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# Exploring the Factors Favoring mCommerce Adoption among Indian MSMEs: A TOE Perspective

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## Abstract

The current research aims to explain, through the Technology-Organization-Environment (TOE) framework, the factors affecting the adoption of mobile commerce (mCommerce) over electronic commerce (eCommerce) by micro, small, and medium enterprises (MSMEs) in emerging markets, particularly India. The current research through a review of literature and multiple case studies, proposes that though eCommerce has its own unique value propositions and benefits, the adoption of mCommerce will be a more feasible option than eCommerce for MSMEs in India. Using the TOE framework, the current research provides insights into the drivers of mCommerce and inhibitors of eCommerce adoption in emerging markets, thus adding to the limited knowledge among both academics and practitioners. The current research finds that given the present business environment, MSMEs' capabilities, and external/internal infrastructural issues, adoption of mCommerce for business is a better option than eCommerce for MSMEs in India. Since mCommerce in India is still in its nascent stage, the current research provides valuable guidance to mCommerce adoption among Indian MSMEs.

***Keywords:*** mCommerce, eCommerce, TOE framework, MSME, Emerging markets, India

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# 1. INTRODUCTION

The last decade has witnessed an increasing interest in the use of mobile applications in business environment which has led to the exponential growth of mobile commerce (mCommerce) (Scornavacca, Barnes, & Huff, 2006). Apart from facilitating communication and financial transactions (Balasubramanian, Peterson, & Jarvenpaa, 2002), mCommerce has enabled new scenarios of business processes in mobile context (Stender & Ritz, 2006), such as sales-force and field-force automation, navigation, tracking, wireless telemetry, mobile office, mobile retailing and auctions, mobile inventory management, and mobile advertising (Scornavacca et al., 2006; Varshney & Vetter, 2002), without the constraints of space and time (Buellingen & Woerter, 2004). Proper utilization of mCommerce technologies for business automation can reduce operational costs, improve decision making, and enhance business efficiency, thus improving productivity and increasing customer satisfaction (Lee & Park, 2008).

mCommerce refers to the use of wireless technologies, particularly handheld mobile devices to facilitate transactions, information searches, and user task performance in consumer, business-to-business, and intra-enterprise communication (Chan & Fang, 2001). Although mCommerce is regarded as an extension of electronic commerce (eCommerce), it is a separate entity, as it delivers a unique value proposition to customers (Balasubramanian et al., 2002). As opposed to computer-mediated eCommerce, mCommerce is

distinguished by novel, location-based services delivered by a handheld terminal (Dholakia & Dholakia, 2004). Both mCommerce and eCommerce are acknowledged to increase the efficiency of business processes and benefit firms in several ways. However, the business application of eCommerce in emerging economies is constrained by several internal and external factors (Humphrey, Mansell, Pare, & Schmitz, 2003). Moreover, many recent studies have indicated that firms, especially micro, small, and medium enterprises (MSMEs), are slow or unresponsive in their adoption of eCommerce (Kapurubandara & Lawson, 2008; Stockdale & Standing, 2004). The reluctance to adopt eCommerce is worrisome as, in order to maintain their growth and achieve competitive gains, MSMEs need to embrace IS technologies (Morgan, Colebourne, & Thomas, 2006) which provide plausible ways to compete with large firms. However, this lack of enthusiasm to adopt IS technology seems to be particularly limited to eCommerce. The use of wireless technologies and mobile devices for business is growing, and firms, especially MSMEs, are showing willingness to integrate mCommerce technology into their business processes (Castelli, 2008).

Even though there is a growing evidence of mCommerce adoption, mCommerce research is in its infancy and several issues still remain to be resolved (Luo, Zhang, & Shim, 2010). Though prior literature suggests several benefits of mCommerce adoption in business operations (e.g., Lee & Park, 2008; Varshney & Vetter, 2002), the factors which favor and predict the adoption of mCommerce in MSMEs in emerging economies are still unclear.

MSMEs are of immense importance in emerging economies as emerging economies are characterized by a large number of MSMEs (Molla & Licker, 2005a) and MSMEs are the key drivers of growth in such economies (Chen, 1999; Kula & Tatoglu, 2003). In view of this, the current research attempts to conceptually identify and qualitatively verify the drivers of mCommerce adoption in MSMEs through Tornatzky and Fleischer's (1990, pp. 152-54) Technology-Organization-Environment (TOE) framework. The current research posits that the present capabilities of Indian MSMEs and the business environment in India favor the adoption of mCommerce over eCommerce among MSMEs for business operations. India is deemed suitable for the current research as it is an emerging economy with the second largest wireless market in the world (SME Times, 2008), making it a potential market for mCommerce (see Figure 1). Further, MSMEs play a vital role in Indian economy by contributing to almost half of the national industrial output as well as exports (SME Chamber of India, 2010).

