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Technology Transfer in Cross-national Context: Experiences of an Online Market Failure in Chinese Food Industry

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Abstract

This case study considers an online market adoption as a process of technology transfer across contexts. This conception enables us to analyze the adoption difficulties from a technology inscription lens. This lens suggests that technology was developed based on a particular context which assumes how technology can be best used and how certain “practices” are inscribed. In this view, the adoption of online market not only implements the technology in the recipient organization, but also transfers the practices inscribed in the technology to the recipient. However, the inscribed practice may not necessarily be assimilated into the situated practices in recipient organization. As a result, the e-marketplace will be considered as inapplicable in the recipient context, given that cultural inertia and unfavorable adoption conditions (i.e. the poor technology infrastructure) are improved. The industry dynamics are highlighted to understand e-marketplace adoption challenges. Practical and theoretical implications of the technology inscription analysis are discussed with reference to technology alignment and global technology transfer.

Keywords: Case study, Technology transfer, E-marketplace, Technology inscription

1. Introduction

In the area of technology transfer, much emphasis has been placed on the analysis of cultural constraints that affect effective transfer of technology across nations. For example, Kedia and Bhagat (1988) summarized that technology transfer is moderated by variations in societal culture. Bhagat et al. (2002) further concluded that cross-border technology transfer is related to the nature of transacting cultural patterns. These analyses relate the outcome of technology transfer to cultural differences. Although these studies help us understand “culture” as a moderating or inhibiting condition to technology transfer, they are reticent in explaining how transfer difficulties may result from misaligned practices, inscribed in technology and enacted from a specific cultural context, in situations where technology is transferred within compatible cultural contexts or is accepted by a heterogeneous culture.

We consider it a valuable endeavor to apply the technology transfer concept to the analysis

of an online market adoption. In this instance, the source is a US technology vendor and the recipient is a major Chinese food company. As Bloomfield and Vurdubakis (1997) suggested, implicitly inscribed with technology is a set of assumptions enacted from people's practices in a given context. According to this "technology inscription" lens, when technology is adopted in another context, the transfer success is dependent on whether the inscribed practices could be effectively assimilated by the situated practices enacted from the recipient context. Therefore, we investigate the adoption of online market by examining the process of technology transfer. In assessing how well a technology is adopted to a cross national context, we propose to investigate three interrelated questions: What is the context and practices inscribed in the technology? What is the context and practices situated in the recipient's context? When the technology is transferred to the recipient context, how does the inscribed context and practices confirm or disrupt the situated context and practices?

We anchor this research attempt in a case study of a Chinese food company's assessment of online market adoption. (Note: the company is one of the largest enterprises in China, listed in Fortune 500). We employ technology inscription lens to analyze the unsuccessful technology adoption initiative. In sum, this study makes two main contributions. The first contribution is to re-examine the adoption difficulties from the technology inscription perspective. The other contribution sparked by this study is to posit a new view of how technology will align with organization.

2. Theoretical Basis: Technology Inscription

Attewell (1992) summarized five types of adoption barriers to transferring technology: lack of resource to adopt innovations, low perceived benefits, lack of innovation champions in the organization, low absorptive capacity of the recipient organization, and environmental constraints (for more barrier analyses in cross-national context, see: Ranganathan et al. 2001). Furthermore, the analysis of cultural constraints explains that the cultural differences between the two nations (of the source and recipient) may make or break a technology transfer project. For example, Kedia and Bhagat (1988) suggested that technology transfer is affected by variations in societal cultures of the two nations. They argued that global technology transfer is determined by the cultural compatibility of the source and the receipt nation. Bhagat et al. (2002) further contended that the individualism-collectivism dimension of cultural variation is a major determinant. People in individualist culture are more concerned with rationality when they transfer and receive technology. Thus, technology is more effectively transferred if both the source and recipient belong to compatible, homogeneous culture (e.g. from US to UK). Following this logic, technology is less effectively transferred if both the source and recipient come from incompatible, heterogeneous culture (e.g. from US to China).

The analysis of adoption barriers helps us identify conditions inhibiting effective acceptance of technology. In addition, the cultural lens considers culture as a contextual factor. Although these analyses are useful in determining whether technology would be "accepted" by the recipient, they explain little about whether technology could be applied effectively if it is accepted. Importantly, technology (as a kind of innovation) is used by people situated in particular cultural context. Social actors may form certain expectations in accepting or resisting an innovation based on their decisions enacted from historically subsequent

strategic situations (Greif 1994: 915).

