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PRACTICES OF MARKET-MAKING FOR SUSTAINING ELECTRONIC AUCTION

Completed Research Paper

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Abstract

This article examines how technology may be used continuously in organizations. Particularly, it investigates the organizing practices that support continuous technology-use. Exploring such organizing practices is meaningful because they could sustain ongoing organizational innovation. A field study on the enterprise application of e-auction (electronic auction, or otherwise known as online reverse auction and electronic bidding) is used to illustrate how a marketplace is effectively maintained over a span of seven years. Our findings identify a set of market-making practices and its principles that underscore sustained use of e-auction. This research contributes to literature on technology-use and adoption, as well as adds to studies on the electronic marketplace. It also offers practical lessons to implementers who seek to adopt the e-auction to achieve significant cost-savings and streamline the supply chain.

Keywords: Field study, e-auction, market-making, organizing, technology use

Introduction

When a technology is adopted, enterprises often assume that it will be used. However, they often forget that initial adoption success does not naturally lead to continuous use of technology. Moreover, they assume wrongly that continuous technology-use may lead to sustained organization innovation. In this study, we seek to examine how technology is used and sustained to produce consistent performance.

The current studies examine best practices (Szulanski, 1996), post-adoption behaviors (Karahanna et al., 1999), and inhibiting organizational factors (Jasperson et al., 2002). However, they somehow offer limited explanation on this issue. Alternatively, the research on technology structuring calls our attention to the process of adaptation, and indicates that technology-use would less likely to be a one-time business or follow several priori-stages of appropriation (Majchrzak et al., 2000, Tyre and Orlikowski, 1994, Beaudry and Pinsonneault, 2005). According to this theory, if a technology would be used continuously, then, as an outcome, technology begins a process of adaptation and a set of organizing practices would be enacted to sustain technology-use (Orlikowski, 2000). Although current studies have extensively analyzed the adaptation process between technology and organization, they have not had an opportunity to unveil the outcomes of this structuring (Orlikowski et al., 1995, Orlikowski, 1992, Orlikowski, 1996, Barley, 1986) This would require us to examine not the structuring process, but rather focus on how (and what) organizing practices are enacted from the adaptation process to support continuous technology-use.

Hence, our motivation in this study is to investigate by asking: After an adaptation process, what are the organizing practices enacted to sustain technology-use in a given context? To address this research question, we conducted a field study and examined the sustained use of e-auction in a leading firm in Singapore. Although e-auctions (electronic auctions) otherwise known as online reverse auctions or electronic bidding have become widely used to reduce procurement costs, few enterprises are actually reaping the power of such online negotiation systems. Our research proposes an alternative way to understand e-auctions by investigating the market-making activities embodied in such systems. From this perspective, we choose to examine neither the technology adoption issue, the market constituencies (Kaplan & Sawhney, 2000; Sweltzer & Carr, 2002; Pavlou & Sawy, 2002; Hsiao & Teo, 2005), nor the institution-based trust (Pavlou & Gefen, 2004; Allen et al., 2000; Hart & Saunders, 1997; Kramer, 1999; Zucker, 1986) produced to support e-auctions. Instead, we examine the organizing practices that sustain market-making activities. By adopting this more devious tack, we suggest the examination of e-auction deployment through the knowledge embedded in the market-making activities. A field study on the enterprise applications of e-auctions is used to illustrate how a marketplace is effectively maintained over a span of seven years. Our findings identify a set of market-making practices that underscore sustained use of the e-auction.

The paper is outlined as follows. The next section explains the theoretical basis of our research design and highlights the role of organizing practices in sustained technology-use. The third section reports research methods employed by this study and provides details on data collection and analysis. We present our findings in the fourth section and elaborate a set of organizing practices that support the effective use of the e-auction. Based on the findings, we surface five distinct organizing practices for market-making: leveraging, calibrating, guarding, energizing and maintaining. By interpreting these organizing practices, we examine why the selected firm could reap benefits from e-auction consistently. The fifth and last sections suggest theoretical implications to supplement technology structuring and e-marketplace literature, as well as offer practical lessons to prospective technology adopters

Literature Review

Information technologies are promised to produce different aspects of organizational innovation. For example, enterprise systems offer an effective way to organize resources. Groupware provides an efficient way to communicate across temporal boundaries. GPS (Global Positioning Systems) offer a creative way to dispatch vehicles. These technologies provide innovative ways of organizing to help us improve performance. However, the adoption of such technologies may not lead directly to organizational innovations（Bolton, 1993）. Rather, many

technology initiatives were not continued after initial adoption. Some of them, though continued, did not lead to anticipated outcomes.

How may a technology be sustained in the organization? The current literature offers three strands of thought to approach this issue. The first group of literature suggests that certain 'best practices' should be in place to exploit technology. These best practices often are exhibited in priori-stages or generic frameworks (Bogan and English, 1994, Szulanski, 1996, Jensen and Szulanski, 2004). Although they are instrumental, they fail to explain how these generalized best practices could help technologies that are contextualized in different types of organizational settings.