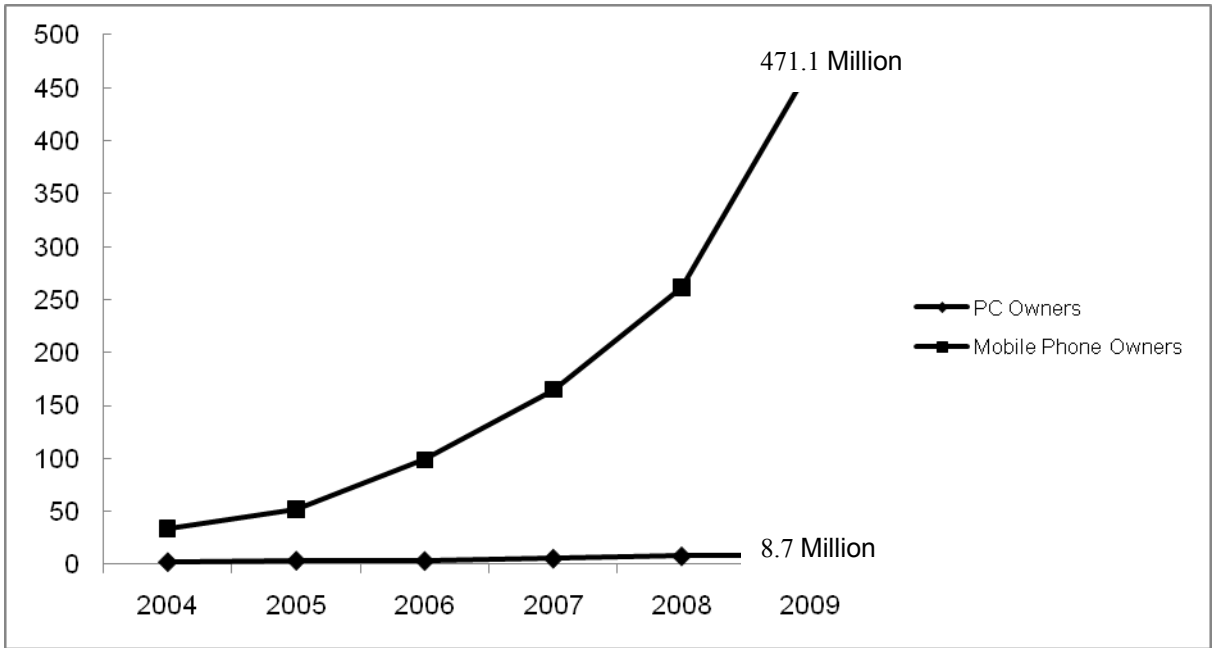


**Figure 1.** A comparison of growth in number of PC owners and Mobile phone users in India
Source: Adapted from IAMAI (2009a, 2009b)

The current research makes vital contributions to the extant literature on mCommerce. It adds to the scarce literature on mCommerce adoption in emerging economies by specifically examining MSMEs through the TOE framework and contributes to the literature on business and enterprise applications of mCommerce, which, despite being the biggest growth area, has been neglected (Scornavacca et al., 2006). As mCommerce in India is in its nascent stage, the research provides valuable guidance to mCommerce adoption in India.

In the following sections, a background on MSMEs in India and mCommerce are presented, followed by research objectives, theoretical background, research framework, research methodology, and the application of the TOE framework to mCommerce adoption in Indian MSMEs. Finally, conclusion and the implications of the current research are discussed.

# 2. MSMES IN INDIA

According to the Indian ministry of MSME (Ministry of MSME, 2010a), MSMEs are defined and classified according to their investment in assets (manufacturing MSMEs) or equipments (service MSMEs), as presented in Table 1.

Table 1: *The Classification of MSMEs*

| **MSME Classification according to Government of India MSMED Act** | | |
|---|---|---|
| **Classification** | **Manufacturing Enterprises**[a] | **Service Enterprises**[b] |
| Micro | Rs. 2.5 million | Rs. 1.0 million |
| Small | Rs. 50.0 million | Rs. 20.0 million |
| Medium | Rs. 100.0 million | Rs. 50.0 million |

[a] Investment limit in plants and machinery
[b] Investment limit in equipments
Exchange rate: Indian Rs. 1 = approximately TWD 1.03
**Source:** Ministry of Micro, Small, and Medium Enterprises (2010a)

The MSME sector has emerged as a dominant player in Indian economy and accounts for 45 percent of the manufactured output and 40 percent of the exports. Therefore, it is apparent that MSMEs are of major importance to India's economic growth (Kula & Tatoglu, 2003). The organized MSMEs sector employs about 60 million persons in over 26 million units throughout the country and manufactures over 6000 products (Ministry of MSME, 2010b). Besides, 94% of MSMEs are unregistered, with the majority of them established in the informal/unorganized sector and employ less than 10 persons (Ministry of MSME, 2010c).

# 3. MCOMMERCE

As predicted by the early work of Evans and Wurster (1997), the mobile Internet revolution has changed the established eCommerce paradigms, and has lead to a reconfiguration of value propositions. The unique services and additional benefits of mCommerce make it a distinct entity from eCommerce (see Figure 2) and create new, different, and novel value propositions for mCommerce (Clarke, 2001). The unique value propositions offered by mCommerce primarily include the following:

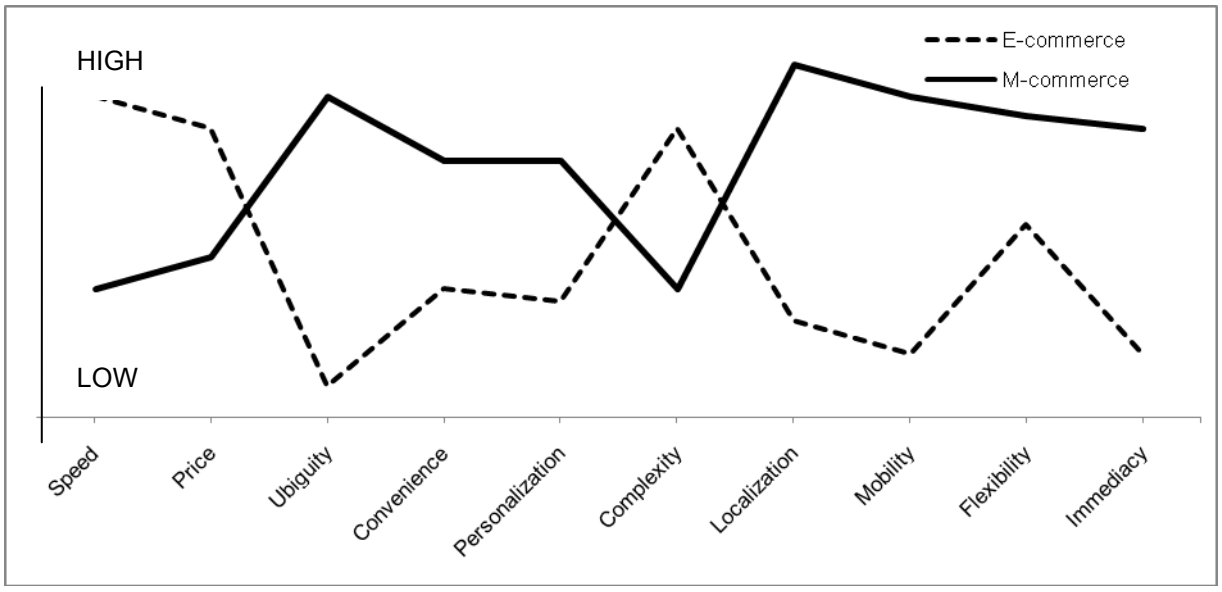


**Figure 2.** A comparison of eCommerce and mCommerce value curve
Source: Adapted from Clarke (2001)

*Ubiquity* refers to the *anytime*, *anywhere* nature of mCommerce. Mobile devices offer users the ability to receive information and perform transactions from virtually any location on a *real-time* basis (Clarke, 2001).

*Localization* refers to the ability to identify the location of a mobile user or a moving target at a particular moment (Zhang & Yuan, 2002).

*Identifiability* is the ability to accurately identify users through the built-in

IDs in some handheld mobile devices (e.g., mobile phones) (Mahatanankoon, Wen, & Lim, 2005). Figure 3 depicts key business applications of mCommerce.

