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Research-in-Progress

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Abstract

Craftsmanship is a concept often left unaddressed in the IT innovation literature. Further, this literature often fails to consider innovation that involves human labor on the shop floor. With the sheer volume of organizations that operate in craft-based industries, placing a strident focus upon craftsmanship and predominantly innovating on the shop floor, this is particularly concerning. This work therefore examines the influence of considered craftsmanship on the nature and consequences of digital innovation in the guitar manufacturing process at C. F. Martin & Company. We propose a model of innovation that incorporates the concept of the activity system, drawn from the field of activity theory. Individual innovations cause disturbances in actor-tool-task relationships (activity systems). This drives a series of reconfigurations, in an effort to eliminate said disturbances. Preliminary qualitative evidence is provided, supporting the proposed model, in the form of a series of semi-structured interviews.

Keywords: Digital innovation; craftsmanship; activity theory; activity system; guitar

Introduction

> ***Craftsmanship names an enduring, basic human impulse, the desire to do a job well for its own sake. Craftsmanship cuts a far wider swath than skilled manual labor; it serves the computer programmer, the doctor, and the artist ... craftsmanship focuses on objective standards, on the thing itself. Social and economic conditions, however, often stand in the way of the craftsman's discipline and commitment: ... workplaces may not truly value the aspiration for quality ... The craftsman often faces conflicting objective standards of excellence; the desire to do something well for its own sake can be impaired by competitive pressure...***
>
> ***- The Craftsman (Sennett 2008)***

In recent years, Yamaha Instruments has seen great success, producing and selling digital keyboards and electric acoustic guitars. Meanwhile, Yamaha's competition in the piano and guitar markets, Steinway and Sons and C. F. Martin & Co. (Martin hereafter), respectively, have instead chosen to maintain their craft, placing a strident focus upon the skill and deep knowledge of their workers in the production process. The contradictory nature of these two fundamentally different approaches to operation begs the question: is it to an organization's benefit to hold fast to tradition? What is to be gained by maintaining this concern for human labor and skill? Can an organization pursue both digital innovation and traditional craftsmanship simultaneously? To explore these questions, we examine the pattern of digital innovation at a *craft-based firm*. We define the *craft-based* firm as an organization that is characterized by its cognizance of the import of craftsmanship. By digital innovation, we mean a broad spectrum of process and product innovations enabled by digital technology, including information systems and robotics. Specifically, we ask the question: how does this focus upon craftsmanship and tradition influence digital innovations?

Martin provides a unique opportunity to explore digital innovation in a context where craftsmanship still plays an important role for mass-produced products. Martin has sought to incorporate a variety of digital technologies into their production and design processes in recent years, including CAD/CAM software, CNC machining, and robotics. Yet the firm, in addition to pursuing the common goals of consistency and productivity, has paid significant consideration to aspects of craftsmanship. While Martin has sought to boost productivity and cost efficiencies through automation, it has simultaneously sought to eliminate rote, ergonomically damaging tasks from their laborer's efforts.

Craft-based firms like Martin occupy a significant proportion of the global economy. According to the Bureau of Labor Statistics, more than 8 million individuals are employed in non-supervisory roles in the American manufacturing sector, as of March 2010[1]. Yet, there is a dearth of research on digital innovation in such firms. This research-in-progress not only draws upon, but also to goes beyond, existing models of digital innovation in organizations. Much of the literature on innovation would suggest that firms like Martin have little impetus to innovate (Tushman and Anderson 1986). Yet in defiance of this, they continue to do so. Martin is quite old, having existed for more than 170 years. Yet, we find evidence of a highly dynamic organizational structure and, further, consistent innovation. Prior work has argued that innovation will be stimulated by a greater intensity of competition (Utterback and Suarez 1993). To the contrary, Martin largely dominates the acoustic guitar market at this time, yet it continues to innovate technologically. Given their focus on craftsmanship, one can expect that the nature and consequence of digital innovations in craft-based firms are quite different than in other firms that focus on mass production. We therefore seek to explore these aspects of digital innovations in craft-based firms. We draw on activity theory (Engestrom 2000) and the phenomenological foundations on technology (Polanyi 1966) to understand how digital innovation reshapes the activity system that underpins craftsmanship in a craft-based firm. Specifically, we attempt to answer the following research questions:

Research Question 1: Given a concern for craftsmanship, what is the nature of digital innovation that arises in craft-based firms?

