (the request)?" Aster acknowledged he had. After hanging up with Aster, Eric told Rick that it was now "out of our hands."

This is a very typical example of an assimilated technology in complex use. Six people including the customer and the deposit operations department were involved and three communication channels (face-to-face between, electronic service requests, and phone calls) were intertwined. Rick began using the service request routinely. He knew what he needed to do. Rick and Eric knew what the other was doing even without explanation. Note also that Aster expected Eric or Rick to send a service request. Although the question "Has Rick sent you?" lacked the object (i.e., a service request), it was taken for granted and understood by her. One key feature of this routine was that participants produced their actions knowing how the system and others would react. Therefore, they did not need to monitor what the system or others were doing or coordinate with explicit explanation.

The resulting "out of our hands" indicates that Eric knew that Aster would handle the request properly. In contrast to what reps experienced with people in the back office, this knowing is markedly special. Because Eric had interacted with her many times in the past and knew her well, he could trust her. The fact that they talked over the phone was also important because reps rarely talk to those in the back office. Eric's knowing Aster, however, is not full knowledge because Eric was comfortable removing himself from what would happen next and

let it out of his hands. Here, his knowing included not only knowing whom to talk to but also knowing what he did not have to know.

Finally it is important to note that the task faced was not necessarily a simple one. The problem dealt with (namely, putting a hold on a check already submitted for deposit) was not an everyday one. Rather, it was one of the many exceptional cases that might arise, but are not anticipated. Still, the problem was dealt with through subtle extension of familiar routine. Moreover, learning resulted, even while bounds were reinforced, as reflected in Eric's comment that the problem was now "out of our hands."

Interpretation

With routinization, remarkably sophisticated use of enterprise systems is made possible, where users interact with each other and with the system, as in the performance of a dance. Individual moves and routines mesh with each other across familiarity pockets deepened by experience and mutual understandings of the task. Workarounds, as well as personal tools and methods, may be incorporated in the interactions. Improvisations and embellishments may also be featured. Even at the perimeter of the firm, where community can be thin, as in the present case, routinization and assimilation of the technology may eventually be effectively achieved. Still, beyond the routine performances and the understandings that facilitate them, much remains unknown to the local participants beyond their familiarity pockets, indeed almost all other aspects of the enterprise system and its use by the many others elsewhere with whom they don't interact and share performances.

DISCUSSION

While the learning processes observed in the present case closely parallel those identified in previous research, the notion of a familiarity pocket enables us to tie the learning together and

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gain insight into what is actually learned, and importantly what is not learned, in local

assimilation of a complex, centralized enterprise system. Having already introduced the notion

of a familiarity pocket above, here we elaborate more systematically and thoroughly.

The familiarity pocket

We begin with a rough definition. *An information system user's familiarity pocket*

comprises work routines and components accumulated through situated interactive use of the

system. Note that the focus here is not on familiarity with the system, apart from its users, but

rather on that gained through routines by which users interact with the system and each other.

Such routines are fundamentally organizational, even as each actor's understanding is individual

(Pentland & Feldman, 2008), i.e., particular to his or her own familiarity pocket. Each actor's

familiarity pocket is accordingly understood to be built and differentiated according to the

interactions engaged in. Where users share a routine, they are understood to do so through these

interactions, and because each must interpret the actions of others, their respective familiarities

with the routine will be different. We illustrate our interpretation of familiarity pockets in

routine interaction in Figure 1.[5]

<insert Figure 1 about here>

While the illustration is a simple one, it allows us to make several important distinctions.

First, a user's familiarity pocket incorporates not only routines, but their components, i.e. moves

and move sequences. Broadly, it defines a user's "sphere of action," delineating the moves from

which routines may be composed, a necessary condition for routine formation (Pentland, et al,

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[5] We are grateful to Brian Pentland for suggesting that what we describe here may be interpreted as a narrative network (Pentland & Feldman, 2007). In the present paper, we chose not to make use of the language of narrative networks, as it wasn't needed to explain our primary findings. We acknowledge that narrative networks and their associated modeling techniques may be useful to doing further work along the lines we later suggest, however.