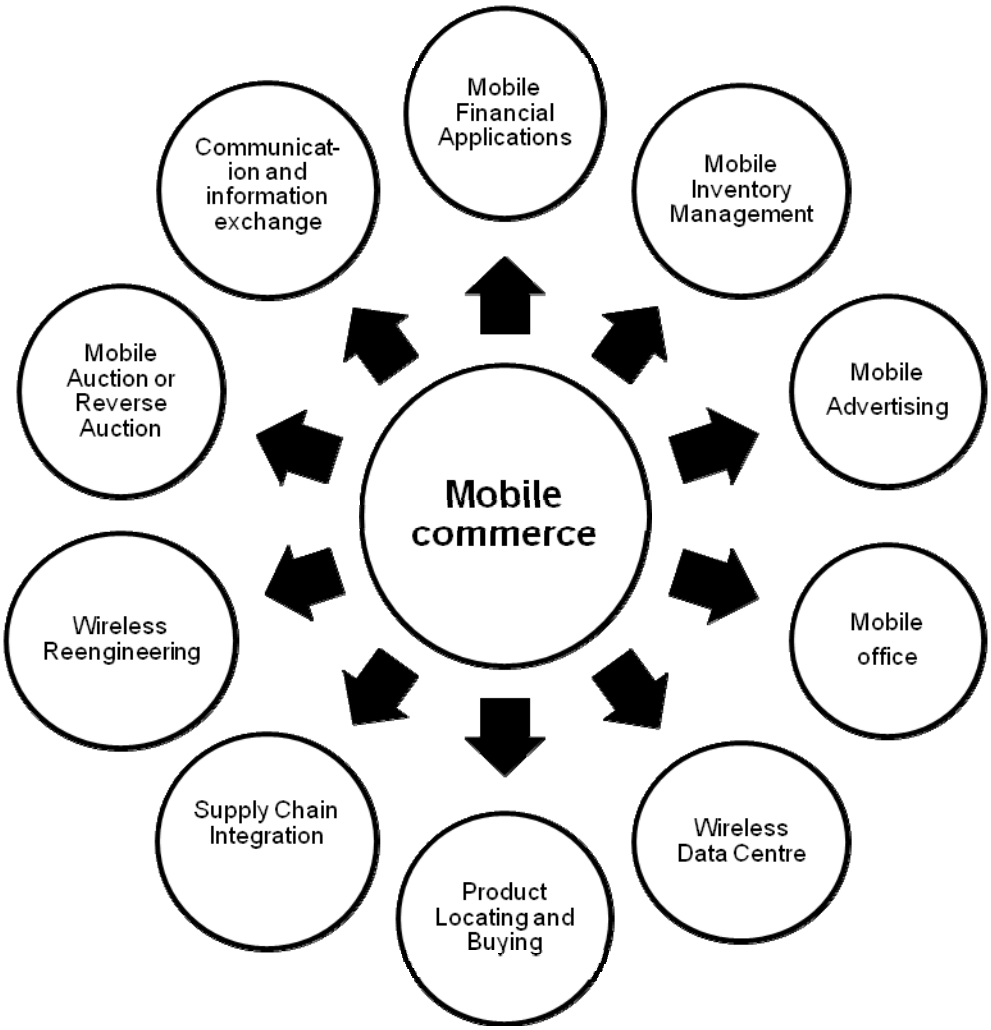


**Figure 3.** mCommerce business applications
Source: Adapted from Varshney and Vetter (2002)

# 4. RESEARCH OBJECTIVES

In light of the above discussion, the current research has two objectives which are stated below:

RO1: To identify the factors which determine the adoption of mCommerce and/or eCommerce in MSMEs in developing countries, especially India.

RO2: To explore and empirically verify which of the two - mCommerce or eCommerce is more preferred by MSMEs in India.

# 5. THEORETICAL BACKGROUND AND RESEARCH FRAMEWORK

## 5.1 Technology Adoption Theory - The TOE Framework

In the innovation diffusion literature, scholars have employed various theories to study the adoption of technologies. However, most of the theories focus on the adoption decision of individuals and thus only provide a partial explanation for organizational adoption (Molla & Licker, 2005b). This is because an organization's adoption of innovation is "*too big and complex to be grasped by a single person's cognitive power*" (Tornatzky & Fleischer, 1990). As the current research focuses on the adoption decision by MSMEs, an individual-level theory is not suitable.

Among the organizational-level theories, the DOI (Diffusion of Innovations) theory (Rogers, 1983), the Diffusion/Implementation model (Kwon & Zmud, 1987), and the Tri-Core model (Swanson, 1994) attempt to evaluate various factors responsible for technology adoption, including technological, organizational, and environmental characteristics (Schmitt, Theisse, & Fleisch., 2007). However, these theories focus on the different stages of adoption and the adoption process at different levels in an organization, and thus, are too broad for the scope of the current research.

Conversely, the TOE framework is a compact framework to study the adoption of technological innovation that considers and clearly distinguishes between all these three factors (technological, organizational, and environmental) for investigating firm-level adoption. Technological context includes internal/external technologies relevant to the firm; organizational context refers to descriptive characteristics of the firm, including firm size, the amount of slack resources available internally and the quality and degree of its human resources; environmental context refers to the arena in which a firm conducts its business, its industry, and dealings with competitors and government. The TOE framework is consistent with the other organization-level innovation diffusion theories. As the current research focuses on the factors which favor the adoption of mCommerce technology, rather than the stages of adoption and implementation, the TOE framework is deemed the most appropriate for the current research. Moreover, the TOE framework has consistent empirical support and has been applied to the study of adoption of technological innovations, such as IS usage (Iacovou, Benbasat, & Dexter, 1995), the Internet (Xu, Zhu, & Gibbs, 2004) and eCommerce (Lin & Lin, 2008; Zhu & Kraemer, 2005). Thus, drawing on the theoretical perspectives and the empirical evidence on the use of the TOE framework in innovation adoption, the current research adopts the TOE framework to explain how mCommerce is better suited than eCommerce for MSMEs in India.