The second group of literature proposes to examine the condition of technology post-adoption (Karahanna et al., 1999, Jasperson et al., 2005, Bhattacherjee, 2001). For example, Karahanna et al. (1999) suggested that different user groups' ongoing beliefs would determine whether the technology would be adopted. In other words, if users continue to 'feel good' about the technology (such as usefulness, ease of use, and trialability), they would keep it. Bhattacherjee (2001) extended the concept that users' ongoing experience determines their expectations of technology-use. Technologies would be used, if they confirm users' expectations continuously. By the same token, Jasperson et al. (2005) conducted a more extensive literature review and stressed that the users' cognitive affirmation of technology merits largely affects whether technology would continue to be adopted. Moreover, the literature on social computing has added that organizational factors such as institutional, cultural, political and power barriers could prohibit initial and continuous technology-use (Robey and Boudreau, 1999, Kling, 1980). Additionally, if members would fail to learn collectively and continuously, technologies could not be sustained too (Robey et al., 2000).

The literature on post-adoption, however, neglects that continued adoption does not mean sustained use of technology. The literature on social computing identifies the external factors inhibiting technology-use. But if all inhibiting factors are removed, we are still unsure whether technology could be used effectively for a span of time (Pfeffer, 1996, Sauer, 1999). Above all, this group of studies explains less of what is inside the technology that makes it sustained. When users interact with technology, they inevitably modify technology to fit different organizational constraints. In the same way, technology would also pose constraints on organizations (Orlikowski, 1996, Orlikowski et al., 1995, Yates et al., 1999). Moreover, users need to adjust their work patterns in response to technology appropriation. It is an interacting process, and would take some time before a technology can be blended adequately into an organization (Leonard-Barton, 1988).

The theory of technology structuring offers an alternative view and suggests that technology-use is a process of adaptation. In such an adaptation process, technology may be constrained by existing social structures as well as present occasions for altering such structures (Orlikowski, 2000, Schultze and Orlikowski, 2004, Barley, 1986). As such, the ongoing human activities within an organization may modify technology in the context of use. Similarly, technology may reshape users' work patterns and an organization's way of coordination. Continuous organizational adaptation is accomplished by technology-in-use (Orlikowski and Yates, 2002).

In this theory, technology consists not only a set of technical functions but also contains certain institutional properties (DeSantics and Poole, 1994, Soh and Sia, 2004). Such institutional properties display coherent ways of coordination, which often are exhibited as a unique set of organizing practices, containing certain organizing principles (Swanson and Ramiller, 1997). Moreover, the organizing practices embedded within a new technology often demonstrate some sort of 'spirit' – general intents, values and goals (DeSantics and Poole, 1994). For example, the production technology in Toyota could follow a spirit of Just-in-Time. In a sense, the organizing practices (or spirit) embedded in technology exhibit a coherent system of knowledge, become a set of organizational routines, and shape how organizational members interact with their work (Attewell, 1992, Edmondson et al., 2001, Hargadon and Sutton, 1997).

Taken from this angle, when a technology is used, the organization is in a process of adapting to the organizing practices embedded within that technology. Because an organization also has its own existing ways of organizing, it may not necessarily align with those contained in technology (Soh and Sia, 2004). Therefore, in this adaptation process, technology initially may enhance and reinforce its 'spirit' in the organization. Later, as misalignment occurs, users may adjust technology in the light of their work contingencies (Orlikowski et al., 1995).

The implication is: if a technology is to be used continuously (and effectively) in an organization, it must go through the adaptation process. Eventually, as the adaptation settles, the organizing practices adapted by the users, and enacted from the structuring process, will align with the technology spirit. In this vein, sustained use of technology means that the embedded organizing practices become organizational routines during the structuring process. One must note that such organizing practices are not standard operating procedures; rather, they are collective capabilities ingrained in an organization's memory (Hargadon and Sutton, 1997, Orlikowski, 2002). They are to be developed through the adaptation process, and unlikely to be transferred directly to another organizational context.

Although this adaptation standpoint offers a deeper understanding of technology-use, this idea is not yet fully explored empirically. Largely, current studies have examined the process of technology structuring and its impact on work transformation. However, we know relatively little about the content and process of such organizing practices, and how such organizing practices may support continuous use of technology. In other words, we do not exactly know what the organizing practices look like after the structuring process to support the technology use and thus, to unveil the embedded knowledge in certain technology. It is equally relevant in the case of the e-auction. E-auction deployment involves a series of market-making activities, such as understanding existing expenditure, constructing a fair negotiation process, and maintaining active participation among suppliers. As Hur (2006) and associates advocated, the e-auction consists of a learning process in which the intermediary must assist buyers and suppliers in establishing competence should effective e-auction use be desired. . But, what is there to be learnt?

In an e-marketplace, ongoing exchanges are based on market-making activities. Largely, prior studies have focused more on the trading/exchanging process (Smith, 1989; Lee & Clark, 1997; Kambil & van Heck, 1998; Casson, 2003; Pearcy et al., 2007). Relatively few studies have been devoted to the organizing practices that support market-making during the sourcing process. Therefore, our study's primary aim is to investigate how an intermediary may organize market-making activities to sustain an e-auction. In the next section we move on to explain how we investigate the organizing practices emerging from the use of an e-auction system.

Research Methods

Research Site and Case Selection

This study aims to understand the process of market-making practices included in an e-auction. Research of this nature is suitable for qualitative methods (Hartley, 1994). Interpretative analysis is also used to elaborate the meanings underlying these market-making practices (Walsham, 1995, Klein and Myers, 1999). Next, we explain the rationale of case selection, methods for data collection and the processes of data analysis.