Research Question 2: What are the consequences of digital innovations, for craftsmanship, in a craft-based firm?

[1] http://www.bls.gov/iag/tgs/iag31-33.htm

In the following sections, we begin by providing an overview of the relevant literature pertaining to IT innovation, activity theory and the concept of craftsmanship, elaborating upon those points of intersection between these literary bases that warrant further analysis from both a theoretical and a practical standpoint. This is followed by a discussion of the proposed methodology and the study context. Examples are provided of specific innovations that will be considered based upon the qualitative evidence we have obtained thus far. Lastly, we conclude with a discussion of the implications and limitations of this work.

Literature Review

IT Innovation in Manufacturing

When Frederick Taylor first proposed the concept of Scientific Management, one of the primary goals was to improve productivity and to cut costs by making the laborer's job easier and more streamlined (Locke 1982). With the introduction of information technology (IT), scholarly work has often gone astray, shifting from advocation of enabling the laborer, to simple substitution. Thus, the vast majority of literature pertaining to IT-enabled innovation gives little consideration to the human element. The majority of extant research on IT innovation in the IS literature has been conducted in the context of office work; relatively few studies appear to have been conducted in a manufacturing context. Consider that, between 1981 and 1991, IT innovation work in the IS literature evaluated such developments as word processing software, mainframe systems, expert systems, laptop computers and database management software (Fichman 1992).

It is also important to note the pro-innovation bias in much of the work: innovations have been considered to be uniformly beneficial, thus the focus has tended to be on how to innovate successfully, with little critical assessment of the goal (Fichman 2004; Van de Ven 1986). The potential negative consequences of the innovation attempt, such as the loss of tacit knowledge and a decline in social welfare, is often left unexplored in the IS literature. The pattern of innovation exhibited in a manufacturing setting is implicitly assumed to parallel that of white-collar settings in a number of respects. However, manufacturing settings are different in that individuals that work in such settings are often required to rely primarily on their physical self, which contains or embodies their knowledge (i.e. tacit knowledge), rather than drawing consciously on their memory, experience or understanding, to carry out their work.

Past research on IT-enabled innovation has also focused on the substitutive role of IT. That is, IT was often seen as a way to replace human labor and ultimately improve the efficiency and effectiveness of organizations. Zuboff conveys her first hand experience of this sentiment, discussing the loss of workers' sense of engagement as a result of firms supplanting manual efforts in the banking sector: "many people voiced distress, describing their work as ... 'lost behind the screen'" (Zuboff 1988). Boland et al. (2007) provide a stark exception to this. In their study of innovation in the work processes of the firm of architect Frank O. Gehry, they note that Gehry avoided the adoption of initial advancements in 2D modeling and animation, only to become an early adopter of 3D technologies. Implied here is that Gehry's goal in incorporating technologies does not merely lie in the pursuit of productivity or of efficiency gains; it lies in the augmentation of existing abilities, to be a master builder without sacrificing existing dimensions of quality (Yoo et al. 2006). Thus, digital 3D tools did not diminish the value of craftsmanship in Gehry's work. Instead, they enhanced it. However, given the nature of architectural design, in which each project is unique, it raises the question as to whether similar types of IT innovation can be found in industries that center on mass-production.

Craftsmanship and Craft-based Firms

Sennett (2008) expounds the concept of craftsmanship, defined as "an enduring, basic human impulse, the desire to do a job well for its own sake" (p. 9), suggesting that it presents a unique state of human *engagement*, in which only the object of work drives the performant; the laborer's focus is placed squarely upon the means, to the complete exclusion of the ends. Sennett suggests that the productivity of a craftsman, in terms of both volume and quality, is largely dependent upon the freedom to conduct oneself without constraint in the course of one's work. Subjected to a dearth of resources, whether physical (as a lack of tools or materials) or mental (as a lack of appreciation or respect) the craftsman's efforts diminish.