Technology does not exist in a vacuum. Every technology use is a codification of practices developed from a particular context (Orlikowski 2000; Orlikowski 2002). When a technology is adopted, the inscribed practices are also transferred to, and activated in, the recipient organization. On the other hand, as the recipient organization is situated in a specific social context, it has developed practices to deal with business contingencies. Therefore, the transferred practices may confirm or disrupt the situated practices in the recipient organization (Kostova 1999). Therefore, to assess the outcome of technology transfer, we need to investigate the differences between originator's context and recipient's context, as well as to contrast the practice inscribed in technology with that of the recipient.

3. Research Methods

Case research method is employed for this study because it is a useful method to examine "what", "how" and "why" questions (Benbasat et al. 1987; Yin 1994). To provide a rich analysis of context, we conduct a single case study to explore online market adoption in food industry. The case study is concerned with a major e-market initiative, called WorldMarket (all names presented here are pseudonyms), launched in China by early 2000. WorldMarket was incorporated by government agencies to provide market-making services to a range of industries. This online market was built upon a technological platform provided by a leading international e-marketplace system vendor. In the early stage, WorldMarket promoted the e-marketplace system to small- and medium-sized firms in China (adopting the Global Sources model; see www.globalsources.com) and received cold responses. Later, starting 2002, WorldMarket began to target at larger state-own enterprises which are able to afford to invest on building online market. FoodCo was one of their key targets.

Established in 1952, FoodCo's business scope includes exchanges of agricultural and grain products. WorldMarket's team perceived that FoodCo will be an excellent candidate for online market adoption because of its massive transaction volume. However, the proposal was rejected immediately by FoodCo. WorldMarket's team was puzzled in four aspects. First, WorldMarket is also a government agency; there should be no trust-related issue. Second, FoodCo needs to process the large volume exchanges of goods on a daily basis; online market will definitely add value to their procurement practices. Third, FoodCo has the resources to invest in such a system and has already incorporated e-business departments to promote online transaction. The internal resistance should be minimal. Fourth, WorldMarket has appropriated the online market to suit Chinese enterprises, such as modifications in system features, language, and taxation matrices. There is little "cultural shock" when the online market is adopted.

With these puzzles in mind, we began to investigate the e-market adoption challenges through a technology inscription perspective. Case data were collected through interviews, company archives, and project documents. Moreover, we also employed telephone interviews with informants and maintained regular contacts to gather field data. We further visited WorldMarket and FoodCo in Beijing in September 2004. First, in-depth interviews were conducted with the CEO and senior managers of WorldMarket (eight of them). Our

aim was to understand the functions and features of online market provided by WorldMarket. Secondly, we interviewed senior executives in FoodCo. We did not ask them to tell us their “perception” of why they accept or reject the online market. Instead, we asked the executives to explain what characterizes food industry in China (context), why handling the exchange of may be difficult (practice), and how they source these products in situ (practice).

The data were thematically analyzed. Two stages coding procedures are used to conceptualize the data. First, we coded the data according to two categories: the WorldMarket’s inscribed context/practices and FoodCo’s context/practices. Secondly, we investigate the differences between the inscribed and situated practices in both companies. This helps us understand whether the inscribed practices (within the online market) would complement or disturb the situated practices. On this basis, we infer how the adopter may assess the feasibility of online market adoption (not acceptance).

4. Case Description and Analysis

Case background: Online market, or e-marketplace, is an Internet-based information system facilitating product exchanges, transactions, and information flow. The main functions of e-marketplace include e-catalogue, e-procurement, and e-auction. E-catalogue provides a product portal in which enterprises can publish their product specification and prices. E-procurement offers functions to gather RFI (Request-for-Information), RFP (Request-for-Proposal) and RFQ (Request-for-Quotation) for preparing procurement through the online market. E-auction facilitate online reverse auction. There are generally two types of e-marketplace: e-hierarchy and e-marketplace (Malone et al. 1987). In e-hierarchy, buyers employ the e- hierarchy to connect with their suppliers within the validated network; in e-marketplace, a market marker acts as a neutral third-party will mediate buyers and suppliers in the e-marketplace.