2009). Second, each user move is understood to be interactive, and links the user with the system and/or another user and vice versa. Because it is interactive, each move incorporates feedback that motivates the next move in a sequence, whether routine or not, and can thus be an occasion for adaptive learning. Third, while a user may make a move not only within his or her familiarity pocket, but outside it, the outside move will generally follow an inside move. That is, routines will typically serve as the basis for needed improvisation (Feldman & Pentland, 2003).

And so users through familiarity pockets come to understand and eventually assimilate a system not in isolation but in the collective action of using it, as situated learning theory would suggest. From our findings, the process by which the pocket is formed and developed is sketched as follows. In initial interactions with a system, the user has little familiarity to draw upon, but through trial-and-error rather quickly establishes a minimal pocket of moves and move sequences that can serve as components of routines not yet coalesced.   As familiarity is gained, he or she then struggles to cope with the inevitable troubles that arise and further seeks help from others, incorporating all of this experience into more elaborate moves, understandings, and eventually, full routines, building out the familiarity pocket and adapting it to the task at hand. With increased routinization, the pocket is then reinforced through repeated performances, even as it is continually refined and extended, while the system itself is assimilated, no longer presenting barriers to the performance, but rather blending into it. Still, to the extent community is thin, as at the perimeter of a firm, pocket development may differ widely among actors and routines may be idiosyncratic.

Bounding effects

As we conceive it, the familiarity pocket is important in large part because of its several bounding effects. First, it establishes a sphere of action within which moves are readily

incorporated into routines and outside of which moves are contemplated and ventured mostly out of necessity. Second, it further bounds the user's ostensive knowledge of his or her actions, such that the world outside this sphere is readily ignored until circumstances dictate otherwise. Third, it establishes bounds on the user's engagement of the system itself. Among the many possible ways of using a system, only a relatively small number will be incorporated into moves and routines, providing the user with a limited number of system touch points. Finally, all of these bounding effects are self-reinforcing as the user gains experience and competence in his or her routines.

Outside a user's familiarity pocket, then, is an unknown world, which, we emphasize, includes many aspects of the system. Indeed, with enterprise systems, the vast majority of its features may remain unknown to an individual user, which, however, does not confuse or overwhelm one with experience, because by means of routines he or she effectively knows to ignore them. This contrasts with the neophyte user who in the absence of routines and lacking even a modest sphere of action, is easily overwhelmed by apparent system complexity. The experienced user's ignorance is thus an achieved one. Supported by the familiarity pocket, he or she overcomes not-knowing, not so much by learning what is not known, but by learning how to competently ignore it.

Within a familiarity pocket, users thus come to know how to use the system, but not necessarily in anticipated ways, nor with the knowledge that might be expected. It was apparent in our study that reps didn't fully understand even the parts of the system they routinely use. When asked, they had difficulty explaining things. This did not necessarily detract from their performances, however. Users are quick to make assumptions as to how a system works, often unconsciously, as their performances inform their ostensive understandings (Feldman &

Pentland, 2003). When assumptions are confronted with counter-evidence, users simply work them out anew. Such indeterminateness did not seem to bother the reps much in their everyday work—they are familiar with using guesses—and they did not mention it unless we asked them about it. In short, the knowledge represented by a familiarity pocket is likely to be rich in assumptions made through performances, and does not imply broader understanding of the system and its functionality.

We are reminded that the ostensive understandings associated with familiarity pockets are both cognitive and embodied (Feldman & Pentland, 2003). While the cognitive understandings of even experienced users may be shaky, as we found, their embodied understandings may nevertheless support rather sophisticated routine use. We observed that routine interactions were marked by substantial reflexivity, reps typically interacting easily with the system and others, knowing how they should react to each of their own actions. Nevertheless, building such routines at the periphery of a firm can be difficult, as was reflected in the reps' problems in working with those in the central office.