Craftsmanship manifests itself in a wide variety of work. However, the stereotypical image the term draws to mind is that of a trade. Consider, in particular, the luthier. A trade that has since its very beginnings embodied the concept of craftsmanship, the luthier's work is rooted in centuries old tradition. Yet, as Sennett alludes, competitive pressures of the modern economy occasionally impinge upon even this seemingly timeless craft. As information technology is now incorporated into virtually every aspect of our modern environment, it is not surprising that it has begun to be incorporated into the guitar manufacturing process over the past three decades. Yet, as mentioned in the introduction, Martin's adoption of technology has been much more restrained than that of other firms, such as Yamaha. This is because, as seen in the case of Gehry (Boland et al. 2007; Yoo et al. 2006), the adoption of technologies in craft-based firms is largely driven by a desire to support the tacit relationship between tools and craftsmen, essential to this effort, rather than its extraction and ultimate automation. Driven by more than the basic pursuit of variety, volume, reliability or flexibility, they strive as well to maintain their craft. Thus, we believe that firms focused upon craftsmanship will deviate in a number of respects from those organizations examined by the majority of prior work, and that the causes of these deviations are worthy of careful exploration.

Craftsmanship as an Activity System

Underlying craftsmanship is the actor-tool-task configuration that underpins all forms of labor, which is best interpreted as an activity system (Engeström 2001). The concept of the activity system is drawn from the field of activity theory (Engestrom 2000; Vygotsky 1978 p. 19), which views social behavior as a web of such systems. An activity is "a form of doing directed to an object" (Gay and Hembrooke 2004 p. 2). The system is comprised of different, related components, including a subject performing the activity (an actor), their instruments (tools), the object of the activity and the rules guiding the activity (together comprising the task), the community in which the activity is being performed and the division of labor amongst those individuals involved. The system then drives an additional component, the outcome of the activity.

An important concept in activity theory is the idea of *mediation*. Actors accomplish their tasks using tools; a relation we refer to later as the tool-actor-task relationship. In this process, tools shape the way that actors interact with the world (Vygotsky 1978). The tools reflect the experiences of prior actors who have attempted to solve similar problems in the past by inventing or modifying tools (Hutchins 1995). The materiality of the tools, then, manifests their historically and culturally accumulated experiences over time. Further, according to activity theory, a task is carried out within a community that consists of multiple actors who share a common object, constrained by rules and an existing division of labor.

The relationships between these components of the system have the potential to become misaligned (Engestrom 2000). These misalignments, or disturbances, result in inefficiencies, such as lost productivity or quality. When disturbances take place, as is likely to be the case with the introduction of new digital tools, stakeholders will react by employing a pattern of expansive learning, attempting to identify possibly reconfigurations that improve the alignment of the system, rectifying misalignments (Engestrom 2000; Engeström 2001). It is this expansive learning process that will drive the reconfiguration effort, the fundamental goal being to remove barriers to the application of tacit knowledge (Polanyi 1966).

Reshaping of Mediation: Proximal to Distal

Craftsmen evolve a problem-attuned focus to their tasks via thousands of hours of experience, accumulating tacit knowledge and a perception of their tools as extensions of themselves (Polanyi 1966; Sennett 2008). The concept of tacit knowledge is easily explained by Polanyi's famous quote: "we can know more than we can tell" (Polanyi 1966 p. 4). One way that Polanyi describes tacit knowledge is through the concepts of *proximal* and *distal*. Proximal refers to something being close-up or at-hand, while distal refers to something being distant. Proximal refers to the minute particulars of action, a microscopic perspective, whereas distal refers to the entirety of action, a macroscopic perspective. According to Polanyi, in the case of tacit skills, our focus is on the distal, while the proximal is that by which we accomplish distal. For example, in operating a tool, an individual lacking tacit skill might focus on their grip, manipulation of the angle at which a blade will be applied to a surface, or adjustment of pressure (proximal), while an experienced individual, having tacit skill, might focus on producing a perfectly smooth surface (distal).