## 5.2 Research Framework

It has been seen that the research findings on technology adoption by large firms cannot be generalized to small firms (Grandon & Pearson, 2004). Therefore, in order to identify the construct components within the TOE framework, a literature review of technology adoption in small firms was conducted and several factors were identified. As the current research studies the comparison between mCommerce and eCommerce adoption among Indian MSMEs, only the factors relevant and consistently cited for studying mCommerce, eCommerce, and technology adoption in the context of small firms were retained. Finally, information system (IS hereafter) infrastructure, relative advantage, complexity, and trialability were identified in the technological context (see among others, Doolin & Al Haj Ali, 2008; Lin & Lin, 2008; Mirchandani & Motwani, 2001; Premkumar & Roberts, 1999; Ramdani, Kawalek, & Lorenzo, 2009; Roberts & Pick, 2004; Zhu, Kraemer, & Xu, 2003); firm size, IS expertise, and financial commitment were identified in the organizational context (see among others, Al-Qirim, 2007; Balocco, Mogre, & Toletti, 2009; Doolin & Al Haj Ali, 2008; Iacovou et al., 1995; Lin & Lin, 2008; Premkumar & Roberts, 1999; Zhu & Kraemer, 2005); trading partner readiness and external IS support were identified in the environmental context (see among others, Al-Qirim, 2007; Chen, Lee, & Cheung, 2001; Doolin & Al Haj Ali, 2008; Lin & Lin, 2008; Premkumar & Roberts, 1999; Ramdani et al., 2009; Zhu et al., 2003). Figure 4 depicts the research model of the current research.

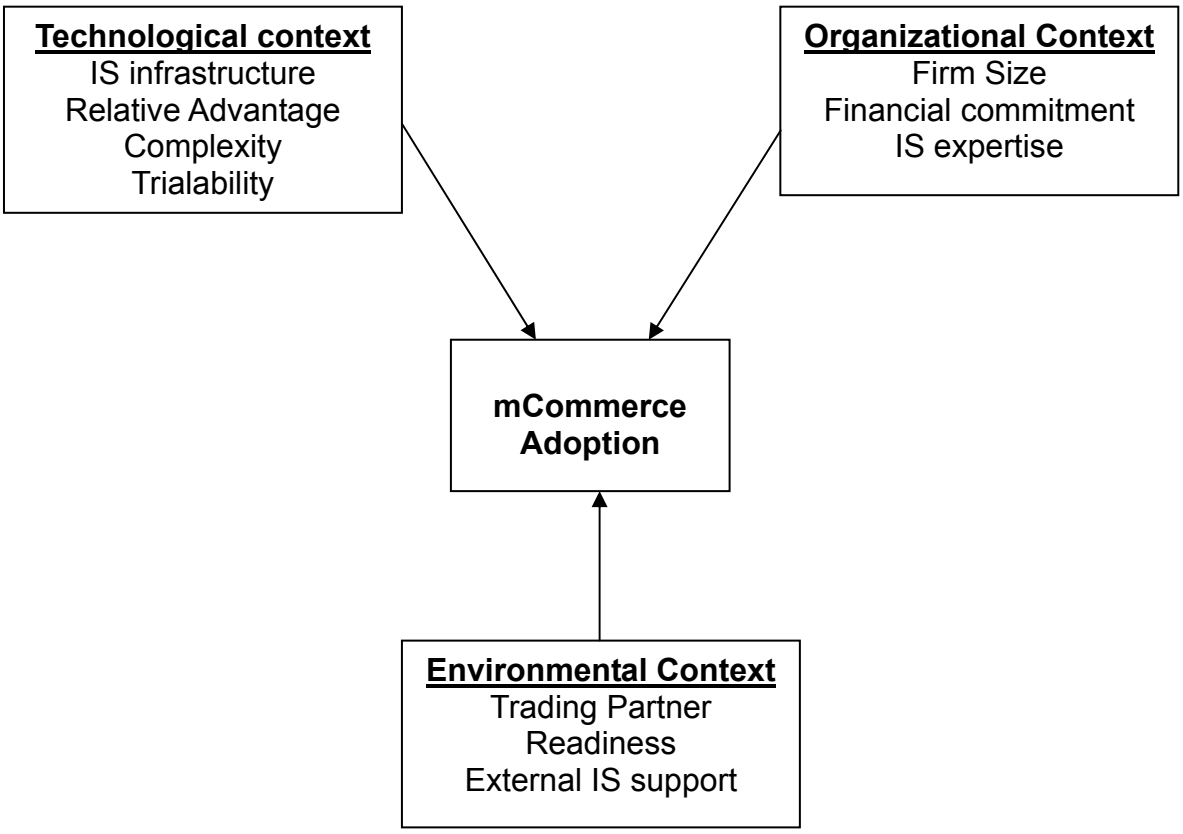


**Figure 4.** The TOE framework of mCommerce adoption

# 6. RESEARCH METHODOLOGY

Apart from relying on a review of literature to support the proposed arguments, the current research also employed multiple case studies to explore the adoption of mCommerce in Indian MSMEs. The case study method is useful when a focus on contemporary phenomenon is needed and it can capture 'reality' in substantial details (Mehrtens, Cragg, & Mills, 2001).). Given the contemporary nature of the mCommerce and wireless technology in India, the case study method was deemed appropriate.

A number of MSMEs listed in the Indian Industries Association members' directory were contacted and finally five MSMEs agreed to participate in the

current research. This is within the recommended range of four to ten cases for a multiple case study (Eisenhardt, 1989). The sample firms were intentionally chosen from different industries from both the manufacturing and service sectors. In line with Scupola (2009), it was expected that MSMEs belonging to different industries would yield a richer data set than MSMEs belonging to a single industry. The names of the 5 MSMEs are withheld following a request for the same.

Three out of five interviewed MSMEs were from the manufacturing sector and their primary businesses were batteries and inverters, bakery, and metal works, respectively. The other two MSMEs in the service sector dealt in wholesale of food grains and international tourism, respectively. All five MSMEs were situated in either the eastern or the northern part of India. The average age of these MSMEs was 20.8 years, with the oldest MSME in sample being 50 years old and the most recent one being 2 years old.

Data collection was carried out through telephonic interviews of the owners of the MSMEs. The interviews were primarily structured and the enquiries were based on the proposed TOE framework. First, questions regarding the firm's profile and background were asked. This was followed by questions specifically aimed at collecting information about the factors affecting the B2B adoption of mCommerce and/or eCommerce.

The following section presents the theoretical arguments in favor of the adoption of mCommerce over eCommerce in Indian MSMEs, along with the findings of the multiple case studies.

# 7. THE TOE FRAMEWORK APPLIED TO THE MCOMMERCE ADOPTION IN INDIAN MSMES

## 7.1 Technological Context

As mentioned above, the technological context includes IS infrastructure, relative advantage, complexity, and trialability.

