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A preliminary study of ecommerce adoption in developing countries

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Abstract. *What factors underlie the adoption dynamics of ecommerce technologies among users in developing countries? Even though the internet promised to be the great equalizer, the nuanced variety of conditions and contingencies that shape user adoption of ecommerce technologies has received little scrutiny. Building on previous research on technology adoption, the paper proposes a global information technology (IT) adoption model. The model includes antecedents of performance expectancy, social influence, and technology opportunism and investigates the crucial influence of facilitating conditions. The proposed model is tested using data from 172 technology users from 37 countries, collected over a 1-year period. The findings suggest that in developing countries, facilitating conditions play a critical moderating role in understanding actual ecommerce adoption, especially when in tandem with technological opportunism. Altogether, the paper offers a preliminary scrutiny of the mechanics of ecommerce adoption in developing countries.*

Keywords: ecommerce adoption, performance, social influence, facilitating conditions, technological opportunism, networked readiness

INTRODUCTION

> E-commerce is one of the most visible examples of the way in which information and communication technologies can contribute to economic growth. . . . Yet despite commendable efforts and various initiatives, we are still very far from ensuring that the benefits of ICT are available to all. The digital divide is as wide as ever, with billions left unconnected – Kofi Annan. [UNCTAD, 2002]

Over the past decade, policy makers, scholars and practitioners agree that ecommerce is an essential ingredient for socio-economic advancement in developing countries (Avgerou, 2002). Yet little is known about the conditions and contingencies surrounding ecommerce adoption in developing countries (Straub *et al.*, 1997). Of particular interest is the growing global popularity of ecommerce. Lawrence *et al.* (1998) define ecommerce as the purchase and sale of information, products, and services using any one of the thousands of computer networks that

make up the internet. In the context of our study, the term ecommerce encompasses a wide variety of activities over the internet involving the exchange of information and data or value-based exchanges between two or more parties – spanning across businesses (B2B), consumers (B2B, B2C, C2C) and governments (G2B, G2C) (Zwass, 1996).

The shifting dynamics of development and ecommerce consumption define (and somewhat constrain) the scope and context of ecommerce adoption in developing countries. In developing countries lacking purchasing power, streamlined payment mechanisms (e.g. established credit services) or a critical mass of vendors (online sellers) and shippers, *ecommerce is often skewed towards information rather than product consumption*. Given landline constraints and high prices of computers, users in developing countries often resort to cyber cafes and cellphones for ecommerce. Consequently, ecommerce practices in developing countries rely mainly on information and content provision and consumption rather than online purchases. Cellular service providers (e.g. Maxis's M-Money initiative in Malaysia and the Philippines (Associated Press, 2007) practise ecommerce using WAP-enabled cell phones to remit money in the absence of established clearing houses; governments publish commodity prices, offer tele-education and health bulletins; news vendors publish and push news and updates; and companies such as Google and Yahoo offer local news, email and chat services, and dedicated web searches. In developing countries where online product shopping appears to be a distant reality, information consumption abounds, attested by the keen interest of vendors such as Google, Yahoo, and 'content and information services' vendors trying to establish a presence in countries such as Slovenia, India, and China. In fact, Google, in 2007, earned 48% of its revenues from international operations (Google, 2007), operating and providing localized information-related content in more 134 more developing countries than Yahoo.

In developing countries, information-centric ecommerce has gained some unlikely adopters. Consider Kwangmyong in North Korea, a government-controlled intranet used to broadcast propaganda in real time. In Vietnam, the Communist Party's official Nhan Dan newspaper was the very first paper to go online. China's People's Daily Web edition today provides a snazzy bilingual (Chinese and English) news site along with a popular chat room called the Strong Country Forum, where privileged users can and do debate issues related to national security, international relations, and China's global role (Kalathil & Boas, 2003). Truly, ecommerce has radically transformed the economic landscape, offering unprecedented opportunities for economic growth and development from Bangalore to Dakar (Kofi Annan cf. UNCTAD, 2002). According to Kofi Annan, countries that fail to adopt ecommerce run the risk of being bypassed in social and economic development. Despite such opportunities, ecommerce adoption has been, at the best, sporadic in the developing world. In 2002, while developed countries contributed towards 95% of ecommerce, Africa and Latin America accounted for less than even 1% (UNCTAD, 2002).

Understanding ecommerce adoption in the developing world has been challenging at the very least (Straub *et al.*, 1997) and often reliant on individual adopters of ecommerce technologies (complementing country-specific factors). Phrases such as 'Internet as the great equalizer' and 'the world is flat' serve as interesting pointers for realizing the ability of individual adopters and users of ecommerce in shaping their country's posture towards ecommerce.