In order to develop the level of experience and subliminal memory necessary for a craftsman to attune his efforts to the problem at hand, he or she will typically require roughly ten thousand hours of practice (Sennett 2008). This extensive experience allows the craftsman to develop the level of tacit knowledge necessary to perform his or her work, without thought for the tool. The craftsman becomes problem-attuned. The tool becomes ready-to-hand; the task becomes distal and the tool's operation proximal.

Methodology

The goal of this work is to explicate the influence of considered craftsmanship upon the pattern and consequences of digital innovation in a firm. As such, we have employed a case study approach. Case studies are a preferred research strategy when one is investigating events over which they have limited control or where the relevant variables of interest cannot be manipulated (Yin 2008 p. 3-24). To our knowledge, none of the extant literature on IT innovation has considered craftsmanship as it relates to the innovation process, and relatively few have examined IT innovation in a manufacturing context, thus little theoretical basis exists from which to postulate. As such, we have employed grounded theory (Glaser and Strauss 1967), incorporating theoretical, purposive sampling, constant comparison and observation to the point of category saturation (Gephart 2004; Suddaby 2006). Grounded theory is fundamentally an interpretivist approach to research, which attempts to understand a state of affairs in terms of the interpretations of actors within some context (Gephart 2004).

Study Context

Martin is the oldest surviving, and arguably most prominent, acoustic guitar maker in the world. Since 1833, the firm has been continuously owned and operated by the Martin family, now in its sixth generation. Throughout its long history, Martin has experienced numerous changes in product design, distribution systems, and manufacturing methods. In spite of these changes, the firm has remained faithful to its initial commitment to quality. An interesting mixture of hand craftsmanship and computerized automation characterizes the Martin workplace. For the vast majority of its history, the Martin organization has been based in Nazareth, Pennsylvania, though it does have manufacturing facilities located in Mexico as well.

Data Source

We have employed multiple data gathering methods, including document analysis and key informant interviews. Interview data was our primary data source, while document analysis was secondary and used primarily to establish background and to corroborate interview data. Interviews were conducted in a semi-structured fashion with a representative sample of employees at Martin (MacCracken 1988). Participants included the owner of the firm, the product design lead, engineers involved in robotics, CAD engineers and craftsmen at the factory. We progressed via snowball sampling, allowing respondents to suggest additional respondents to us as the potential contribution of these additional parties became apparent (Biernacki and Waldorf 1981). For each interviewee, we asked them to identify major digital innovations that had taken place since the initial introduction of digital technology into the organization. We then asked them about the source and consequences of each innovation. This process was repeated with different interviewees in order to corroborate responses. As this remains a work in progress, and we are continuing to gather data, we will continue with this approach until our respondents cease to identify new examples.

A table of data has been developed, in which relevant theoretical constructs have been documented with respect to each innovation example, thereby ensuring comprehensive data collection. For each innovation, we have documented whether it is process or product related, its source, its consequences, supporting quotations and documentation, the digital component of the innovation and the actors involved. As our data collection progresses, this list of characteristics has been reevaluated and expanded upon as appropriate, as part of our constant comparison activities (Suddaby 2006). Further, all interviews have been digitally recorded and transcribed. These transcriptions have been subsequently coded. Once our data collection and coding have been completed, inter-coder reliability will be assessed.