Singapore Technology Engineering (hereafter STEngg) is a leading firm in exploiting the e-auction. With its headquarters based in Singapore, the firm consists of defense and engineering groups, with 17,000 personnel in 25 cities. It provides advanced products and services in four strategic business areas: aerospace, electronics, marine, and land systems. Its operation achieved a combined revenue of US$4.49 billion in 2006. STEngg's Cost of Goods Sold (COGS) ranges from 65% to 85%, which makes procurement a strategic concern. The firm constantly seeks alternative purchasing methods to improve its operational efficiency.

In February 2000, STEngg adopted e-auction with an aim to streamline its supply chain operation and reduce procurement costs. Through e-bidding, the firm achieved cost-savings of 18-23% and reduced purchasing lead-time to three days on an average (down from 4-12 weeks) in 2002. The firm keeps the same performance level of purchasing in the last seven years (2002-2008). The considerable savings were not possible with traditional face-to-face procurement methods, which generated an approximate 5-10% price reduction. STEngg has sustained e-auction as a cost-saving tool over a seven-year period. This case is selected because it illustrates continuous use of technology and consistent performance

Data Collection and Analysis

This study is a major part of an ongoing research project which aims to understand organization innovation induced by the electronic marketplace. Starting from 2005, a research team, including two investigators (the authors) and four research assistants, began to conduct its fieldwork. Our goal is to understand the engineers' work practices so as to examine the process and principle contained in technology-use (Orr, 1996). Our fieldwork, in three years, focused on three dimensions: conducting in-depth interviews, participating in system training and observing on-line bidding.

First, we conducted personal interviews with internal buyers, market-makers and suppliers. STEngg incorporated a buyer-centric market. This means that one buyer set up an e-marketplace, mediated by an intermediary (i.e. the purchasing department or service provider), to coordinate transactions between internal buyers from different business units and suppliers (i.e. the bidders). In terms of internal buyers, we interviewed business executives and quality engineers to understand the practices involved in deploying e-auction.

With regard to market makers, we interviewed the procurement department, including the chief procurement officer, sourcing managers/engineers, the market-making team, as well as the technology/service provider (deployment consultants). There were two operational teams in the procurement department. One was the sourcing team, which gathers requests for quotations, identifies vendors and defines product requirements. The other was the market-making team that organizes on-line bidding events. We investigated key bidding events to examine STEngg's unique procurement process. The technology provider supported the market-making team in high-value procurement. Hence, we interviewed the consultants to understand their service provision. Moreover, we conducted ongoing interviews with the chief procurement officer, approximately two times each quarter, to explore the strategic intentions underlying the sourcing practices as well as to verify our findings. This long-term engagement helped the chief procurement officer to reflect on the meanings of the practices.

With reference to suppliers, we talked to the participants at key bidding events. Among others, we interviewed a computer manufacturer in Taiwan, with considerable experience in e-bidding events held by STEngg. We analyzed the operational manuals and the internal procurement procedures so as to triangulate our data. We interviewed a total of 52 persons, and each interview lasted an average of 40-80 minutes. Many of these interviewees were conducted more than twice. The fieldwork scheme is summarized in Table 1.

Table 1. Fieldwork Scheme (from July 2005 to December 2008)		
Categories	Number of People Interviewed	Duration (by hour)
Internal buyer		
Chief Executive Officer (CPO)	1	36
Vice Chief Executive Officer	1	4
Directors of the Board	2	5
Marketing Managers	1	2

Purchasing Representative of SBU	7	24
Market-maker: Market-making Team, Sourcing Team and Service Provider		
Group Procurement Manager	3	10
Sourcing Engineers	6	15
Market Making Team	6	15
Supply Chain Managers	1	3
Technical Supporter	4	8
Software Manager	5	13
Suppliers		
Procurement Manager	6	20
Quality Engineer	3	6
Adopters	6	32
Total	52 persons	193 hours

Secondly, we participated in training programs and learned how to operate the software. This enabled us to work together with the suppliers and employees, so that we could gather data from informal conversations. We learned how to set technical parameters, evaluate prices and conduct on-line bidding. Our learning process enabled us to become familiar with the users' local languages and practices. In the process, we worked with STEngg to create an educational seminar for training internal buyers, which helped us to grasp the contextual details.

Thirdly, we visited the 'war rooms' where the market-makers (STEngg's team and service provider) negotiated prices with suppliers through online bidding events. Such visits were important as we could observe actual online bidding and the challenges occurring onsite. For example, during bidding events, we observed how suppliers assessed cost structures, appraised business information (e.g. management subsidies), and evaluated potential businesses for STEngg. In the war room, we were able to observe how suppliers maintained contact with their headquarters online and understood that e-bidding involves not just individual bidders but also the whole supply chain. From July to December 2007, it was arranged for a research assistant to participate in the routine work in the procurement department, five days a week. This enabled us to gather more data, appreciate STEngg's unique practices of organizing, and authenticate the work practices identified.

The data collection and analysis was conducted in tandem, as an emergent process. We initially investigated the practices used to organize online bidding. It did not take long for us to perceive that STEngg spends considerable effort in preparation before and after bidding events. Hence, we traced the procurement process backwards and forwards to examine its work practices, rather than focusing solely on the e-auction process.