Pocket adaptation

Where troubles and new situations are encountered, users must of course adapt or expand their familiarity pockets, devising new or refined moves and repairing or deepening ostensive understandings. We found that in dealing with troubles, reps tended to make an interesting trade-off in adapting their familiarity pockets. Rather than seek a deeper cognitive understanding of a problematic routine, they tended to work around their ignorance, devising ways to use the system reflexively without really understanding the interaction. For instance, when reps didn't know whether the system had received submitted communication records, they often double-checked by other means instead of figuring out how the system worked and gaining confidence

in it. They incorporated what might be termed "patchwork" into their routines, devising an extra move or two to mask that which they did not know.   Such patchwork may be considered a special form of workaround, where users patch over their ignorance of the system, more than they work around an obvious short-coming of the system, as the term is classically understood.

The same practice was observed in reps' interactions with others located elsewhere. When they did not know whether others had acted on their service requests, reps often double-checked via another system. They could have instead talked with these others and worked out a mutually understood way of using the system. At a distance, however, users find it difficult to reach consensus on practices, lacking knowledge of each other's situations. They may find it easier to patch over their ignorance, incorporating a new move or two into their routines. This does not mean that local reps were happy doing such additional work. They expressed frustration if asked about it. Still, patchwork within familiarity pockets was itself routine. Routine performances lacked the deeper cognitive understandings that might have been expected to accompany them.

Beyond such dealing with troubles, users will of course over time encounter many new situations or variations of familiar ones, also requiring adaptation. With experience, then, a user's familiarity pocket should be substantially expanded in terms of what we call the breadth and depth of its routines. Pocket breadth, as we conceive it, is gained largely by expanding the sphere of action, adding moves or sequences that extend the range of routines to accommodate somewhat new situations, enriching performances. In some cases this may entail making use of a richer set of system features. But from our study, we observed that reps also made use of personal means to accomplish this, as when one rep discovered how to query by phone number in situations where other data were lacking, adding a new move to her routine.

Pocket depth, as we conceive it, reflects cognitive as well as embodied understandings, and also facilitates adaptation as it allows for greater sophistication in reworking routines to deal with novel situations. We observed in particular that when a routine's implicit assumptions are brought to light through unexpected events, users often gained in their understandings. What was known only implicitly is opened to situated examination, interpretation, and validation. Familiarity pockets can thus be deepened, although the understandings gained remain imperfect and incomplete.

Local assimilation revisited

Revisiting our central questions, when local users are distanced from a highly complex enterprise system, how can they achieve competent situated practices of using it? At the same time, how can they coordinate as needed with remote others whom they do not know well and cannot interact with face-to-face? How is all of this made routine, such that the system is assimilated? The notion of a familiarity pocket suggests answers and helps us understand too what is actually accomplished.

We find that what users achieve in building familiarity pockets is not only a kind of knowledge-in-practice, but what might be termed a certain "competent ignorance." Users learn first, to ignore that which lies outside their familiarity pockets. Within the pockets, they learn work routines that enable them to interact skillfully both with the system and with other users, but which further mask much which they do not need to know.

Whereas most prior research has stressed the knowledge that workers typically develop and display as users of systems, we suggest here that in assimilating new enterprise systems, local users may as much display an achieved competent ignorance. This counter-intuitive interpretation yields further insights into what we know from other research.