### 7.1.1 IS infrastructure

IS infrastructure is operationalized as the technologies which enable Internet- (Lin & Lin, 2008) or mobile-related businesses. It provides a platform on which eCommerce (or as in this case, mCommerce) could be built (see Zhu & Kraemer, 2005). The adoption of eCommerce necessitates significant initial and subsequent investments in IS infrastructure. These include costs of the Internet, hardware/software, set-up, and the resulting maintenance costs (Kaynak, Tatoglu, & Kula, 2005). The start-up costs are a prime concern for MSMEs as they lack slack financial resources (Todd & Javalgi, 2007). Besides, the cost of certain infrastructure, such as the Internet, is several times higher in emerging economies when compared with the developed countries (see Sridhar & Jain, 2004), which render the adoption of eCommerce expensive in emerging economies.

On the contrary, mCommerce involves lower costs of developing and provisioning infrastructure and services (Dholakia & Dholakia, 2004). It does not necessarily require heavy investments in hardware since a simple mobile phone could also serve as a mCommerce device with negligible set-up and

maintenance cost. Similar sentiments were echoed by all the interviewed MSMEs who agreed that start-up cost is a decisive factor in technology adoption and one of the main reasons behind adoption of mCommerce. One of the interviewed MSMEs indicated, "*we don't even need to provide mobile phones to our employees, everyone has one…we are already hardware ready without any investments"*. Further, the use of mobile phones for mCommerce may not always involve dedicated applications for business operations. Short Message Service (SMS), an extremely low cost service in India (average 0.06 USD/SMS), could be used for several business functions such as communication, financial transactions, order placement, information search and so on. For instance, almost all interviewed MSMEs indicated that they use SMS for information search, order placement, and instant communication with business partners, while two MSMEs reported that they use bulk SMS for advertising.

While low cost SMS will be beneficial for highly resource constrained MSMEs, mobile-based cloud-computing solutions such as Software-as-a-Service (SaaS) can cater to MSMEs with more sophisticated services and applications needs. Cloud-computing has a low entry barrier as the adoption does not require heavy investments on applications and services. The services/applications are simply subscribed on an *on-demand* or monthly basis (Varindia, 2010). Such mobile-based cloud computing solutions could help MSMEs in several ways, such as real-time information search and follow-up of market trends, otherwise difficult under eCommerce due to lack

of mobility. For instance, one of the interviewed MSMEs reported that they often use *Just Dial*, a cloud-based search service, from their mobile phones to locate prospective suppliers in a given area. Another interviewed MSME indicated that they have subscribed to a cloud-based information service which instantly sends them a message whenever there is a change in market trend and/or prices. This helps the MSME act immediately irrespective of time and location and has helped in improving profits.

### 7.1.2 Relative advantage

Relative advantage is defined as the degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 2003). It refers to how an organization may perceive a technology over the existing or an alternate technology. As noted, mCommerce, in addition to extending several benefits of eCommerce, offers its own unique benefits of being time critical, localized, flexible, and personalized, giving it a clear advantage over eCommerce. However, mobility is the most important aspect of mCommerce, which distinguishes it from eCommerce and allows firms to do real-time data management, business communication, and remote monitoring of sales-force. In fact, all the interviewed MSMEs reported that mobility is the single most important factor or advantage which favors their adoption of mCommerce. As one of the interviewed MSME's owner put it, "*I cannot conduct business sitting in my office. I need to shuffle around and at the same time conduct and coordinate my business….mobile (phone) allows me to do all this…I can oversee my business anywhere, anytime…check accounts, download reports,*

*instruct my sales force…..all while I am on the move.*" Another important benefit of mCommerce applications, in contrast to eCommerce applications, is their easy integration with the business processes of the firm without the need of significant modifications in such processes (Gebauer & Shaw, 2004)

As evident, the unique benefits of mCommerce, provided through handheld mobile devices such as Smart-phones and PDAs make it relatively more advantageous than eCommerce. Further, the *always on* feature of handheld mobile devices, their inbuilt ability to access the Internet anytime and anywhere through cellular networks and transfer large volumes of information *on the move* through mobile communication technologies such as UMTS[1], EDGE[2], HSDPA[3], and HSUPA[4] makes mCommerce more preferable than eCommerce. It must be noted that even though notebooks can also access the Internet through the above technologies, notebooks are not inherently mobile, which limits their use as mCommerce devices. Moreover, the high cost of notebooks, the additional cost of data cards which enable such communication technologies, and the unavailability of large wireless computer networks (WMAN) or Wi-Fi hotspots make them less preferable. The unavailability of WMAN or Wi-Fi hotspots in India might also explain the marginal use of the Internet through such devices (IAMAI, 2009b). The above difficulties are illustrated in the example of Chennai-based *TVS motors*, which initially provided its sales-force with laptops and data cards to access their back-end

[1] Universal Mobile Telecommunications System
[2] Enhanced Data rates for GSM Evolution
[3] High-Speed Downlink Packet Access
[4] High- Speed Uplink Packet Access

CRM system while on the move. However, the firm found that it was difficult to handle a laptop at dealers' premises, which forced them to switch to smart-phones such as Blackberry (Pasha, 2010).

### 7.1.3 Complexity

Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 2003, pp. 257). The complexity of an innovation and the processes involved in its implementation negatively influence its adoption (Russell & Hoag, 2004). eCommerce, together with the processes and activities related to its adoption, is considered complex and sophisticated (Zhang & Yuan, 2002). In comparison, mCommerce applications are relatively simple (Dholakia & Dholakia, 2004), which could be attributed to the limited development of mCommerce technology in contrast to eCommerce technology (Zhang & Yuan, 2002). Further, when compared with the low penetration of PCs (7%), the high penetration of mobile phones (almost 50 %) in India (see Figure 1) suggests high probability of prior exposure to mobile technology and perceived ease of use. Thus mCommerce adoption can bring significant advantages to MSMEs who otherwise are non-proficient in the use of computers (Anckar & D'Incau, 2002) or are uneducated and have not even heard of computers or the Internet, such as those in India (Donner, 2006). Evidently, four out of five interviewed MSMEs reported that they find mobile phones much easier and simpler to use than PCs. According to one of the MSMEs, *"our employees are mostly illiterate and yet it took them only 5 minutes to learn how to use a mobile phone……. a*

*computer takes the same time just to boot"*. Similarly, one of the other MSMEs indicated that their employees, who are mostly illiterate, consider mobile phones to be part of their lives and hence find it easy to use.