The study adopts the interpret approach to analyze the data in terms of exploring the meaning of organizing practices in the whole context (Walsham, 1995). In the first phase of data analysis, the key points are to investigate why the firm developed such activities which become organizing practices in the end. We tried to identify what activities STEngg conduct and how the activities are conducted in the existing way under the scope of e-bidding usage. The focus of the second phase of data analysis moved to why the organizing practices are conducted in this existing way. What are the meanings of the organizing practices to support the sustained use of e-auction technology? That's why we interviewed the different stakeholders (internal buyer, market-maker and suppliers) to investigate why they arrange and execute those organizing practices. It's a kind of meta-analysis to reflect why those

current practices as the guideline for the members of organization (also see in Hargadon & Sutton, 1997). We summarized five organizing practices altogether, and they were analyzed in three stages.

In the first stage, we conducted interviews with the market-making team. As the bidding activities were examined, we found that STEngg spent a great deal of effort on ensuring a set of codes-of-conduct for participating in e-bidding. STEngg's market-making team was strictly enforced these codes and made both suppliers and buyers to adhere to them. This was how we identified the principle of Guarding (the third principle in the Finding section).

In the second stage, we spent more time familiarizing ourselves with the work prepared before online bidding is conducted. The sourcing team helped us to understand how an e-bidding event is selected. After many visits, we understood that STEngg exercises a 'first-choice policy', i.e., each procurement initiative, be it direct or indirect purchasing, must employ e-auction unless proved inappropriate. Interestingly, we found that e-bidding was used for only 20% of these initiatives. This was because STEngg used an assessment method to screen out misaligned initiatives, which are amounted to 80% of the initiatives. This was how we identified the principle of Leveraging (the first principle in the Finding section).

Moreover, by participating in the software training, we learned how the intermediary (service provider) assists the market-making team in specifying the procurement requirements of each project and incorporates domain experts to calibrate requests for quotations. In refining purchasing requirements, sourcing engineers adapt consultants' know-how and internalized expenditure analysis methods. This was how we discovered the principle of Calibrating (the second principle in the Finding section).

In the third stage, we examined procurement engineers' post-bidding activities and sought to understand how they handle suppliers. In our meetings with the chief procurement officer, we found that his major concern is to expedite the contract awarding process. He insisted on personally writing and signing letters to congratulate the winners as well as to explain to suppliers why they lost their bids. Such practices were implicit and not described in the operating manual. But they were STEngg's strategic practices in organizing contracts. This was how we discerned the principle of Energizing (the fourth principle in the Finding section).

Furthermore, in our on-site investigations, we found that STEngg conducts regular supplier inspections after e-bidding, rather than simply closing the case after product delivery. We came to know that STEngg spent even more time checking existing suppliers' service capabilities. To gain an in-depth understanding of the firm's operations, we visited the firm's branches in Singapore and Taipei to examine how procurement engineers conduct supplier inspection. This was how we recognized the principle of Maintaining (the last principle in the Finding section).

In the next section, we compile the findings according to the five organizing practices. We analyzed the data in two 'orders of analyses'. The first-order analysis explains STEngg's practices in organizing sourcing activities, with regard to each principle. The second-order analysis then interprets the organizing practices underlying these practices and surfaces their theoretical implications.

Research Findings

STEngg has conducted more than 150 e-bidding events (2003-2007) and achieved cost- savings of US$13.7 million from e-bidding events worth US$141 million. Here we report the practices for organizing market-making activities. These market-making practices can enable us to understand how e-auctions are sustained in this firm, and more generally for other prospective implementers. In the next section, we summarize these practices into five key organizing practices: leveraging, calibrating, guarding, energizing, and maintaining (see Table 2). For each practice, we elaborate the unique working practices and the rationale of organizing of this nature.

Practice 1: Leveraging on the Use of the e-Auction

Organizing practices. STEngg has institutionalized a policy of 'first-choice', which requires that all procurement projects must employ the e-auction unless the executive-in-charge is able to prove the system inappropriate. The chief procurement officer explains: "Not every product is suitable for e-auction. But we ask every business division to consider e-auction first, unless the internal buyers have reasonable concerns… (Our goal is) to establish an effective sourcing network by leveraging on information technologies so that purchasing information and best practices can be shared by all SBUs (Strategic Business Units) effectively to reduce business costs by 30% "

Table 2. Organizing Practices of Market-making that Sustain the Use of e-Auction

Procurement Process	Market-making Activities	Organizing Practices	Checking point	Impact
BEFORE Preparing	First Choice Policy Sourcing Assessment	Leveraging: Focus on smart utilization through leverage effect, and concentrate on 20% of e-auction items to produce 80% saving impact.	Can e-auction really be applied for this procurement item?	Avoid over exploitation of e-auction
	Requirement Calibration Expenditure analysis	Calibrating: Examine procurement requirements meticulously so as to gain/avoid unnecessary use of e-auction.	Do we understand exactly what we want to buy?	Gain visibility of spending
DURING Implementing	Codes of Conduct for Online Bidding	Guarding: Discourage suppliers' opportunistic behaviors, avoid repudiation and transaction disputes, and manage exceptions.	How can the market-maker ensure fair online exchange?	Develop trust for fair exchange
AFTER Evaluating	Low/High Value Buys Fast Contracting Lot Strategy	Energizing: Boost market efficiency and motivate market participants. Take care of new suppliers as well as incumbents.	How can we keep participants active in the market?	Build an active market
	Suppliers Inspection Routine	Maintaining: Evaluate delivery performance to check suppliers' logistics capability; assess rejection lots to check their ability to maintain product quality; appraise service levels to test their agility.	How do we know the suppliers are still in the best shape?	Reduce supply chain risks by keeping reliable participants