While users in some countries have been able to harness the potential of information technologies to thrive and become a major contender in today's information economy, others have lagged behind as producers of low-value labor and products for wealthier nations (Watson & Myers, 2001). Ernst Schumacher (1989) pointed out that because technology choices were the most important decision that developing countries could make, understanding the decision-making criteria is imperative. Technological choices are also implicated in Amartya Sen's idea of 'development as freedom': using technologies that will reduce information asymmetry, leading to more informed decision-making, thus furthering development and freedom. Still, 95% of internet and ecommerce technologies is adopted and used by the top 20 developed countries in the world (World Bank, 2003), begging the question: *what are the conditions and contingencies that explain ecommerce adoption in developing countries?*

The purpose of this study was to derive and empirically validate a model of user behaviour that examines ecommerce adoption in the developing world. Specifically, the objectives of this study were to (1) develop a model of user behaviour related to ecommerce technologies in developing countries based on theory and informed by practice; (2) investigate user perceptions of socio-economic contingencies as a part of the model; and (3) offer preliminary validation of the model using data collected from users in developing countries.

The paper assumes that for ecommerce technologies to aid development, they must be adopted and practised in developing countries. To build a digitally integrated and perhaps a better world with information and communication technologies (ICTs), one must first make converts (adopters) out of the global populace. Needless to mention, investigating factors surrounding ecommerce adoption thus becomes a paramount responsibility for researchers and practitioners alike. While explaining user adoption of new technology is a mature research discipline in contemporary information system research, the plethora of theoretical models and empirical examinations that began a decade-and-a-half earlier was reviewed and synthesized as a unified theory of acceptance and use of technology (UTAUT) by Venkatesh *et al.* (2003). While this synthesis deserves tremendous merit, its reference frame has been captive to individuals and organizations in the developing world. (e.g. Davis *et al.*, 1989; Venkatesh & Morris, 2000; Venkatesh *et al.*, 2003). However, an analysis of user acceptance of technology in the predominantly developing world has generally escaped scrutiny. One should note that the USA, as a nation state, has relatively greater homogeneity among its users vis-à-vis other countries in the world with low cultural, legal, technological (infrastructure) or political variation. Similar references could also be made for Western Europe and Australia. By limiting references to the developed world while overlooking the burgeoning presence of the developing world, we risk diluting the behavioural dynamics of technology adoption.

When comparing user behaviour related to IT (including ecommerce technologies) adoption across countries in the developing world, adoption behaviour is varied and nuanced. Multiple factors dominate the landscape, defining and influencing stances that countries assume towards IT adoption. For example, in a study by the Center for International Development at Harvard University, Kirkman *et al.* (2002) found that countries such as Estonia and Israel have IT acceptance and use rates at par with wealthier nations such as Italy, Japan and France, while a country like India, with the number of sophisticated IT users more than the total

population of Iceland, has much less overall technology acceptance, ranking about 53 places behind Iceland. In India, much like other developing countries, IT acceptance and use are confined to regional pockets such as Bangalore, while much of the country remains information starved. The inherent richness of the phenomenon begs an investigation into the diversity of perspectives and factors related to how developing countries perceive and accept information technology (Avgerou, 2002).

The organization of the paper is as follows: the following section reviews the theoretical foundation behind our arguments. Next, we draw on existing literature to frame our arguments and hypotheses to propose a model of ecommerce adoption in developing countries. The model and hypotheses incorporate conditions and contingencies specifically relevant to developing countries, combining behavioural, cultural, socio-political, legal, economic, and technical factors to explain variances in ecommerce adoption in developing countries. Particular emphasis is placed on user perceptions on instrumental gains from ecommerce (performance expectancy), the role of socially influencing factors (social influence) and the user's personal characteristics (technological opportunism) that promote or inhibit adoption. Furthermore, given that infrastructure conditions vary across countries in the developing world, we examine the moderating role played by facilitating conditions on adoption behaviour. The next section details the research design and empirically validates the hypotheses with data from 172 users from 37 developing countries. The study ends with a discussion of the results and a synthesis of the implications and limitations.