For instance, it is widely known that users are inclined to employ only a small set of a system's features (e.g., Orlikowski, 2000; Jasperson et al., 2005; Jones et al, 2008). The achievement of a competent ignorance may underlie this phenomenon. Orlikowski (2000) remarks that "some properties provided by the artifact do not exist for us as part of our technology-in-practice, while other properties are rich in detailed possibilities" (p. 408). As we interpret it, a user's competent ignorance may enable certain properties "not to exist." Importantly, users do not only engage in explicit sense-making and construction of coherent stories when facing systems that they do not know (Suchman, 1987). Rather, users seek not just to make sense but to substantially ignore. Thus, not-knowing is important in explaining not just situational breakdowns (Suchman, 1987; Orr, 1996) but also everyday routine execution. At a distance, as at a firm's periphery, centralized systems are thus assimilated by routinely engaging them in certain local interactions, while rendering their larger unknown aspects invisible.

The familiar concept of workarounds can also be reinterpreted in part from the findings of the present research. As traditionally interpreted, a workaround is developed by a user to overcome misalignment between the system and the necessary work (Gasser, 1986; Sachs, 1995; Robey et al., 2002; Koopman et al., 2003; Boudreau & Robey, 2005; Wagner & Newell, 2006). The notion of patchwork introduced here, suggests a different kind of workaround, in which users adjust their practices, not in response to misalignments, but to working around their lack of knowledge. Working both within and around the system, they build patchwork moves into their familiarity pockets as part of developing their competent ignorance. We speculate that such patchwork may be rather more widespread than has thus far been observed, particularly in using complex enterprise systems, where familiarity pockets must embrace large unknowns. Certain of

the workarounds reported by Boudreau & Robey (2005), for instance, clearly involve patchwork as we distinguish it.

We note too that while patchwork might seem inefficient, it can make coordination between distant users of enterprise systems robust. Where communications are difficult and trust in others' actions is problematic, patchwork by means of double-checks and such can confirm that related work elsewhere has been carried out as expected. It can enable a user's competent ignorance to extend beyond interactions with the system, to embrace those with others who are scarcely known. Accordingly, at a firm's periphery, where community can be thin, we might expect to find relatively more patchwork in the routine use of enterprise systems, than at the firm's center. Assimilation is likely to be more idiosyncratic.

Finally, the present research suggests that the organizational learning that accompanies assimilation of enterprise systems at the periphery of the firm may be rather different from that suggested by the literature that emphasizes the importance and sophistication of knowing-in-practice to organizational capabilities and innovation (Cook & Brown, 1999; Orlikowski, 2002). We observe that much of the local use of enterprise systems is rather mundane and the knowing-in-practice achieved, while subtle and nuanced, can be of a very modest kind with respect to appropriation of system features. In assimilating enterprise systems locally, users may not need to learn to work deeply with the technology, which may therefore remain at something of a distance. They may not need to learn the intricacies of the transaction processing, which can be quite sophisticated. Rather, they may first of all need to build familiarity pockets that enable a certain competent ignorance to be achieved in doing their daily work, where the primary focus may be not with the system, but elsewhere.

CONCLUSION

In sum, complex, large-scale global enterprise systems must be used across a firm, in diverse and widespread local settings. They must be assimilated not only at the firm's core, but at its periphery, where employees interact with customers and suppliers. In the present study, we observed how one bank's CRM system was used and assimilated by representatives in relatively isolated small branch offices. We found that the bank's reps came to use the system by building familiarity pockets of accumulated moves and routines, which excluded or masked that which they did not need to know, enabling them to develop a kind of competent ignorance in their interactions with the system and with others. This notion of a familiarity pocket, while it emerged from the context of our particular study, has broader ramifications for the study of information system assimilation. It underscores in particular the importance of organizational routines to the underlying learning process, making a modest contribution to this literature (Pentland, 1992; Feldman & Pentland, 2003), in helping to explain routine formation, not yet well understood (Miller, et al, 2009; Pentland, et al, 2009). It contributes too to the broader literature on knowing in practice (Brown & Duguid, 1991, 2001; Cook & Brown, 1999), which has effectively contrasted codifiable knowledge with practical knowing, but has tended toward seeing the latter as a competence largely uncompromised in its acquisition. The concept of a familiarity pocket suggests a more nuanced view that emphasizes not-knowing as an inherent part of knowing-in-practice, yielding what we term a competent ignorance. In local assimilation of enterprise systems, in particular, this competent ignorance may explain in part how users accommodate themselves to the distances faced.