While the first-choice policy expanded the scope of e-auction usage, STEngg was also cautious. The key question asked by the sourcing team was: *Can e-auction really be applied for this procurement item?* The sourcing team assessed whether a product could be auctioned by assessing its potential business value and the possible harm caused to suppliers. STEngg divided its procurement into four categories. The first category comprises *commodities* which are products that can be sourced easily from the market, such as stationery and generic cartoon boxes. The margin of these products is shape, even with significant aggregation. Although suppliers would not be greatly harmed, STEngg also gained little value from such e-bidding projects. Often, the cost of conducting an e-bidding project often outweighs the cost-savings. Hence, the easier way would be to negotiate prices directly with the suppliers.

The second category consists of *risky items* which are products, systems or services that are critical to STEngg's operations, such as power generators, key electronic components or enterprise software. If e-auction would be used for these items, the suppliers' margin would be underlined. But STEngg would not save much money on these risky items, because the suppliers could always use service contracts to compensate for the loss. If the price were to be cut to an unreasonable level, suppliers could withdraw their services which might cause operational breakdowns. Therefore, e-auction is not suitable for such risky items.

The third category comprises *partnership items,* which are collaboratively developed with suppliers, such as specially-designed circuits, weaponry modules, and tailor-made mechanical components. If the e-auction were to be used for such items, STEngg could benefit from significant cost-savings. But in so doing, STEngg could also infringe suppliers' intellectual rights. Thus the legal costs would undoubtedly outweigh the savings. Therefore, this category is also not suited for e-auction.

The fourth category consists of *leverage items,* which could be aggregated for considerable savings, while suppliers would not have too many profits. These items might include toolbox assembly kits, workshop cranes, forging, copper slag, batteries, steel plates, and notebook computers. Using this assessment method, STEngg found that often 20% of the items are suitable for e-auction, while e-auction is unnecessary for 80% of purchasing projects.

Interpreting Leveraging practice. Most firms tend to maximize the use of e-auction in the hope of achieving more cost reductions. The assumption for them is: 'the more you use e-bidding, the more can costs be reduced'. But STEngg uses e-auction in a different manner. Through the assessment method, STEngg leverages e-auction only to deal with the critical 20% procurement items, so as to achieve 80% impact. A procurement manager explains: "Although it seems that we achieve only 18% cost-reduction on an average, the actual number is higher. For example, in a bidding event for notebook computers, we achieved savings of 57%. And for workshop cranes, we gained savings of 52%; and in security fencing, we saved 46%."

STEngg realized that the costs attached to an e-bidding event could range from US$6250 to US$10,000, including license fees and variable costs. Any unsuccessful e-bidding event would incur not only the setup costs, but also disappointment from internal buyers and suppliers. Such disappointment often tends to induce overrun costs, supplier revenge and a vulnerable supply chain. STEngg's first organizing principle for market-making can be summed up as 'smart utilization', in contrast to maximized exploitation.

Principle 2: Calibrating Sourcing Requirements(technology use?)

Organizing practices. If an item is appropriate for e-auction, STEngg will proceed to a further precaution. The sourcing team would gather purchasing information from the business divisions. The team would ask the next question: *Do we understand exactly what we want to buy?* A sourcing committee would be set up to clarify purchasing requirements. The committee would include the chief procurement officer, the procurement head of each business divisions, project engineers and technical experts. The product knowledge required for global sourcing might differ from region to region. The sourcing team would work with the sourcing committee to draft RFQ (Request for Quotation). This task analyzed not only the precise product specifications but also reviewed prospective suppliers in the market. In the early stage, the team would involve potential suppliers in defining product specifications.

The sourcing team did not just gather product specifications; the engineers calibrated them. In defining a request for quotation, the sourcing team detailed the required quantity, industry standards (such as ISO9000), size (e.g. European or US standards), lead-time, brand concern, inaccurate possibilities, local purchasing requirements, transportation conditions, and service requirements (e.g. warranties). The team then invited domain experts to review the specifications. Experts would offer domain knowledge to refine the specifications. For example, in a

plant refurbishment project, experts would assess a vendor's supply capability, suggest concerns in installing security systems, and issue reminders on seasonal fluctuations in aluminum prices (for indoor construction). As an purchasing executive said, "E-auction is just a tool; the most important thing is to go through the 'devil details' and know what not to buy."

But this is not the end of product definition. The sourcing team would carry out another task before using the e-auction. It would analyze expenditure in the past 12 months, cleanse spending data, and identify ineffective procurement items. For this purpose, the sourcing team generally inspected four areas of spend-cut: reducing premium costs, enforcing price conformance, optimizing the supply base and discounting schedule adherence.