THEORETICAL BACKGROUND

Historically, there have been two parallel streams of research converging on IT adoption. On the one hand, while research from the positivist school has concentrated on objective, statistical treatment of predominantly variance models of diffusion and adoption, the interpretivist school has conducted more focused studies in the sociology and phenomenology of user understanding and construction of reality. The interpretive perspective on technology adoption and diffusion examines the continuous interplay between users and their subjective construction of reality driven by their own experiences. For example, Walsham & Sahay's (1998) use of Structuration theory and Actor Network Theory (ANT) to surface geographic information systems (GIS) adoption and implementation in India highlights intuitively subjective rather than objective construction of technology by users in India. Walsham and Sahay (1998) note the difficulties of explicating user behaviour when trying to align multiple socially constructed realities among various human actors. As the authors note, 'maps are not deeply embedded in Indian daily life, but GIS require users to adopt a map-oriented approach to their work' (p. 56). In essence, the interpretive tradition seeks to highlight the idiosyncrasies of adoption behaviour that surface from understanding the socially subjective context of technological adoption and diffusion. Similarly, Tatnall & Jerzy (2003) follow the interpretive tradition to examine internet adoption by the older population as a phenomenon that transcends innate characteristics of a technology to reveal nuanced interrelationships and forces that propel

adoptive behaviour. Tatnall and Lepa use ANT to construct a social network for understanding internet adoption where users, as actors, create their own social worlds that contextualize their own adoption behaviour through their personal interactions and experiences. In the case studies that follow, Tatnall and Lepa trace how user adoption often reflects how the user construes a technology artefact rather than relying on the technology artefact's innate, objective characteristics: a grandmother adopting the internet as a means to communicate with her grandchildren; a retired teacher constructing the internet only to research genealogy and woodworking – driving home an understanding of how users construct their own reality and adopt technology as a means to a specific end. While the interpretive stream delves deeper into user dynamics of adoption, the positivist stream, on the other hand, is driven more by its attempt to objectify the adoption phenomenon for generalizability, assuming stability of constructs and their interrelationships.

This paper is informed by two areas of positivist research on IT adoption: Rogers's (1983) Diffusion Theory and Davis *et al.*'s (1989) Technology Acceptance Model (TAM) (refer to Venkatesh *et al.*, 2003, for a comprehensive review of TAM-related research). Rogers's Diffusion Theory looks at key characteristics of technological innovations to trace their impact on adoption. Davis *et al.*'s TAM, built on Azjen and Fishbein's Theory of Reasoned Action, is a parsimonious model that looks at key behavioural elements that influence decision-making related to IT adoption. Some of the key characteristics of technological innovations offer a similar meaning to the behavioural characteristics in TAM. Particularly, the key antecedents of *perceived usefulness*, *perceived ease of use*, *social influence*, and *facilitating conditions* in TAM are semantically suggestive of *relative advantage*, *complexity*, *image* and *compatibility* in Diffusion Theory (Moore & Benbasat, 1991; Venkatesh *et al.*, 2003). Moreover, following Wolfe's (2004) seminal work on innovation adoption and diffusion, these factors represent adopter perceptions, their social network, and the general environment under which the adoption is attempted.

TAM is a close analogue of Diffusion Theory (Moore & Benbasat, 1991; Rose & Straub, 1998). First, perceived usefulness is defined as the degree to which one believes that a particular system would enhance performance; relative advantage is the degree to which one believes that a particular technology would enhance enhancement over an existing technology. Second, perceived ease of use is defined as one's belief that using a system will entail little effort or would not have a steep learning curve; complexity is defined as one's belief that the adoption of a technology will entail little difficulty of understanding and use. Third, social influence or subjective norm is the perception that people important to the user will affirm its adoption; image is the perception that adoption will enhance the user's image in the eyes of the social or reference group. Fourth, facilitating conditions refer to objective conditions that can enhance adoption; compatibility is the perception of consistency between what is offered by the technology and the user's immediate resources and values. In short, both TAM and Diffusion Theory examine the mechanisms defining behavioural cues towards adopting an IT artefact.

Clearly, similar behavioural cues surround ecommerce adoption beyond the individual as the unit of analysis to explain ecommerce adoption even at a macroeconomic level of analy-

sis. Bagozzi *et al.* (1992) noted that because IT is complex, an element of uncertainty exists among decision-makers planning to adopt the technology. This perception is accentuated within developing countries that may lack the education, training, infrastructure, support and capital for ecommerce adoption (Jarvenpaa & Leidner, 1998). The opportunity cost of ecommerce adoption is high, especially when there are other immediate concerns such as poverty, famine, hunger, illiteracy and endemic diseases. While capitalizing on IT requires preliminary adoption, the decision-making involves serious consideration of multiple factors specific and unique to the context of developing countries. TAM and Diffusion Theory become useful here because they allow a focus on the impact of key technology-specific and external factors on the adoption of IT. Both of these theoretical approaches were formulated in an attempt to achieve these goals by identifying a parsimonious set of fundamental variables dealing with cognitive and affective determinants of ecommerce adoption. Venkatesh *et al.*'s (2003) unified view of user adoption, in combination with contributions from Rogers's (1983; 1995) diffusion of innovations, provides the theoretical basis for framework development in this paper, giving us a macroeconomic perspective of ecommerce adoption in developing countries.