Preliminary Results

Based upon our initial round of interviews, we have identified a few innovations that have taken place at Martin in the past, which we will discuss and analyze in our final work. One example is the introduction of Robotics into the guitar finishing process. Robotic technology constitutes a form of information technology as robots reflect codified knowledge. The activities of a robot are dictated through the definition and codification of a specified set of rules and sequences. The product design lead reflected on this technology as follows:

> "We felt that with our inconsistent thickness and mills, it would be beneficial to conquer the robotic spraying first. Get that down and then move into robotic polishing. [Once that was in place] there was a lot less people hand-spraying. So that shifted people around in the manufacturing group. The same holds true with robotic polishing. That was one area where there was a whole lot more people back there, hand polishing. So, as the machine came on board, people were freed up to go and do more meaningful tasks ... [t]here're skill sets that haven't been able to be modernized, such as pearl inlay. Custom guitars in general."

In implementing the robotics, Martin's main concern was retaining craftsmanship. The product design lead continued:

> "The sprayers became the robotics operators for the most part ... with the spraying aspect, they actually taught the robot the moves ... So that was a skill set. There's a whole lot of different things in spraying in general. When you're spraying something, each piece of wood is a little different, right? So you can see, as an operator, "Well, I need to go back and re-spray this one section." Robot doesn't know that."

The introduction of robotics into the mix seems to have influenced the tool-actor-task configuration. With the introduction of robots, the direct link between the sprayer and the spraying tools was broken. The initial reconfiguration of the activity system thus constitutes a distal relationship between the actor and robot, as the actor was made responsible for training the robot's motions. At the same time, the sprayer is responsible for the operation and continued training of the robot in its spraying. Therefore, the sprayer's task was changed from the spraying activity to a combination of managing the robot and spraying.

In this new activity system, the sprayer no longer manipulates the spraying tools directly. The hand tools, which used to be ready-to-hand in the sprayer's manipulation of the distal object (i.e. the application of consistent paint thickness to the guitar surface), are no longer as such. Instead, it is now the robot that is handling the spraying tools, performing the task. In a sense, a new proximal relationship is established between the robot and the spraying tools, as it is the robot that needs to attend to the minute details of the spraying activity. At the same time, the sprayer's perception of what is distal (now as the operator of the robot) remains the same – the task of applying paint consistently to the guitar surface. Although the spraying tools are no longer perceived as extensions of the operator's self, the new spraying tools that the robot is using are employed by the operator, in a sense, *through* the robot. This is because the robot is effectively integrated with the spraying tool from the operator's perspective. Thus, what is now perceived to be proximal for the operator is an outcome of the coupling between the robot and spraying tools (Dourish 2004). The sprayer-robot-spraying tool coupling is not merely physical; rather, it is *intentional*, as it is the intentionality of the sprayer, as a craftsman, that is being transferred into the robot, not just his physical force. It is also a temporary coupling, not permanent, as the sprayer occasionally does direct his attention away from the robot to the spraying tools that it is manipulating. This de-coupling is to ensure the quality of the spraying job performed by the robot. Figure 1 shows the reconfiguration of the activity system for the spraying task, as a result of the introduction of robotics.

Pre-robotics:
Sprayer ---> Spraying tools (Proximal)
---> Application of Paint to Guitar (Distal)

Post-robotics:
Sprayer ---> Robot (Proximal | Sprayer)
---> Spraying tools (Proximal | Robot)
---> Application of Paint to Guitar (Distal | Sprayer & Robot)

Figure 1. Reconfiguration of Activity System with Spraying Robot

What seems to separate this reconfiguration of the activity system from other typical factory automation efforts, in which worker involvement is often eliminated from the task entirely, is that the worker remains involved in the activity system and that what is distal (i.e. the object of both activity systems), before and after, remains the same, with the same intensity of concern on the quality of the outcome. The consistently high quality of the guitars produced at Martin is driven by the organization's obsession to reproduce its golden era sound. Maintenance of distal task and object is accomplished through a coupling between robot and the spraying tools. In other cases of factory automation, the distal relationship that emerges is primarily concerned with efficiency and productivity. In this case, there is no meaningful coupling that emerges by which the craftsmen can retain their control over the object, working *through* the new digital tools. Instead, in most cases, laborers merely end up working *on* the new tool. That is, rather than focusing upon the task output (working through the tools), the laborer becomes primarily focused upon maintaining the tool's operation (working on the tool).