Further, simple voice, SMS or mobile cloud-computing based application/services can significantly help MSMEs with such demographics to conduct business in a way not possible due to the complexity related to eCommerce. In fact, the use of such applications is already on a rise in India. For instance, fishermen and their wholesalers in Kerala use SMS to access free information about weather conditions, market prices, and optimal fishing zones. This has reduced uncertainty and price dispersion and has eliminated wastage (Jensen, 2007). Similarly, Indian agro producers are now using (cloud-based) text and voice services via basic mobile phones to inquire about market demand estimates and market prices, compare traders, and seek information on transport and storage problems. These easy to use, customized, and time saving mobile applications have significantly increased their productivity (Vodafone, 2009). It also helps them communicate effectively and timely to their clients and partners, and achieve better business coordination. Further, cloud-computing services such as mobile enterprise can also substantially simplify larger MSMEs' business processes (Varindia, 2010) and mobile-based SaaS applications may be easier to grasp given the simplicity of mobile applications.

### 7.1.4 Trialability

Trialability is the degree to which an innovation may be experimented with on limited basis (Rogers, 2003). As discussed, the high tangible and intangible investments required for eCommerce adoption limits its trialability. However, mCommerce trialability is not constrained to a large extent by such hurdles. In terms of investment on hardware, even when compared at the minimal infrastructure level, a well-equipped mCommerce device such as a smart-phone is readily available in India for less than USD 150, while the minimum cost of desktops, notebooks or subnotebooks is at least USD 300 or more. In terms of services and applications, cloud-computing solutions such as SaaS provide excellent means to test the technology for a limited time before adoption (Dutta, 2010). Being subscription based, it is easier for MSMEs to experiment with these services/applications before adoption. Moreover, mCommerce applications are more user-friendly and the learning curve for mCommerce is much faster than other information and communication technologies (Anckar & D'Incau, 2002).

In line with the above, all but one interviewed MSME indicated that trialability is one of the most crucial factors which limit the adoption of eCommerce. According to the owner of one MSME, *"...yes I can try mCommerce today…may be eCommerce will be better for my business, but I simply cannot afford to take a risk and invest in it"*.

## 7.2 Organizational Context

Organizational context includes organization specific factors such as firm size, IS expertise, and financial commitment.

### 7.2.1 Firm size

Firm size is an important determinant of technology adoption (Ramdani et al., 2009). Large firms are characterized by greater resources and better capability to survive failures than MSMEs (Hwang, Ku, Yen, & Cheng, 2004). MSMEs, owing to their small size, often have limited information (Bhagwat & Sharma, 2007), financial, and human resources (Todd & Javalgi, 2007), which are the prerequisites for eCommerce adoption. Moreover, since their size limits their ability to survive failures, they are reluctant to adopt the technologies (such as eCommerce) that require high investment against their limited tangible and intangible resources. Conversely, mCommerce is a far safer option for MSMEs because of the relatively lower investment requirements for its adoption. Further, owing to their small firm size, the technology requirements of MSMEs are quite limited, which can easily be fulfilled by the adoption of mCommerce. eCommerce technologies, together with its complex applications and advanced development, might not be necessary for MSMEs with simple application requirements.

### 7.2.2 Financial commitment

Financial commitment refers to financial resources committed to innovation adoption (Zhu & Kraemer, 2005). MSMEs have limited financial capital (Theng & Boon, 1996) and find it difficult to acquire credit given the

low availability and high cost of bank loans. These factors restrict MSMEs to allot resources for the adoption of new technologies. In the given conditions, MSMEs will not be willing to financially commit to eCommerce adoption which entails high cost technologies (Bhagwat & Sharma, 2007). However, MSMEs may not see mCommerce in a similar light. In addition to comparatively lower cost of hardware/software procurement, mCommerce may not burden MSMEs with incremental costs of human resource training and development as the application requirements of MSMEs and the mCommerce technology itself are simple in nature. Incidentally, cost-cutting is currently one of the major reasons why MSMEs are inclining towards mCommerce and adopting low cost technology such as mobile-based private branch exchange (Castelli, 2008). To this, all the interviewed MSMEs agreed that it will be very difficult to financially commit to a technology which requires high costs and maintenance. As reported by the owner of an interviewed MSME*, "we are a small firm. Whatever profit we make, most of it is used up for further expansion and growth….if a technology needs financial commitment it will be difficult to adopt it…we cannot always find resources to feed it"*.

**7.2.3 IS expertise**

IS expertise is defined as the firm's level of specialized IS expertise in the technology (Lin & Lin, 2008). The availability of IS expertise could increase the inclination towards innovation adoption (Crook & Kumar, 1998). Lin and Lee (2005) suggest that firms with the required skills and technical knowledge are more likely to develop eCommerce applications. However, due to the lack

of qualified human resources with required skills and knowledge, SMEs' successful adoption of eCommerce is hindered, and they have failed to reap the benefits of eCommerce adoption (Kaynak et al., 2005). On the other hand, mCommerce applications require lower level of IS expertise owing to their simplicity and prior exposure to the technology, which may reduce the incremental cost and knowledge requirement for mCommerce adoption (Dholakia & Kshetri, 2002). Further, as noted, though several MSMEs' workforce are uneducated and have no knowledge about PCs or the Internet, they are proficient in using mobile phones (Donner, 2006). This makes SMS, MMS (Multimedia Messaging Service) and mobile email the most preferred mobile applications for business among Indian MSMEs (Castelli, 2008). Further, owing to their recent popularity, numerous solution providers and software firms such as *Hewlett Packard*, *Cisco*, and *Salesforce.com* are offering MSME specific cloud-based services. As, these cloud-computing services (such as mobile-based SaaS) are relatively easy to install, maintain, and update (Kshetri, 2010), mobile-phone-based mCommerce will be more suitable than eCommerce for IS ignorant MSMEs.

In this regard, all but one interviewed MSME indicated that they lack qualified human resources for eCommerce adoption. While four MSMEs pointed out that they cannot divert financial resources for IS proficient human resources, all five agreed that mCommerce would be the viable choice given the lack of requirement of such professionals.

## 7.3 Environmental Context

The current research includes trading partner readiness and external IS support as indicators of a firm's environmental context.