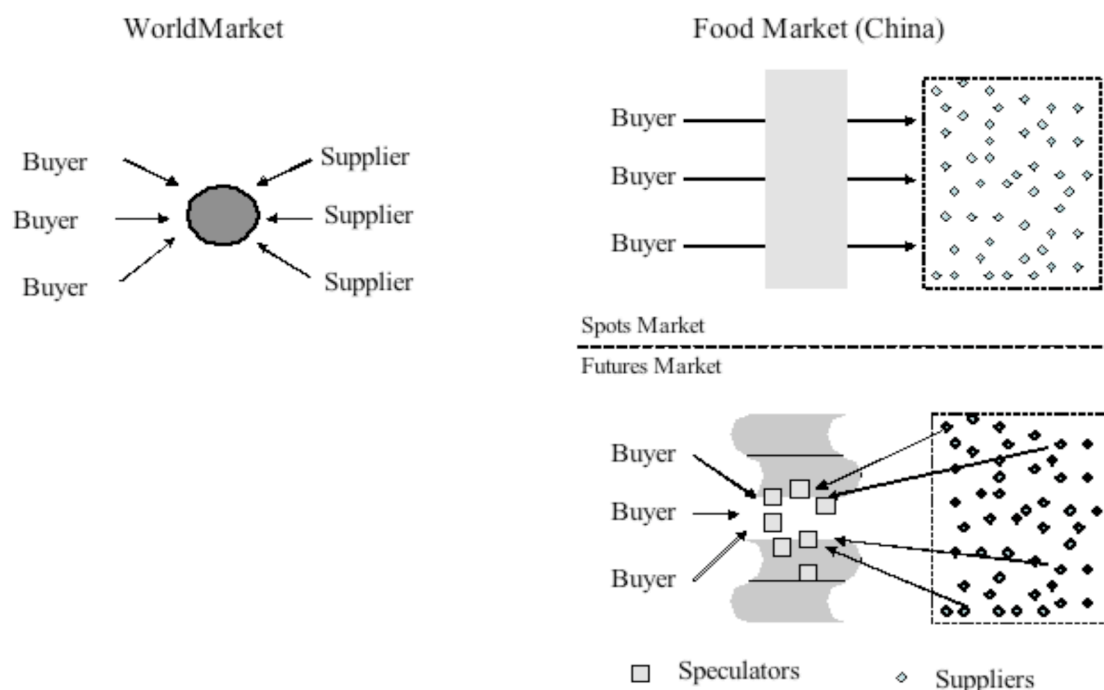
WorldMarket belongs to the second type of online market. In 1998, WorldMarket launched its first portal to provide government reports and consulting services for Chinese enterprises. Around 2000, with the rapid growth of Internet, WorldMarket transformed the portal into an e-marketplace. The vision was to establish a “global trading web” which connects to e-marketplace countries portals. However, in spite of the enthusiasm, this global trading web vision was unrealized.

4.1. Context and practice inscribed in the technology

Inscribed context: WorldMarket’s e-market system is developed in by a major US-based technology company. In this technology, “free-market” is the fundamental assumption about the economic environment which mediates the transactions between buyers and suppliers, according to Williamson (1981). The online market can help reduce asymmetric information. In this way, buyers can identify suitable products and suppliers quickly. Suppliers can also gather market information efficiently and adjust their prices and services accordingly. In addition, buyers and suppliers are rational self-interest actors, whose aim are to maximum their benefits. In a perfect market, a product’s price would be reduced to its most reasonable level due to intensive competition among suppliers.

Inscribed practices: Under this free market assumption, buyers are required to specify clearly their purchase requirement. Buyers often can negotiate a most economical price by aggregating the purchase volume, inviting more bidders, and negotiating price through competitive biddings. In addition to price, buyers can incorporate other measures, such as product quality, delivery time, and services, into the competitive bidding, which is known as “transformation bidding”. Buyers award contracts based on the measure of rational factors (e.g. price) rather than past relationship. If a supplier is unwilling to participate in the competition, a buyer can always replace it other suppliers (who offer similar products) in the market. In an ideal online market, these market-making activities (from request for quotation, supplier selection, competitive bidding to contract award) are mediated through Internet-based system. As a whole, through online market, buyers can achieve cost saving and ensure deal transparency, and suppliers can reduce transaction cost and achieve exchange efficiency.