According to activity theory, such new configurations of activity systems emerge through disturbances, where the dyadic entities are no longer aligned with one another, resulting in inefficiencies. The expansive learning process that is articulated by activity theory allows us to describe how craftsman pursue and accomplish reconfigurations of the actor-tool-task relationship, as they attempt to reestablish the stability of the activity system, eliminating these disturbances (Engestrom 2000). The nature these learning and reconfiguration activities, as well as organizational actors reference to concepts of craftsmanship in the consideration of new innovations, are currently indeterminate. As such, we must employ appropriate methodology, ensuring we do not constrain our consideration of examples or signs of the occurrence of these activities.

Discussion

Our results thus far suggest that digital innovations at craft-based firms exhibit different characteristics, relative to other firms. With respect to mindful innovation with IT, which has been defined as attending to an innovation with reasoning grounded in organizational facts and specifics, it has been suggested that firms innovating with IT will be more likely to exhibit mindlessness early on in the process, becoming more mindful as the innovation progresses. Martin, however, exhibits the greatest degree of mindfulness early on in the process, as any suggestion of change immediately grabs actors' attentions due to their concern over deviating from the ideal. One interviewee stated that Chris Martin, CEO of Martin guitar, "is a primary stakeholder in all change proposals and he insists that things not change. Nothing that would result in a change from the traditional form is even considered, because Chris will strike it down." Another example of Martin deviating from expectations with regard to mindful IT innovation pertains to Swanson and Ramiller's suggestion that mindlessness will be more likely to occur the more radical the innovation is. In Martin's case, the more radical the innovation, the more mindful the organization tends to behave. This is because such an innovation presents a greater break from tradition.

The reason for these deviations from Swanson and Ramiller's (2004) propositions likely lies in their implicit assumption that firms share a homogenous goal set. That is, they presume that all firms have two primary concerns; remaining competitive and profitable. Accounting for craftsmanship, it is apparent that some organizations have other priorities that are of equal concern to them. As such, the findings of our work have implications for the literature pertaining to 'mindful' innovation of IT. Yet the relevance of this work extends to a much broader base of work. Our results also show that, in craft-based firms, the ideal past serves as an important basis for digital innovation. As shown in the robotic spraying example, the ideal standard plays an important role, forming a coupling between the robotics and spraying tools, by which the craftsman can retain control over the distal. An important dyadic tension we observe in our study pertains to the concept of "*working-on-the-tool*" versus "*working-through-the-tool*." The former is an outcome of IT innovation that is aimed at replacing skilled laborers with non-skilled operators of IT, who perform the tasks that were previously performed by the craftsmen. To the contrary, the latter is an outcome of IT innovation that is aimed at enhancing and retaining the quality and consistency of craftsmanship using IT.

With regard to broader implications of our work to the management profession, Wallace and Kalleberg (1982) examine an exemplary case of the potential negative outcomes that may manifest when a firm ignores aspects of human skill and knowledge in adopting technology. They examine the progressive loss of skill and craft in the printing industry over five decades with the introduction of new technologies. The unfettered adoption of technology can be detrimental, in that the benefits of craft are lost; Sennett gives explicit consideration to the fact that craftsmanship is a revealing process, which allows the laborer to gain insight into their own character, to develop skill and achieve a state of satisfaction (Sennett 2008). Further, if the ultimate goal of the firm lies only in cost efficiency and productivity, the achievement of that goal through technological innovation and automation will most likely see the loss of valuable tacit knowledge held by human workers.

Future Plan

Going forward, we expect that the theorizing process will also elucidate opportunities for future research. As mentioned above, concepts of tacit knowledge often go unconsidered in the IT innovation literature, thus a portfolio of research may evolve. It is likely that our examination of activity systems in this novel context may drive expansions to activity theory, and its application to job design. As Engestrom (2000) has conducted research in the Finnish healthcare system, it would be only fitting to take our findings from this research and examine their applicability to the craft of medicine. The practice of medicine is infused with much tacit knowledge, thus activity theory might indirectly be used to examine and explain the extensive anecdotal evidence that speaks to medical practitioners resistance to the adoption of the plethora of new technologies entering this field. Further, the activities that medical personnel perform are often highly complex. This significant variation in task complexity might provide further insight into the process of activity system reconfiguration that takes place in organizational contexts in which the *craft* is of focal consideration.