### 7.3.1 Trading partner readiness

Trading partner readiness refers to the partners' technology readiness and ability to provide related services (Zhu et al., 2003). It is recognized as an important determinant of new technology adoption (Lin & Lin, 2008). As is the case with a majority of the Indian MSMEs, their trading partners might face similar problems in the adoption of eCommerce, thereby limiting the potential of eCommerce among such relationships. Further, the majority of MSMEs' business partners are not online (Kaynak et al., 2005). As a result, though several MSMEs in India have invested in eCommerce web portals, their portals are not accessed by their customers (Business Standard, 2010). This has made their investment in eCommerce technology futile. This is particularly evident by the statement of the owner of one of the interviewed MSME, "*eCommerce, computer is a big no no for our business partners….though their daily transaction exceeds 100 thousand rupees, they simply don't understand computers…yes they can use mobile phones with ease and they prefer to conduct business through it.*" Almost all interviewed MSMEs had similar feeling regarding their trading partners' readiness and reported that their partners are either not equipped or not willing to adopt eCommerce. In this context, the adoption of mCommerce will be easier as almost all trade partners might already possess handheld mobile devices (mainly mobile phones) and

can easily use applications such as SiteOnMobile to access their partners' information. SiteOnMoble is *Hewlett-Packard'*s cloud-based mobile application in India which allows MSMEs to define particular "tasks", such as *check order status* or *request a quotation* on their website and make those tasks accessible to their customers or partners through low-end mobile phones (Business Standard, 2010). Internet enabled mobile devices can also allow MSMEs to access online marketplaces, advertise their products, interact with potential buyers, communicate, participate in m-auctions, and get up-to-date information. Thus, the easy-to-use and no/low cost mobile solutions are particularly suitable for MSMEs and their business partners, making the adoption of mCommerce easier.

### 7.3.2 External IS support

External IS support refers to the availability of external support for the implementation and the use of technology, and increases the propensity of technology adoption (Premkumar & Roberts, 1999). Currently, there is a slow adoption of eCommerce in India due to the lack of physical infrastructure (Kaynak et al., 2005). India lacks a proper IS architecture (Bhagwat & Sharma, 2007) and it is still low in Internet network readiness (Weaver, Dickson, Gibson, & Turner, 2006). There are several other infrastructural issues such as frequent power cuts (or no electricity in several areas) and limited access to online payment mechanisms which restrain the adoption of eCommerce in India (Slyke, Belanger, & Sridhar, 2005).

However, owing to the explosive growth of mobile phone subscriptions in India, the mobile network infrastructure has seen significant improvements. Mobile networks are scalable and expanded quickly (Dholakia & Dholakia, 2004). Due to their unique ability of exploiting the existing infrastructure, mobile networks do not need exclusive infrastructure for mCommerce and high speed data transfer technologies such as UMTS, EDGE, HSDPA, and HSUPA can easily be provided through the same cellular networks. Mobile networks could reach areas with no electricity, providing a geographical flexibility unparalleled to eCommerce networks. Moreover, there are numerous peer-to-peer payment mechanisms available for mCommerce transactions such as mobile banking, prepayment systems, and SMS payments offered by several financial service firms (e.g., Paymate, Flypp, ITZ Cash, and Obopay). The proposed business transaction gateway for MSMEs by *EKO India* (Wong, 2010) may also encourage MSMEs to adopt mobile technology for financial transactions, as such services save time and reduce transaction costs (King, 2010). The payment option flexibility is of prime importance as several micro enterprises might not even have a credit card or bank account necessary for eCommerce transactions. SMS-based payment gateways, for example that by *EKO India*, can allow MSMEs to carry out transactions such as buying and selling while on the move. Further, all the interviewed MSMEs reported that the currently available external infrastructure supports the adoption of mCommerce over eCommerce. Table 2 summarizes the factors affecting mCommerce and eCommerce adoption based on the TOE framework in India.

Table 2: *TOE factors affecting the adoption of mCommerce over eCommerce in Indian MSMEs*

| Firm Contexts | eCommerce | mCommerce |
|---|---|---|
| **Technological Context** | | |
| IS infrastructure | High start-up cost and investments | Start-up costs and investment significantly lower |
| Relative advantage | Higher than traditional channel, lower than mCommerce | High relative advantage as includes both the benefits of eCommerce and its own benefits |
| Complexity | Complex and sophisticated applications | Far simpler applications |
| Trialability | Low trialability | High trialability |
| **Organizational Context** | | |
| Firm size | Suitable for bigger firms | Suitable for MSMEs |
| Financial commitment | Requires high financial commitment | Could be adopted with low financial commitment |
| IS expertise | High IS expertise, involves qualified human resources | Low requirement for IS expertise, minimal or no additional burden of qualified human resources |
| **Environmental Context** | | |
| Trading partner readiness | Trading partners might face similar problems in adoption | Trading partner may be ready due to low investment requirements |
| External IS support | Requires high external IS and infra structure support | Requirement significantly less, can exploit existing networks |

# 8. DISCUSSION AND CONCLUSION

Aungst and Wilson (2005) state that the number of mobile phone subscription is perhaps the best indicator of mobile market size and dynamics. Currently, there are 811 million mobile subscriptions in India. While the percentage of PCs with Internet connection dropped 14% between the years 2006-2008, the same period saw a growth of 250% in the number of mobile phone subscriptions in India. Though these figures do not indicate the business potential of mCommerce, they certainly reflect the high acceptance of mobile

technology in India, which can have an indirect effect on the adoption of mCommerce among Indian MSMEs.

In line with the above, the current research attempts to conceptually and empirically evaluate the factors which favor the adoption of mCommerce over eCommerce for business operations among Indian MSMEs. Given the challenges that MSMEs face in adopting eCommerce and a scrutiny of MSMEs' technological capabilities, available resources, firm characteristics, and external factors suggest that mCommerce is a better technology option for Indian MSMEs. The adoption of mCommerce does not entail high degree of financial commitment as it requires less internal IS infrastructure, thus, reducing the cost of procurement of hardware, software, set-up, and resulting maintenance. The nominal need of IS expertise also saves the MSMEs from hiring IS-dedicated human resources. The viability of eCommerce adoption is limited by the lack of trading partner readiness and the firm size of Indian MSMEs. mCommerce has clear relative advantage over eCommerce for Indian MSMEs as it seamlessly integrates into the existing processes of the firm and offers the distinctive benefits of being time critical, localized, flexible, and personalized, along with providing the benefits of eCommerce. Besides, in comparison with mCommerce, the low trialability, high complexity and high external IS support requirement of eCommerce makes its adoption a distant possibility for MSMEs in India.