A more comprehensive set of factors is obtained from Venkatesh *et al.*'s (2003) UTAUT as a unified view of user adoption. By combining eight competing theoretical models, the authors derive an overarching set of four constructs that have an immediate influence on acceptance and usage behaviour: performance expectancy (perceived usefulness; Davis, 1989) and extrinsic motivation (Davis *et al.*, 1989) in TAM and relative advantage (Moore & Benbasat, 1991 in Diffusion Theory), effort expectancy (perceived ease of use; Davis, 1989) in TAM and complexity (Moore & Benbasat, 1991 in Diffusion Theory), social influence (subjective norm in TAM and image; Moore & Benbasat, 1991) in Diffusion Theory), and facilitating conditions (behavioural control in TAM and compatibility (Moore & Benbasat, 1991 in Diffusion Theory). These factors are deemed as having a direct effect on ecommerce adoption and are likewise used as fundamental antecedents to unravelling ecommerce adoption in the developing world.

In choosing antecedents to ecommerce adoption, national culture towards ecommerce adoption was excluded. While national attitudes towards adoption are reflected by national culture (Straub *et al.*, 1997), the issue is somewhat moot in our investigation. Because this paper investigates national attitudes towards ecommerce adoption, the sample frame is that of developing countries. Although developing countries are diverse in their cultures with many intricate nuances, they share similar overarching cultural qualities in terms of (1) power distance, which specifies national culture towards authority orientation; (2) collectivism vs. individualism, which specifies the self-orientation of national cultures; (3) femininity vs. masculinity, which focuses on achievement orientation in cultures; and (4) uncertainty avoidance, which focuses on risk orientation across nations (Morosini *et al.*, 1998). Developed and developing nations manifest large inter-group variation but low intra-group variability. Typically, developing countries share high power distance, are collectivistic, more feminine and tend to avoid uncertainty (Adler, 1997; UNCTAD, 2004), thus reducing variance in use behaviour.

HYPOTHESIS DEVELOPMENT

Variables concerning individual perceptions of ecommerce technologies

Performance expectancy

Based on Davis *et al.* (1989) and Venkatesh *et al.* (2003), performance expectancy is defined as the degree to which individuals in a country perceive that ecommerce adoption will offer development potential. Performance expectancy or perceived usefulness has been found to be the strongest predictor of adoption behaviour (Venkatesh *et al.*, 2003). Perceived expectancy is also believed to be instrumental in understanding national perceptions towards ecommerce adoption. Ecommerce has been championed as the business model that can reduce disparities between the developing and the developed world. Because ecommerce commonly uses the public internet to conduct business, it reduces much of the impediments inherent to the physical world. This has lead to a general perception that ecommerce will enhance national productivity and performance, vis-à-vis traditional forms of commerce where geographical and temporal constraints loom large (Kalakota & Whinston, 1997).

The ecommerce model has been found to reduce transaction and coordination costs by utilizing cheap, coordinative transactions, interconnected networks, and online databases accessible to all around the globe. Gereffi (2000) argues how ecommerce enhances the bargaining power of producer firms in developing countries so that they can reposition themselves in the global value chain. Such cost savings and strategic advantages afforded by ecommerce, especially in sharp contrast with physical storefronts and single-source sales channels, offer favourable expectations of usefulness and performance (Malone *et al.*, 1987; Benjamin & Wigand, 1995; Bakos, 1997), leading to positive adoption behaviour towards ecommerce technologies (Wolcott *et al.*, 2001). According to Panagariya (2000), because cost savings from internet technology allow developing countries to leapfrog stages of development that developed countries had to go through, the perceived expectancy of benefits from ecommerce is likely to be high enough to warrant positive adoption behaviour.