For example, in reducing premium costs, the team identified costs of $430,000 for a contract for 10 parts due to continual expediting charges. The team could renegotiate contracts with new lead times for $200,000 savings. In enforcing price conformance, a division was buying from a subsidiary of the corporate supplier under different suppliers' names. The team could ask the supplier to conform to the contract price, which resulted in savings of $120,000. In optimizing the supply base, the team identified 47 gasket suppliers used across six plants. The team could renegotiate contracts and reduce the number of suppliers to 10 to save $150,000 annually by thus consolidating suppliers. In discounting schedule adherence, the team monitored the year-to-date volume for polycarbonate resin to determine where to shift business in the fourth quarter for discount opportunities. The team could capture $520,000 in additional discounts. This would move the purchasing volume from one quarter to another quarter to gain a lower price, whereas the total volume did not change.

Interpreting Calibrating practice. The components purchased by STEngg are used in building systems and the production line. Should any incompatibility issue arise, the supply chain might be disrupted. This is why STEngg needs to calibrate the requirements by detailing the specifications and incorporating domain product knowledge. For example, the purchase of some products might cause the firm to run foul of the law over the local government's protection policies. Through such calibration, the firm can elaborate detailed specifications. STEngg is also cautious in identifying its excessive expenditure. When specifications and expenditure are more visible, the use of e-auction may not be necessary.

Practice 3: Guarding the Marketplace

Organizing practices. Market-making includes three key players: buyer, supplier and intermediary. Buyers and suppliers are willing to transact only if they can trust each other and the intermediary. In setting an e-bidding event, STEngg's next key question is: *How can the market-maker ensure fair online exchange?* To address this issue, three things must be assured: the market-maker offers a fair exchange process, the buyer plays no tricks during bidding, and the supplier submits honest bids. A procurement executive notes: "The key is fairness. You need to assure suppliers that there is no collusion or ghost biddings. Otherwise, suppliers will leave the market before too long."

To act as a market guardian, the market-making team enforced a set of codes-of-conduct, to which (internal) buyers and suppliers must adhere. There is little legal binding for not practicing the five codes-of-conduct. But, STEngg would exercise community punishment, if suppliers fail to follow them, by putting them on the blacklist, for example. The first code is 'bidding honestly online'. This requires the buyer to agree to award contracts only to suppliers who bid online, while suppliers must not submit bids offline. The second is 'entering with permission'. This requires the buyer to invite only qualified suppliers, while suppliers must agree to bid as aggressively as possible.

The third is 'awarding full contract'. This requires the buyer to award contracts in whole lots as described in an RFQ, while suppliers must bid on entire lots. The fourth is 'adhering to online bidding prices'. This requires the buyer to award business at the online bid price, while suppliers must submit all bids as legal quotations. The fifth is 'understanding exceptions'. This requires the buyer to offer a fair chance to lowest price bidders to win the contract, while suppliers must understand that a 'lower bidder' might not always win the contract. This is because the buyers

may take into account other contingent factors, such as quality, history of the relationship, and service-level. STEngg estimates the total costs, not just the price.

Interpreting Guarding practice. These codes-of-conduct provide transparency, familiarity and confidence to the internal buyers and suppliers. These codes encourage both the buyers and suppliers to behave as agents of integrity. The first and second codes aim to discourage suppliers' opportunistic behaviors. The third and fourth codes seek to avoid repudiation and transaction disputes. The fifth aims to manage exceptions. For example, if there were disease outbreaks in Asia, the suppliers in Hong Kong might delay their deliveries. In this case, the buyer might turn to other suppliers and not award the contract to the lowest bidder. This requires mutual understanding, an important element that grow trust in the exchange. However, it is surprising that most companies do not establish these codes-of-conduct, despite these rules being straightforward. This is largely due to 'buyer instinct'. Buyers tend to feel regret when they encounter a lower price from another supplier after e-bidding. Suppliers are also inclined to workaround to sell their products, if they do not get the bid. Knowing and implementing these codes-of-conduct are vital to maintaining a fair e-marketplace.

Practice 4: Energizing Market Participants

Organizing practices. An active marketplace requires energetic suppliers. In this light, STEngg further asks a question: *How can we keep participants active in the market?* STEngg's key practice is to retain efficiency and quick responsiveness. To gain efficiency, STEngg has classified e-bidding events into Low and High Value Buys. Both tracks offer lucrative profits and make transactions more efficient. If an initiative costs less than US$500,000, it is referred to as a Low Value Buy. Low Value Buy initiatives are related to indirect procurements, such as notebook computers. The sourcing team would employ a standardized method to conduct Low Value Buy events with known suppliers. These initiatives usually can be accomplished in one week.

If an initiative amounts to more than US$500,000, it is called a High Value Buy. Such initiatives are project-based items, such as the large engineering construction or transportation systems or intelligent software. The sourcing team would invite an external intermediary to manage such critical e-bidding events, while reserving key purchasing decisions for themselves. Such High Value Buy projects would involve adding new suppliers from around the world, and often require months of preparation.