It must be noted that mCommerce is not an alternative/substitute for eCommerce. eCommerce has its own benefits and business applications which

are beneficial and necessary for some specific and advanced business processes. One interviewed MSME, while stressing on this indicated, *"We actively employ mCommerce in our B2B operations….but this does not mean that we don't use eCommerce…in fact some of our business operations heavily rely on eCommerce."* However, given the limited capabilities and basic technology requirements of MSMEs (in comparison with large firms), eCommerce adoption among MSMEs seems unnecessary or futile. Still, MSMEs need to digitalize business through technology adoption in order to increase efficiency, productivity, and gain competitive advantage. In such a scenario, mCommerce can be effectively and efficiently implemented to such business processes and activities where implementation of eCommerce is difficult, expensive or nearly impracticable for MSMEs. Thus, the benefits of mCommerce and the willingness of MSMEs to go mobile (Castelli, 2008) can significantly reduce MSMEs' limitations related to technology adoption for business.

The adoption of mCommerce among MSMEs is not without its roadblocks. The physical constraints of mobile devices, such as limited user interface, small screen size, unfriendly keyboards, limited physical memory, and limited processing power make their use difficult in certain situations. Apart from these, the limited bandwidth and slow speed of wireless networks (when compared with wired networks) currently make them inferior to wired networks. It is noteworthy that even though the latest 3G communication technology offers a data rate of 2Mbps, it is still not comparable to wired networks. Almost all the interviewed MSMEs indicated the above limitations

of mCommerce. One of the MSMEs reported, *"Of course mCommerce helps us to instantly reply to our business partners…but it's just a "short" instant reply…we can hardly use mCommerce for sending very large amount of information requested by our partners."* Another MSME indicated, *"the interface and the keypad (of mobile phones) are very tiring…(though) touch screens are somewhat better."* Besides, the costs associated with mCommerce, though low when compared with eCommerce, cannot be neglected (especially for highly resources constrained micro firms). mCommerce also suffers from same security issues faced by eCommerce. Though several security measures are in place, the additional costs of their procurement might act as a hindrance to mCommerce's adoption. While cheaper solutions like virtual private network (VPN) are available, they also add to the cost and complexity of mCommerce. Moreover, as the wireless technologies are continuously being improved and evolved, that too fast, the investment in hardware and infrastructure is sometimes considered risky.

In spite of the above mentioned drawbacks, the importance and need of mCommerce adoption cannot be ignored. The literature and cases presented in the current research reveal that though mCommerce and its adoption in India is still in its formative years, there is an increasing evidence of its successful application. mCommerce adoption among Indian firms has resulted in faster communication, better supply chain integration, lower costs, improved productivity, and higher competitive advantage. The analysis reveals that mCommerce adoption in India is not only limited to voice and SMS-based

services. The adoption of more sophisticated mCommerce services, such as mobile-based cloud-computing, is also on the rise. This is suggestive of the acceptance and popularity of B2B mCommerce in India.

## 8.1 Implications

The current research provides important managerial implications. Given the nature and characteristics of Indian MSMEs, the MSMEs should preferably adopt mCommerce over eCommerce. mCommerce can enable MSMEs to carry out a number of business operations such as information search, accessing real-time market data, immediate communication with partners, fast financial transactions, fast delivery/order placements and so on, without space and time constraints. Therefore, successful adoption of mCommerce will help MSMEs minimize paperwork and reduce costs, more importantly save time and eventually increase productivity and efficiency.

However, the decision to adopt mCommerce by no means should be impulsive. Firms should carefully evaluate their needs and capabilities, employee willingness, trading partner readiness and expected benefits, before deciding upon the viability, nature, and the extent of adoption. This is evident from the examples of two of the five interviewed MSMEs. While one MSME reported that mobile phones form the backbone of their business, another indicated that though they have adopted both mCommerce and eCommerce, their business mainly depends on eCommerce. Thus, the failure to take into account the above factors may render the adoption of mCommerce ineffective.

The findings also has implications for the others players in the mobile

value chain such as mobile operators, content providers, application developers and service providers. Current trends suggest that mCommerce has huge potential in India and is expected to grow exponentially. Though the above stakeholders in the value chain are successful in providing consumer services and applications in India, the adoption of mCommerce for B2B operations among MSMEs will open up a completely new market of a different nature, with varied requirements. In order to cater to the demands of such an emerging mCommerce market, the players in the value chain must be aware of Indian MSMEs' needs, and develop applications and provide services that address their personalized needs and are compatible with the characteristics of MSMEs.

Though the current research discusses the mCommerce adoption in Indian MSMEs, the findings drawn from the application of the TOE framework is relevant to other emerging economies as well. MSMEs in emerging economies such as Latin America, China, and South Africa face similar challenges in the adoption of eCommerce (see, for examples, Rohm, Kashyap, Brashear, & Milne, 2004; Vaithianathan, 2010). Thus, the recommendations of the current research could be extended to the other emerging economies. Owing to the immense importance of MSMEs in emerging economies and their position as drivers of economic growth (Kula & Tatoglu, 2003), the adoption of mCommerce and its subsequent benefits will eventually prove advantageous to the economy as a whole.

## 8.2 Future Research

While the current research explores the factors affecting mCommerce adoption through a theoretical perspective, there are several issues that need to be addressed for a better understanding of the subject. Research should be undertaken to corroborate and extend the findings of the current research. Further, though there are theoretical and exemplar evidence that mCommerce positively affects performance, there is a need for empirical studies to determine the degree of gain in performance post adoption. Future research could also explore the relative impact of different mCommerce business applications on firm performance, and employee efficiency and productivity. This is crucial as it will provide guidance to firms on relative importance of different business functions of mCommerce and help them in designing mCommerce business processes accordingly. Future research should also investigate how addition of mCommerce services, such as mobile distribution channels, affect customer satisfaction and trust.

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# 印度「中小微型」企業支持採用「行動商務」因素的探討：「科技–組織–環境」學理的觀點

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## 摘要

本研究主要是經由「科技-組織-環境」學理的觀點，來解釋為何新興市場的「中小微型」企業，尤其是在印度，比較適合採用「行動商務」，而非「電子商務」。經由文獻探討以及案例探討，本研究認為，雖然「電子商務」的應用有其獨特的利益，但採用「行動商務」對印度「中小微型」企業卻是較佳的選擇。利用「科技-組織-環境」學理的觀點，本研究提出新興市場使用「行動商務」來替代「電子商務」的潛在因素，如此，本研究強化了學術及業界在這方面原有有限的知識。本研究發現，在目前的商業環境下，「中小微型」企業的能力、以及內外部基礎建設相關等等的原因下，對印度的「中小微型」企業而言，「行動商務」應該是比「電子商務」為更好的選擇方案。當「行動商務」在印度仍處於導入初期，本研究適時提供給印度「中小微型」企業採用「行動商務」重要的指引。

**關鍵詞**：行動商務，電子商務，「科技–組織–環境」，中小微型企業，新興市場，印度

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