In developing countries, there are three apparent dimensions of perceived performance expectancy. Ecommerce may be perceived in terms of its *social* usefulness, i.e. an expectancy that ecommerce adoption will bring about social development. For example, the Imperial Tobacco Company (ITC) in India is trying to adopt internet technologies to adopt internet kiosks (*e-choupal*) in rural India. As a corporate entity, the ITC has no economic stake in it; however, it believes that *e-choupals* will allow farmers to check regional and worldwide commodity markets to price their harvest (none of which is tobacco), order fertilizer, consult agronomists, and even buy health insurance online. Engulfed in feudal poverty and with little or no access to information, ecommerce is perceived to be useful in social development to 'transform the rural life in India' (The Economist, 2004) and create a degree of 'social inclusion' even among the traditionally disenfranchised. Another case-in-point is Maldives, where consumers seem to be keen on adopting online banking services after having lost their lives savings held in cash after the tsunami of 2004 (Technology Quarterly, 2008).

A country's expectations towards ecommerce technologies may also be triggered by its *economic* usefulness, i.e. an expectation that adopting ecommerce will lead to economic development. Economic usefulness is an essential performance dimension for developing countries. Beset with meager income and other economic woes, developing countries often perceive ecommerce as a promise that will allow them to leapfrog developmental impediments (Avgerou, 2002), promote export-oriented small to medium enterprises, and attract foreign investments. In fact, ecommerce-driven business-process outsourcing services are a $600 billion industry and have been key to the economic development in India (UNCTAD, 2004). The ability of farmers to check commodity prices before trading, the creation of ancillary services, the growth of knowledge-based work and simpler service exports are palpable economic benefits of ecommerce adoption that run the gamut. For example, the Malaysian government was willing to invest in an expensive e-procurement solution called e-Perolehan because of instrumental economic benefits that would reduce costs by more than 93%, from $260 to $17 per transaction (UNCTAD, 2004). Perceived economic and social usefulness are also well exemplified by India's adoption of telemedicine technologies to create mobile medical units in rural areas for remote web-based consultation using store-and-forward technologies as a way to uplift the pariah status of health care in Indian villages (Pal *et al.*, 2005).

Finally, perceived expectancy for countries could also be a function of their perception of *strategic* usefulness from adopting a technology, i.e. expectancy in terms of strategic development that ecommerce adoption may bring. Take, e.g. the horticultural sector in Kenya and South Africa. The sector showed tremendous interest in adopting ecommerce technologies that would allow them to maintain customer relationships with their importers in the UK. The technology would allow Kenyan and South African horticulture exporters to continuously update their customers on the latest planting schedules, output projections, and delivery details. The exporters perceive that adopting ecommerce would give them a definite strategic edge over the competition from other global producers (UNCTAD, 2004). However, we postulate that because developing countries are relatively more pressed towards economic upliftment vis-à-vis social or strategic development (Kirkman *et al.*, 2002; The Economist, 2004),

H1: Performance expectancy about ecommerce will have a positive effect on ecommerce adoption in developing countries and that perceptions of economic usefulness will be more strongly related to performance expectancy than social or strategic usefulness.

Social influence

Developing countries are in a race to catch up with developed nations, and social influence plays an important role in understanding their adoption behaviour (Venkatesh *et al.*, 2003). In this context, social influence is defined as the degree to which individuals in developing countries perceive how other people they consider important feel about their adoption of ecommerce technologies. Perceptions of referents become important for the adopter, who may not have enough experience with it and look to others for opinions and reference. This is

particularly true for the adoption of ecommerce technologies, where social influence is the key to understanding the instability of belief structures and attitudes (Malhotra & Galletta, 1999).

Referents serve as important and credible external inputs of information impacting behavioural attitudes but occur at different levels (Kelman, 1958). Therefore, social influence has multiple inducement processes (Kelman, 1958): compliance, identification and internalization.

Compliance is a social influence induced by expectations of reward or avoidance of risk rather than because of personal belief in the outcome. Compliance is a strong behavioural inducement for developing countries. The lack of capital and infrastructure in these countries has often forced developing countries to request capital and infrastructure aid injections from other countries. In many cases, the aid donors require the recipients to comply with a few demands. Although the aid is handed down by world bodies and non-governmental organizations (NGOs), the NGOs are sponsored by corporate charities. This has always been the case with promises of aid requiring some form of trade or some other compliance in return. For example, according to the Rio Declaration (2003), Latin American and Caribbean countries that are promised aid are implicitly required to, in return, adopt ecommerce technologies to link to partners and shippers, most of whom belong to the donor nations.