Thus far, we have conducted and transcribed interviews with 9 individuals at Martin, with each interview having lasted between 30 and 60 minutes. Going forward, we expect to progress through interviews with an additional 5 to 10 employees. If necessary, we may conduct interviews with individuals that are external to the firm, if that is where the snowball sampling process should lead us (Biernacki and Waldorf 1981). This is a distinct possibility, as prior work has shown that individual innovations have a tendency to spawn further innovation across organizational boundaries. Innovations propagate as 'wakes' across the inter-organizational landscape (Boland et al. 2007). Further, as mentioned previously, activity theory conceptualizes all human behavior as an interconnected web of activity systems. Thus, an individual-level analogue to Boland et al.'s organizational wakes of innovation may manifest at Martin. As individual activity systems undergo reconfiguration, the web of related activities is likely to be impacted. It is therefore possible that wakes of reconfiguration will take place. An example of this might be a shift in task assignments, personnel retraining, or up- and down-stream adjustments in the manufacturing process to accommodate changes in a focal activity system.

Limitations

Wolfe (1994) points out that many aspects of innovation will have greater homogeneity within, than across, organizational types. As such, it is quite likely that the results of much prior innovation research are not entirely generalizable. With this in mind, we caution the reader in interpreting any results that might result from our efforts. We do not wish to suggest that all firms participating in a given industry that includes some artistic component will operate in keeping with the proposed model. As Sennett points out, craftsmanship is evident in a number of professions, from the laboratory technician, to the construction worker, to the weaver. This model is proposed to pertain to a specific organizational type, one that is sensitive to the import of craftsmanship. As an example of the potential for intra-industry divergence, Taylor Guitars places no such focus on tradition, yet they compete with Martin directly. As one interviewee stated:

> "Martin was very innovative to use the best tools available at the time. But to do it in a way that made what was considered even a classic, stay a classic. They never wanted to stray too far from what worked ... I think when Bob Taylor took off, his idea was, 'I am starting with a blank piece of paper and I don't care how traditional this thing is. I want to address certain issues' ..."

Further, some organizations, even meeting such criteria, will place varying degrees of focus on maintaining tradition. It is readily apparent that a greater degree of concern in this regard will result in a greater amount of leeway in the firm's practices with respect to innovating. This may result in varying degrees of concern in buffering the craft, whether through less-strict proposal evaluation processes or less concern for the involvement of the craftsman in decision making. Lastly, it should also be noted that, in examining a specific context (i.e. one firm), we would be implicitly assuming that the locus of innovation resides at either the individual, sub-group or organizational level (Rothaermel and Hess 2007). As we will not be evaluating Martin's interactions with other organizations (i.e. it's organizational network) we are constrained from considering their behavior in this regard. It is expected that additional limitations of this work will become apparent over the course of empirical evaluation and, as such, will be documented in later revisions.

Conclusion

As information systems become ever more ubiquitous, their relationship and influence upon issues of human capital are driving our focus toward the implications of IT innovation for people, both users and producers. As such, the topics of tacit knowledge, human skill, craftsmanship and the related concept of employee satisfaction should remain in the forefront of research and practitioner concerns. Researchers must remain concerned with these issues as they relate to both IS professionals and those who are affected by the IS profession. This work provides initial insight into previously unexamined effects of digital innovations upon individual worker activities, and said workers' subsequent attempts to adapt. By reinvigorating and offering a fresh perspective on long standing conceptualizations of IT innovation, shifting the scholarly and managerial focus to a more balanced consideration of productivity and the unique contribution of humans, this work provides the first steps toward a broader research agenda.

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