In addition to efficiency, STEngg keeps suppliers energetic by implementing 'fast contracting'. For Low Value Buy projects, contracts should be awarded within 48 hours. For High Value Buy projects, contracts should be awarded within three weeks. Winners of e-bidding events are happy to receive contracts quickly. This establishes STEngg's credentials and builds suppliers' confidence in participating in the e-marketplace. STEngg also writes letters to other bidders and explains why they have lost a bid. The chief procurement officer explains: "It is important that you must award every bid. If you don't award contracts to suppliers every time, they won't believe in you. When suppliers participate in our e-bidding and they quickly bring back a contract, they will be excited. And if you don't award the contract to the supplier who offers the lowest bid, then you must explain to them why they did not get the contract. It's maintaining a good reputation that makes for an active market, not an e-auction. "

However, when more new suppliers are eager to participate in e-bidding events, the incumbents often feel left out. This is why many firms encounter supplier revenge when adopting the e-auction. Although new suppliers are competitive and cause a lowering of prices, they also present risks. If a new supplier fails to deliver components within a specified time and incumbents refuse to co-operate, the buyer's production line might be disrupted. Foreseeing this risk, STEngg's practice is to divide a procurement project into two lots. The first lot, which often consists of 1/3 of the contract, is reserved for incumbents to keep them active. The second lot, which constitutes 2/3 of the contract, is open for bidding. The incumbents are motivated when competing with new global suppliers in e-bidding. When new suppliers cannot deliver their promises, incumbents are often happy to take over the contract. This lot strategy alleviates STEngg's supply chain risks.

Interpreting Energizing practice. STEngg boosts market efficiency through low/high value buys, and motivates the market participants through fast contracting (new suppliers) and lot strategy (incumbent suppliers). These two practices energize an active market, and imply two ways to build trust. The first is the use of low/high value categories to simplify e-bidding preparation. STEngg uses low-value buy projects to train its market-making team and leverages external resources for high-value buy projects and enables the market-making and sourcing teams acquire new skills. The hidden agenda is to promote the sourcing engineers' professional identity so as to establish internal buyers' trust in their competence. Also, when the sourcing engineers can operate e-bidding efficiently, suppliers will become familiar with the market-making process quickly. Such familiarity then dissipates unnecessary doubts (e.g. a supplier might wonder if the firm really knows what it is doing), and grows mutual trust.

Moreover, STEngg is sensitive in keeping new and incumbent suppliers vigorous. Fast contracting and detailed analysis of unsuccessful bids give new suppliers the impression that the firm is concerned about the consequences of an e-auction. As a result, new suppliers gain confidence in STEngg as they receive lucrative contracts promptly. Incumbent suppliers also gain a sense of safety as their contracts are secured through reserved lots. But STEngg also motivates the incumbents through e-bidding (with new suppliers). For example, after losing several bids, a French incumbent supplier decided to streamline its supply chain and eventually won more contracts in subsequent bidding events.

Practice 5: Maintaining a Reliable Supply Base

Organizing practices. At the last stage, STEngg regularly reviews suppliers' performance. The key question asked is: *How do we know the suppliers are still in the best shape?* The sourcing team conducts routine suppliers' inspections, which involves two tasks. First, the team would perform a post-bid assessment for each supplier. This is to evaluate suppliers' competitiveness in bidding. Second, STEngg develops Vendor Performance Measurement Systems (VPMS) for ongoing evaluation of approved suppliers. The VPMS is measured by the weighted average of three measurement criteria: delivery performance, rejection lots, and service level. In the measure of delivery performance*,* STEngg monitors how well the suppliers meet the specified delivery dates. It is an analysis of suppliers' logistics capabilities, which could affect production schedules.

The second measure inspects the quality of goods being rejected by internal buyers. This assesses suppliers' reliability in terms of maintaining product quality. The third measure checks service levels, and is based on the feedback survey obtained from internal buyers. Using this measure, STEngg aims to test suppliers' ability to respond to requests. STEngg assesses how quickly the supplier could react to defective products or how effectively a supplier could deal with unexpected logistics delays.

Interpreting Maintaining practice. The inspection routine ensures the suppliers' competence can keep up with the passage of time. The measure of delivery performance checks suppliers' logistics. The measure of rejection lot examines reliability in quality. The measure of service level focuses on response time and suppliers' agility. STEngg performs such routine inspections in a discipline manner, and this is considered as the most important practice among all market-making activities. An executive explains: "We need reliable suppliers to maintain a good market. You cannot assume that a good supplier in Time 1 would remain as good in Time 2. We monitor their delivery time, product quality and service so as to know they still have enough muscle to hold their responsibility. The best market requires the best participants; and this is how we identify reliable participants to make the market robust." It is worth noting that most companies fail to sustain the e-auction not because of technical dysfunctions, but due to the lack of capable market participants.

Discussion

Theoretical Implications

This article contributes to technology-use literature and adds to existing implications on e-marketplace studies. The theory of technology structuring highlights the need for a better focus on adaptation process (Beaudry and Pinsonneault, 2005, Majchrzak et al., 2000). From our perspective view, technology-use is not a static, one-stage adoption process. Rather, technology always evolves 'in the context of use' (Orlikowski, 2000, Yates et al., 1999, Barley, 1986). Moreover, technology consists not only of technical functionalities guiding operational procedures but also certain institutional properties leading how firms organize tasks and achieve goals (DeSantics and Poole, 1994, Swanson and Ramiller, 1997, Soh and Sia, 2004). Thus far, we know more about its structuring process and its impact on shaping technology-use and transforming organizations. However, we understand relatively little about the institutional properties and knowledge contained in technology that shape members' organizing activities in an organization.