Identification is a social influence induced by expectations of creating and maintaining a satisfying self-defining relationship with others that are deemed important. Developing countries, under the yoke of colonial influence, have grown to believe in the formulaic notion of Western growth spurred by technology. Developing countries look up to the Western world and try to identify with them by adopting their culture along with their technology. In Africa, e.g. the steadily brooding stance towards Western technology has created a policy-making elite that identifies itself as a surrogate for Western culture. These developing countries become marginal consumers by adopting IT solutions such as ecommerce to identify themselves with the West (Prah, 2001). For example, many developing countries tend to adopt IT to raise its status among its peers (Odedra-Straub, 1992). Even more so, 'in many sub-Saharan African countries, there exists a blind notion that if the more developed countries use the technology and tell us to do so as well, then we should' (Odedra-Straub, 1992, p. 22). Similarly, Barrett *et al.* (1998) found that India's adoption of GIS was hindered because the value system in India emphasizes people's perception of space rather than objective definition by a technology. Identification has thus been implicated to be the most important constituent of social influence, partly because of perceptual lock-in by Western nations (Odedra-Straub, 2003).

Internalization is a social influence process induced by national beliefs and values that have an impact on IT acceptance. The inducement originates from a country's value and belief system, leading to differences in adoption behaviour. The beliefs and values may arise from the culture or aspiration of its population, reflected in the national attitudes towards acceptance of ecommerce. For example, India leveraged its educational value-system (Odedra-Straub, 2003) to develop a positive adoption behaviour for ecommerce technologies, leading to double-digit growth in business process outsourcing. On the other hand, a lack of internalization can be observed in conservative social, economic and religious beliefs in several countries. In a practice of information protectionism, countries control or prohibit ecommerce and internet access on the grounds of socio-economic conservatism, e.g. prohibition of the internet

and ecommerce in Afghanistan on moral grounds and on economic philosophy in North Korea. Such culturally ingrained concerns consequently limit exposure to ecommerce technologies. Low internalization reduces the adoption of ecommerce technologies, perhaps led by the perception of Western corruption.

H2: Social influence from compliance, identification and internalization will have a positive effect on ecommerce adoption in developing countries, with identification being the most important determinant of social influence.

Technological opportunism

Technological opportunism is defined as the sense-and-respond capability of entities with respect to new technologies (Srinivasan *et al.*, 2002). In investigating ecommerce adoption in organizations, the authors find that technologically opportunistic individuals engage in risk taking and experimentation with new technology. After all, ecommerce is an opportunity that developing countries and users need to be motivated enough to seize the technological opportunity to search for a digital niche (UNCTAD, 2004). Recasting the behaviour in ecommerce adoption in developing countries, technological opportunism is also a reflection of how proactive and ambitious users in developing countries are with adopting ecommerce (Srinivasan *et al.*, 2002). Countries that have users with high technological opportunism are better able to identify, assimilate and exploit emerging technology, allowing it to capitalize on emerging technologies. Indeed, technological opportunism reflects a sense of entrepreneurial spirit. For example, in comparing forest and ICT sectors in Finland, Lopperi *et al.* (2006) found that users in sectors that had were more opportunistic about taking advantage of radical technology such as wireless ecommerce were more likely to gain benefits of early adoption. For example, users in Brazil seem to be the most opportunistic of the entrepreneurship prospects surrounding ecommerce, leading to a growth in ecommerce adoption (The Economist, 2008a). Furthermore, because technological opportunistic users are more aware of technological developments and applicability, they are more likely to promote the adoption of ecommerce. Thus, it may be argued,

H3: Technological opportunism will have a positive effect on ecommerce adoption among users in developing countries.

Variables concerning individual perceptions of macro-level climate

Facilitating conditions

Building on Venkatesh *et al.* (2003), facilitating conditions are defined as the degree to which a prospective adopter in a country believes that enabling factors exist to support the adoption of ecommerce technologies. Regardless of user perceptions towards ecommerce technologies, ecommerce technology adoption has to rely on macro-level contingencies. The conduciveness of the macro-level climate is often a critical factor in ecommerce adoption and is

independent of user-level perceptions of ecommerce technologies *per se*. For example, users in a country may marvel at ecommerce, only to realize the paucity of technology support personnel or networking infrastructures.

Facilitating conditions highlight user perceptions of the macro-level socio-economic state of affairs – portraying the overall adoption climate that is independent of the individual adopter. As such, facilitating conditions remove existing barriers to adoption by finding alignment points between the technology and the national environment. Facilitating conditions include objective factors: efficacy, resource and technology availability (Taylor & Todd, 1995); support structure (Thompson *et al.*, 1991); and compatibility and experience (Moore & Benbasat, 1991). Facilitating conditions reflect the objective preconditions for positive ecommerce adoption. Conditions consistent with national needs and conducive to the adoption of ecommerce must exist for adoption. It is well established that facilitating conditions in developing countries do not directly impact adoption (Kaplinsky, 1982; Katz, 1984; Hoffman, 1985). Because of the strength of institutional and technical infrastructure, developed countries are also early adopters of technology; developing countries, on the other hand, have weaker support mechanisms and are late adopters of IT and need to 'feel good' (intention) about an adoption before actually adopting or using it (Katz, 1984).