Figure 1. The difference in the structure of exchange: WorldMarket vs. Food Market



4.2. Context and practices situated in the recipient organization

Situated context: To understand the grain industry, we must examine how grain products are produced and exchanged. The quality of grain products closely depends on the natural environment. The same type of seeds, farmed in the same soil by the same farmers in the same way, may yield different degrees of product quality because of variances in the environmental conditions. Taking the production of wheat in North China for instance, the date and amount of snowfall will influence the result of harvest. If snows fall too early, the growth of the wheat will be impaired by insufficient sunshine. If the snows fall too late, pests may not be winterkilled. As well, snows will not form snow covers to protect wheat

grasses from cold air and great flakes and to result greenhouse effect. Moreover, the amount of snowfall will also influence the growth of grasses. For example, if snowing is small, snow covers will not be thick enough to protect wheat grasses, and the thaw may hurt wheat grasses. But if snowing is too big, it may overwhelm the grain and the production may be reduced as a result.

The grain industry in China is also characterized by a regulated market. In the demand side, since grains are basic consumption products, the demand is stable and its impact on the price is relatively measurable. On the contrary, grain supplies will greatly affect its price in the market. Insufficient supplies will increase the market price and subsequently impact on the price of general commodities, leading to inflation and resulting in nationwide economic crises. Therefore, grain products are closely monitored and controlled by the government. Chinese government only allows state-owned enterprises to exchange grain products. Private-owned enterprises are not permitted to trade grains with farmers directly. A procurement manager in FoodCo explains:

If private-state enterprises would allow to trade grains, farmers won't want to sell the grain to the government when the market price is higher than the government's acquisition price. This may affect national grain storage. Even though farmers sell the prescriptive amount of the grain to the government, the quality is hard to guarantee. Because farmers will sell the better products to private enterprises to make more profits, and sell worse products to the government agencies.

Chinese government employs a two-tier system in purchasing grain products: the planned system and the market system. In the planned system, the state entrusts a large-scale state-owned enterprise, like FoodCo, to procure grains from farmers. These entrusted enterprises purchase the promissory quantity of grain products at promissory price from farmers according to national grain policies. In the market system, the grain price is determined by the supply. In this case, the farmer's income may be fluctuated in the harvest year due to price fluctuation in the market. Drawing from this phenomenon, the state employs "make for order" to share risk with farmers, which means the farmers would sign a contract with the procurement agencies before farm production. Then, farmers produce grains according to the contract. In this way, farmers' risks are transferred to the procurement agencies. For this reason, procurement agencies employ futures market to reduce their transaction risks.

Situated practices: FoodCo purchases grain products both in the spot market and in the futures market. In the spots market, buyers mainly categorize different types of grain products and evaluate product quality. However, in contrast to industry commodity, grain products have a greater range of varieties. A grain product usually is classified in terms of breeds; each category will be grouped into sub-category according to cultivation conditions (such as temperature and soil). For instance, wheat has more than ten varieties, and the types of nuts and vegetables are even more. Furthermore, it requires deep tacit knowledge to specify the quality of the products. An executive in FoodCo noted:

To examine its rigidity, wheat should be cut into two halves transversely. If the transverse section looks hard and transparent, and the vitreous body is more than half of the section, then this wheat is a breed of hard white wheat. If the transverse section looks soft and opaque, and the floury body is more than half of the section, the wheat is a breed of soft white wheat.

To master the tacit knowledge of grain products, buyers have to go to the farm and learn such knowledge from farmers directly. One novice buyer usually takes two or three year-time to become an experienced buyer, specializing in a particular area of grain products. However, even for the most experienced buyers, it is difficult for them to learn all types of grain products.

In the futures market, exchangers, speculators, planters and buyers need to work together to complete a transaction. Exchangers deal with the futures markets, with the support of the government. Their major obligation is to maintain the market price. Planters are farmers, who produce grains. Buyers monitor the price fluctuation in futures market and procure grain at the lowest cost. FoodCo is a buyer. Speculators employ capitals to leverage the futures price in order to obtain profits. The aim of speculators is not to purchase grains but to earn profit from exchanges.