To address this issue, we examine the organizing practices, contained in technology, and exhibited through members' work practices. Our study fills in a theoretical gap and uses the e-auction as an example to illustrate our perspective. In our findings, the organizing practices included in an e-auction help us understand the coherent system of market-making knowledge embedded in technology. Such organizing practices, in our analysis, offer evidence to explain why e-auction can be sustained over a significant period of time. By elaborating the organizing practices through the actual work practices, we surface the sourcing process and market-making knowledge required to uphold continuous technology-use.

It must be emphasized that our analysis does not aim to provide a set of 'best practices'. These organizing practices are products of technology adaptation. They are shaped from the outcome of STEngg's ongoing appropriation of e-auction and users' adaptation to technological constraints. In other words, the organizing practices we observed are routines constituted by collective capabilities over a period of technology adaptation (Orlikowski, 2002, Cook and Brown, 1999).

In bridging the gaps inherent in current studies we are required to focus greater attention on the issue of continuous technology-use. To assess whether a technology can be sustained, we need to understand the organizing practices guiding technology-use and members' coordinating patterns. These organizing practices help us to understand how a set of organizing practices in appropriating technology is routinized in an organization. In our study, this set of market-making routines can be seen as a form of organizational memory, which is subject to ongoing adaptation between users' practices in organizing sourcing activities and how the e-auction is used continuously (Hargadon and Sutton, 1997).

Our analysis of market-making practices help to interpret the organizing practices inscribed within an e-auction. This is in line with other practice-based analyses of different types of technology, such as web-based trading (Schultze & Orlikowski, 2004) , electronic trading (Barrett & Walsham, 1999), and satellite vehicle dispatch systems (Hsiao et al., 2008). By elaborating the organizing practices, we surface the market-making knowledge required to uphold productive technology-use.

Furthermore, our study partially adds to literature on the e-marketplace which largely analyzes the technical, generic use of a system, for purposes such as to identify potential trade, arrange logistics, install payment gateways and execute transactions (Choudhury et al., 1998, Kambil and van Heck, 1998). This stream of research also emphasizes the role of trust in sustaining the e-marketplace (Hart and Saunders, 1997, Allen et al., 2000), price transparency (Soh et al., 2006), strategic deployment (Raisch, 2001), and decision traps (Emiliani, 2006). Particularly, many studies examine various ways to produce trust, such as through technical measures (McKnight et al., 2002, Knights et al., 2001), institution-based systems (Pavlou, 2002), reputation mechanisms (Ba and Pavlou, 2002), and moral sanction through embedded social relations (Kumar et al., 1998). However, these studies shed relatively little light

on the process of market-making. In our case study on STEngg, the organizing practices enable us to understand the process of producing trust, securing fair exchange, and maintaining cascading vitality among market participants. Our study offers a unique pattern of market-making and sourcing dynamics that has not yet been fully explored in current studies.

However, our study must be apprehended in terms of its limitation. Our study has examined how to realize the value of e-auction systems through an analysis of market-making practices. However, we have not yet examined the trust production mechanisms embedded in these organizing practices. Future research should attempt to address this theoretical gap.

Practical Implications

The process model of market-making offers practical lessons for prospective adopters of e-auction. Our study suggests that e-bidding deployment should not focus mainly on technical measures (Mabert and Skeels, 2002, Talluri et al., 2007, Hartley et al., 2004). We need to gain a deeper understanding of the embedded knowledge that supports effective technology-use. The use of e-auction can be sustained, if the market-making practices are applied in the context of technology-use.

However, there is a word of caution. In our interaction with the practitioners, we found that most adopting firms are eager to 'transfer' these organizing practices to their organizations, and expect to reap benefits once these practices are installed. They assume that a complete transfer of the organizing practices could overcome the problem of knowledge stickiness (Szulanski, 1996). But this transfer approach would not work, in our view. As we have emphasized previously, the organizing practices spring out from mutual adaptation between technology and organization (Majchrzak et al., 2000, Orlikowski and Robey, 1991). A mere replication of these organizing practices would importantly ignore users' learning processes that are required for technology adaptation (Levinthal and March, 1993). The key is not to replicate the 'practices', but to develop the vision of 'organizing'.

Our standpoint is that firms could adopt the organizing practices and use them as a starting point to begin their learning journey. Firms need to recognize that they are not STEngg (with the same organizational structure) and their business environment might not be similar to that of Singapore. The organizing practices could serve as a reference model to begin the adopter's adaptation process. The case of STEngg could aid the adopter in shortening the learning curve of technology adaptation. With this caution, our analysis of organizing practices could also be applied to examine other technologies, such as enterprise resource planning, product lifecycle management, and customer relationship management systems.

Conclusion

Technology is used because firms want to achieve certain organizational innovations, such as increased productivity, improved quality, or better service. However, we often emphasize technology acceptance, adoption and implementation, while neglecting technology-use. To achieve organizational innovation, technology must be used continuously. This requires us to reveal the organizing practices and practices that orient technology-use. In the case of the e-auction, the substantiation of exchange systems must be complemented with a set of market-making practices, which consist of five ways of organizing a market: leveraging, calibrating, guarding, energizing, and maintaining. Our study suggests that effective use of the e-auction significantly depends on whether a marketplace is well-organized to provide fair exchanges and ensure cost reduction (healthy competition among suppliers to reduce costs). This requires us to develop a robust marketplace that contains a disciplined buyer, neutral market-maker, and reliable suppliers.

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