In an extensive study of global technology readiness, Kirkman *et al.* (2002) uses four distinct dimensions that make up facilitating conditions: policy (legislative environment), society (education and training), access (infrastructure capabilities) and economy (national incorporation).

Policy-related facilitation concerns the overall business and economic climate of a country. It considers the level of competition allowed from privatization, entrepreneurship, and competition, technology development subsidies, and national legislative policies in the context of ecommerce adoption. For example, in Kenya, internet access costs are prohibitive and import duties on IT equipment is about 100% (Odedra-Straub, 2003; James, 2001). Restrictive government policies against entrepreneurship and privatization offer very little incentive for Cuba to adopt and promote ecommerce or any such internet-related technologies. A similar adoption behaviour is observable in Myanmar, where a 1996 decree by the authoritarian regime prohibited ownership of computers or any internet-related technologies. In contrast, Malaysia has grown, over the years, to be an ecommerce super-corridor for ecommerce technology firms by providing tax breaks and hands-off censorship policies for ecommerce technology investors (Kalathil & Boas, 2003).

Society-related facilitation defines national adoption behaviour by considering demographics, education and training. According to the International Telecommunications Union (ITU, 2005), ecommerce adoption is more positive for younger people, especially males, with higher income living in mostly urban areas. The educated tech-savvy population in countries such as India, Argentina, Malaysia, and China has adopted ecommerce technologies faster than the population in countries such as Bolivia, Nigeria, and Bangladesh where skilled technology professionals are few with little or no training and support (Kirkman *et al.*, 2002; Kalathil & Boas, 2003).

Access-related facilitation relates to the availability of a telecommunications and information infrastructure and the availability of software, hardware, and ICT services (Kirkman *et al.*,

2002). Together, they offer the underlying access capabilities. Access is considered as a prerequisite to IT adoption in developing countries where infrastructure conditions are in severe disarray (Odedra, 1992; Odedra *et al.*, 1993). Sub-Saharan Africa is plagued by a lack of landlines, and the low teledensity is preventing future technology adoption decisions (Odedra *et al.*, 1993). Without the necessary access infrastructure available to link the populace of a country, even the best technology remains alien to the society. Iranian weblogs gained popularity after blogs were Unicode Transformation Format-8 (UTF-8) enabled (Persian Unicode script) (Delio, 2003). In addition, without a strong support structure, the value of a newfound technology diminishes as users are left to solve all potential problems by themselves (Kirkman *et al.*, 2002). Also important to note is the fact that the hardware, software and support infrastructure must have a balanced development. In India, Ireland, and Israel, adoption has somewhat suffered because the software and support infrastructure have far outpaced network connectivity or hardware development (Kirkman *et al.*, 2002).

Economic facilitation is the extent to which the technology under consideration is likely to be incorporated and integrated into the economic activity of a country. A country that has a well-determined agenda of how to incorporate ecommerce technologies into its national processes will be likely to develop more positive adoption behaviour towards the technology. For example, China had a firm plan in place to incorporate ecommerce to promote larger development goals. The Chinese government proposed an ecommerce project for the All China Women's Federation to help rural women get accurate, up-to-date health information and counselling on issues such as rape and spousal abuse online through local organizations that have internet access. Even in Egypt, where internet censorship is common, ecommerce adoption was perceived much more positively when considering developing technology-access community centres to promote rural education (Kalathil & Boas, 2003).

The above discussion argues for the moderating role of the macro-level socio-economic climate in ecommerce adoption behaviour. Generally, socio-economic facilitation is independent of individual attributes and is underpinned by the national climate. China provides a prime example, where socio-economic changes, led by a concerted deregulation, have had profound impact on ecommerce adoption in the past few years (Kalathil & Boas, 2003).

H4: For users in developing countries, facilitating conditions will positively moderate the relationship between user perceptions towards ecommerce technologies and ecommerce adoption.

Figure 1 depicts the hypothesized model.