In the grain futures market, the exchange price not only relies on the supply-demand relationship but also takes into account of the opportunism. It is a gambling game. Planters are individual farmers who have no capital or bargaining. Thus, such gambling games are mainly played by speculators and buyers. In such situation, buyers will keep their information confidential in the market in order to avoid speculators' opportunistic behavior. One procurement manager in FoodCo explained:

For instance, although we intend to purchase 100 thousand tons of wheat, we won't put our demand on the market one-off. Commonly, we will divide our demand into several lots, and put them into the market separately. Our aim is to create a situation that convinces planters and speculators that the supply is greater than the demand in order to lower the price. For speculators, they use capital to invest on the futures market by guessing our actual demand and the bottom-line price. Therefore, the information is the golden key to win this game.

Besides the information on grain products, the information on packages should also keep confidential. FoodCo illustrates it using the bags' case. If the procurement number and the type of bags are open to the market, speculators will calculator how much grain FoodCo has or intends to buy in futures market, using the capacity per bag to multiply the procurement amount of bags. In such case, the information of grain products will also leaks out in the market.

4.3. Difficulties in technology transfer across context

Through an analysis of the situated context and practices (see table 1), we found three

major concerns experienced by FoodCo. These concerns are related to the market dynamics, product specification, and information security. These concerns are not unfounded fears. They influence the adopter to form opinions about the feasibility of online market.

Table 1. E-marketplace Difficulties: Inscribed Context/Practice vs. Situated Context/Practice

	WorldMarket	FoodCo	Impact
<i>Context</i>	The inscribed context	The actual context	<i>E-marketplace adoption will result in inflation</i>
	The exchange is conducted in terms of best price in free market mechanism.	The government introduces the planned system and market system to control the price of grain products.	Without regulation, the price of grain products may be fluctuated and result in inflation.
	Public information shapes the perfect competition between suppliers and buyers.	Buyers use <i>farm produce for order</i> in sport market, and play gamble games in futures market.	
	Suppliers and buyers are major traders in the market.	Speculators, as well as suppliers and buyers, also participate in the exchange of market.	
<i>Practice</i>	The inscribed practice	The situated practice	<i>E-marketplace adoption will result in trade repudiation</i>
	Conduct e-procurement with suppliers, and initiate e-auction to invite suppliers for bidding.	Evaluate the product quality by observing the product sample directly with rich experiences.	Grains have complex varieties of product categories and cannot be easily specified. Trading these products over online market will result in repudiation and incur losses.
	Publish supply information in e-catalogue, and update e-catalogue in real-time.	Employ futures market to avoid the risk in spot market Buy planned procurement from farmers certain amount at certain price.	<i>E-marketplace adoption will encourage opportunism</i>
	Ensure e-procurement and e-auction are conducted according to market rules.	Speculators trade products over in futures market, seeking opportunistic gains.	Procurement information will leak out through the e-marketplace and benefit speculators.
	Exchange products are standard manufactured products.	The grain products have more varieties and are difficult to be specified.	

E-marketplace adoption will result inflation: Because the grain production is the basic daily consumption, the government is necessary to evolve in the market to control the transaction. However, E-marketplace is based on the assumption of free market and perfect competition, the price is decided on the supply-demand relationships. Thus, for the E-marketplace, the government will not be able to evolve in the market.

While the market mechanism may not be a complete solution for exchanger, the inefficiency exists in the market. The importance of the government is to avoid the market failure. For example, since the grain product may be affected by the natural conditions to reduce supply. In the case of insufficient supply, the price of grain product will increase. Given the E-marketplace adoption, there are no the government evolved, in

the worse case, when the price is raised violently, two consequences may be: (1) it will result in the inflation, and then shock the national general economy, and (2) the supply and demand will be fluctuated in the grain market.

E-marketplace adoption will result in trade repudiation: In China, grain exchanges are situated in a regulated market. The grain market is not controlled by the market mechanism. Suppliers are not competing with one another. The best price or best transformation value is the criteria in supplier selection. But for the grain industry, on one hand, price fluctuation of grain products may result in the price fluctuation in general market; on the other hand, grain product is the necessary consumption of people. Thus, government regulates the market in some extent. In China, Chinese government employs two-tier system, plan market plus free market, in grain transactions.