We acknowledge the obvious limitations of the study, which dealt with a single case of local situated use of an enterprise system, which we were able to observe only over a short

period. We note that the system's users, while experienced in the industry, were also all relatively new to the firm and several were learning both the local work and the technology. In other, more mature work settings, the assimilation processes for newly introduced technology might be different, in particular where older legacy systems previously prevailed (see especially Boudreau & Robey, 2005). Too, assimilation processes may well be different in central offices, where management staff may make more sophisticated use of an enterprise system, e.g. seeking to mine its large database. Whether the notion of familiarity pockets has relevance in less routine work situations than those we observed may be questioned. More broadly, it remains for future research to probe the extent to which our insights have validity beyond the present case.

Looking ahead, the notion of familiarity pocket should be further developed and examined more closely, in terms of its assimilative role. Here we have only introduced the concept; it remains to theorize it more specifically and probe its significance in the post-adoption learning process. Broadly, we need to know more about a pocket's characteristic size and growth pattern, and its interplay with assimilation. With regard to size, we suggest that it reflects users' need to balance what they know with what they don't know and can competently ignore in interacting with a complex system. Size is important then not by itself, but in relation to the system and its greater potential. With regard to a pocket's growth pattern, it would be interesting to know not only its characteristic form, but the interplay between growth in breadth and depth, as the assimilative process unfolds. Too, we need to investigate management and design interventions that might enable familiarity pockets to be purposefully shaped in advancing learning.

Most importantly, we should further explore the ways in which users' familiarity pockets develop and adapt to each other collectively, through routine interactions. Broadly, to the extent that familiarity pockets overlap through interactions, communications should be facilitated, as

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community can be built. Thus, co-located representatives may be expected to adapt their familiarity pockets to each other, but less so to reps doing the same work at other locations, as we observed. Because reps had relatively little interaction with those in the back office doing very different work, their pockets no doubt overlapped very little with those of these others, and communications with this distant group were accordingly not only few, but problematic. While we were not able to directly observe familiarity pockets in the back office in the present study, our indirect evidence suggests likely misalignment with the pockets of the representatives working at the bank's periphery. While the reps coped with this issue through patch-work, it is possible to imagine design changes that might better serve both parties to the interaction. In sum, by investigating how different pockets of familiarity adapt or not to each other, we are likely to attain a deeper understanding of the ways in which collective learning and coordination can better be achieved.

From the practitioner perspective, managers and designers should understand that even where an enterprise system is deployed and put to use without much difficulty, the potential value of the system may hardly be tapped, particularly at the periphery of the firm. Distant users are likely to rely on a very limited set of routines with relatively few touch points to the system, where much is ignored, even within the routines themselves. Thus, where managers are concerned about infusing a new technology subsequent to its introduction, so as to better capture promised benefits (Jasperson et al., 2005), they might well focus on user familiarity pockets and how these might be shaped to advantage through facilitative interventions, such as providing new communication channels, e.g. electronic discussion groups, that encourage the sharing of best practices. In the present case studied, it seemed clear that learning and use of the CRM by the bank reps across locations might be advanced by such an intervention. It may be true in general,

that managers underestimate the assimilation problems that centralized systems can raise at the firm's periphery.

More broadly, the notion of familiarity pocket gives managers and designers a way to focus on and evaluate user practices. In some cases, designers may wish to revisit assumptions about what users should be expected to know about systems. Some researchers have suggested that users need to take control of a system's behavior, which should by design be transparent to them (Brown & Newman, 1985; Norman, 1988, 2007). In the case of enterprise systems, however, this notion may be problematic, as it is not at all clear that local users seek such control and transparency. They may rather seek to relegate as much as they can to background which they may then competently ignore. Their impulses may run counter to design assumptions. Designing systems to aid users in competently ignoring them for the most part presents an alternative challenge, one which egoless designers might wish to take up.