Even in the free market part, the suppliers in grain markets greatly differ from those assumed by e-market. For instance, FoodCo's suppliers are thousands of Chinese farmers. The bargain power of each farmer is weak, and the government does not allow private-owned enterprises to merge farmers' supply. But WorldMarket assumes that the bargain power among traders is comparative. The other point is that in e-market enterprises select suppliers according to best price/value. But in grain market, FoodCo has to face all suppliers and purchase from all of them in terms of the government plan. Only the common items can be procured by market mechanism. In such situation, grain market is distinctive with the free market assumed in online market because of the government involvement and the characters of suppliers.

E-marketplace adoption will encourage opportunism: In the grain market, the gamble games are played among planters, speculators and buyers. Because the speculators employ the capital leverage to control the market price, the buyers will keep their information confidential in the market in order to avoid the opportunism of the speculators. In contrast, based on the assumption of free market, E-marketplace makes information public to participators in order to avoid the asymmetric information. Therefore, when suppliers can to acquire the information of procurement quantity, they are willing to join E-marketplace to sell their goods. But there also give a serious problem. Obviously, the procurement information totally leaks out in the E-marketplace, and the speculators can operate the opportunism to affect the market price.

5. Research Implications

This study employs technology inscription lens to examine e-marketplace adoption difficulties. We consider the adoption of e-marketplace as a process of technology transfer. This research offers two major contributions to the current literature. First, the current literature mainly examines how cultural variance may inhibit technology transfer between the source and recipient (Bhagat et al. 2002; Kedia and Bhagat 1988; Martinsons and Westwood 1997). This focus is nevertheless too narrow and only analyzes the condition in which technology transfer occurred. Such a cultural analysis could help us understand how unfavorable condition may impede the "acceptance" of technology transfer; but it could not tell us why technology may not be "feasible" for the recipient. Our proposed analysis looks into the practice embedded in the technology, rather than treat the technology as a black

box, and assess how “feasible” it is to transfer the embedded practice into the situated practices enacted from the recipient’s context. This provides an alternative perspective to understand technology transfer in cross-national context. In the case of WorldMarket, technology transfer was unsuccessful not because the source’s culture is individualistic (US-based vendor) and the recipient’s culture is collectivistic (Chinese enterprise). Such a cultural analysis would oversimplify the issue of technology transfer. One could quickly find counterexamples to this cultural logic: Nissan had encountered great difficulties in transferring Toyota’s production system, whereas General Motor was able to transfer the same Toyota’s system successfully (Wilms et al. 1994). Our study suggests analyzing what practice is embedded in technology and what practice is situated in the recipient’s context in order to understand why technology is considered not applicable – rather than acceptable (Orlikowski 2000; Orlikowski 2002).

Secondly, our study also invites a re-examination of how technology should align with the organization. The current analyses have three divergent thoughts. The first school considers that effective technology transfer is to impose technology into organization in order to induce fundamental transformation (Hammer and Champy 1993). In this case, technology determines organizational change. The second school suggests that effective technology transfer is to adapt technology to the existing organizational configuration (Scott-Morton 1991). In this situation, organization determines technology appropriation. The third school suggests that technology and organization should go through an ongoing, mutual adaptation (Majchrzak et al. 2000).

Our study suggests an alternative direction. We suggest that whether technology can be transferred into an organization is determined by the compatibility between the embedded practices and the situated practices. If the situated practices are not so ingrained within the context and they are outmoded, use technology as a mean to renew organizational practices could be an effective method. If the recipient’s practices are deeply situated in the context and they are useful practices enacted from daily working situations, then appropriating technology to adapt to the existing organization arrangement may be a better transfer method. If the situated practices are relatively easy to modify and they require certain degree of renewal, then mutual adaptation may be a better transfer strategy. At any rate, we should analyze the situated context and its enacted practices so as to assess how we could transfer technology. For the FoodCo’s case, as we see it, technology seems to be better transferred by a re-appropriation of its system functions (perhaps with minor adjustment of the organizational practices). And in this circumstance, the online market is best managed internally; employing an external market maker is considered inappropriate.

In conclusion, this study suggests a viable alternative way to consider technology transfer across national contexts. Our analysis rejects the cultural thesis and proposes a “practice thesis” to assess technology transfer feasibility. Future theoretical development could benefit from this study by extending the technology inscription lens to examine other global technology transfer initiatives. In practical terms, our study suggests a more critical view to technology transfer. When firms attempts to transfer a “better” technology in the hope to transfer certain “best practices”, they should think again and carefully conduct an internal analysis of their existing practices which are situated in a particular organizational context.

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