Both manager and designers can target familiarity pockets strategically. Managers seeking to encourage perceived ease of use and thereby gain wide support for a system, might aim for initially smaller pockets by focusing on the learning of a few basic tasks, while providing subsequent means, e.g. additional training, to expand upon these. Designers in turn might seek to facilitate faster growth of the pocket. Because users learn through troubles, designers might seek to build in equivalent means, e.g. challenging exercises, by which users "take the trouble" to advance their own work practice. Finally, managers should give increased attention to the multiplicity of groups and locations associated with use of their enterprise systems, and seek creative ways to facilitate trouble-shooting and learning across these. Only then, by bringing familiarity pockets together through interaction, will the enterprise be likely to be integrated as envisioned by the system as conceived.

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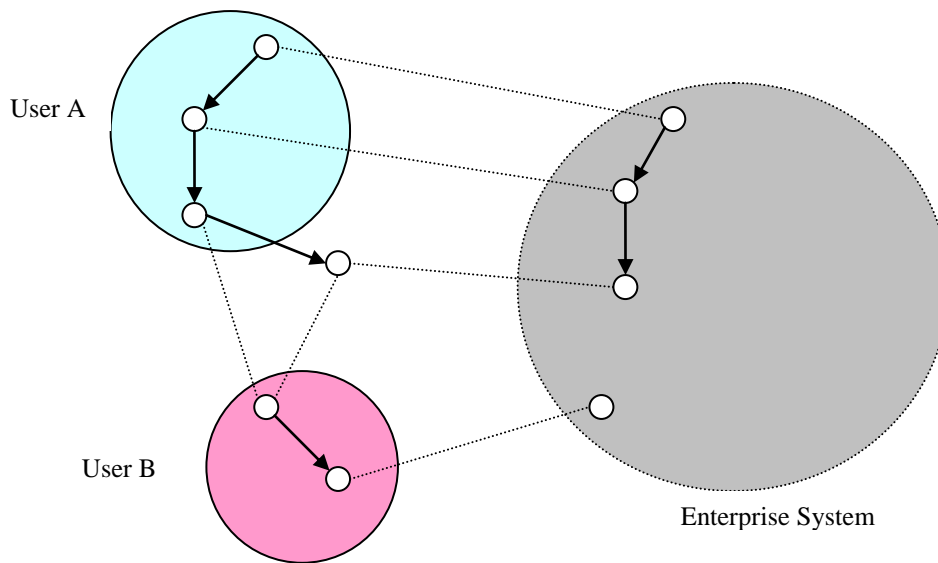
Figure 1
Illustrative Routine Interaction

User A engages in a routine interaction with an Enterprise System (ES) and another User B. User A makes a sequence of four communicative moves, the first two engaging the system, the third engaging User B, the fourth engaging both the system and User B. User A's third move is to ask a question of User B, with whom he frequently interacts. User A's fourth move, supported by further interaction with User B, is then an improvisation outside his familiarity pocket, e.g. engaging a system function new to him. User B routinely fields such questions about the ES from User A and others. Having provided assistance to User A, User B makes a second move, e.g., updating the system to reflect her interaction with User A. The ES is shown as updated independently of its interactions with User A. The performances shown are generative in that, for instance, User A, faced again with the same situation, may now work with an expanded familiarity pocket, and may or may not need to consult again with User B.

In the above graphic, communicative moves are shown as nodes which may be linked by connective arrows to represent move sequences. Communications between actors are represented by dotted line links. The larger shaded circles represent the familiarity pockets associated with the actors and their moves. (In the case of the ES, its "familiarity" may be interpreted as confined to its software and data, lacking human understanding.)