Control variables

Our study includes three control variables: level of privatization of ICT, gross domestic product (GDP) per capita and gross national product (GNP). Privatization has been considered to be an important predictor of ecommerce adoption. Countries that have a higher level of privatization in the ICT sector are more likely to adopt ecommerce and other technology solutions (Primo Braga & Ziegler, 1998; Ochoa-Morales, 2001; World Bank, 2001; ITU, 2007). Privati-

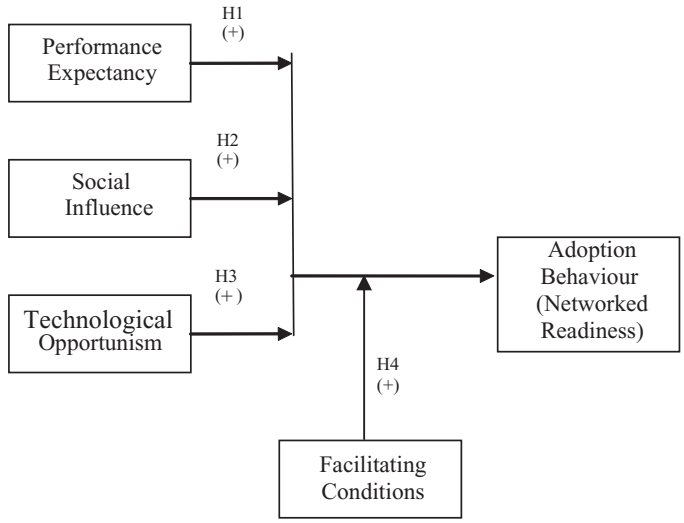

Figure 1. Ecommerce adoption in developing countries: proposed research model.

zation can be associated with more competitive investments in ICT and acts as an incentive for garnering more direct investment and know-how to ease ecommerce adoption. With more privatization, firms are likely to become competitive in their pricing and service options, therefore promoting adoption behaviour. Privatization was operationalized by the level of private ownership of ICT from the ITU (2006) ICT Indicators database.

The overall economic power of a country (GNP) and its individual income standards (GDP per capita) are also assumed to influence ecommerce adoption (Kamel, 2005). A country with a resource windfall is more likely to be conducive towards adopting ecommerce. GDP per capita and GNP are proxies for country-specific resources. Similarly, GDP per capita is also a proxy for consumer disposable income. By controlling for GNP and GDP per capita, we are able to minimize effects from country-specific resources and the size of the population, respectively. GDP and GNP data were gathered from the World Bank (2006).

RESEARCH METHODOLOGY

Data for this study were collected using a questionnaire-based field survey administered to users in developing countries with help from few United Nations (UN) agencies and NGOs. The agency-solicited members served as a panel representative of the population.

Data were collected during 2005–2006. The use of personnel from the UN and NGOs helped solicit legitimate users, particularly because these agencies are actively involved in technology development work across the globe. For example, the United Nations Development Programme (UNDP) has an Information and Communication Technology Development (ICTD) arm that looks at ICTD-related adoption and development strategies. A few of its initiatives

include the Cisco-UNDP Network Academies programme for 24 developing countries, regional initiatives such as the Asia Pacific Development Internet Program, the Internet Initiative for Africa and sponsoring the World Summit on Information Society conference.

As remarked earlier, access to participants was acquired through a mediated solicitation with the help of UN agencies and NGOs. Given that more than one agency provided us with the panel of potential respondents, we were somewhat assured that the sample was generally representative of the population. Users had to be computer literate with the capacity to make adoption decisions. Based on the criteria, 713 users from 67 countries were identified based on their initial willingness to participate. This initial set served as a representative panel. The process began early July 2005 and took a little over 3 months to complete. An email was then sent to each potential respondent with an explanation of the study and a request for participation, forwarded with a general referral from one of the senior UN members identifying the importance and credibility of the study. Participation was voluntary and all prospective subjects were assured that their responses would be treated as confidential. A second solicitation was sent a week later. Emails were sent to all prospective participants. Of the 713 requests sent, 342 potential participants (~48%) from 51 countries conveyed their continued interest. In general, respondents seemed quite enthusiastic and corresponded with us to understand more about the research.

The survey was developed and administered using WebSurveyor 3.0. The survey was administered online and was accessible between December 2005 and February 2006. Survey instructions and URL (including an embedded random ID) were sent via email to the original set of 713 potential subjects including those that did not confirm participation. A follow-up email was sent 2 weeks later and a reminder was sent after 6 weeks. However, the final count tallied at 172 respondents from 37 countries, 73 lower than the initial number of willing participants, a final response rate of approximately 37.7%. It may be assumed that most of the lost responses were possibly due to year-end appointments and plans.

Participants included entrepreneurs (16%) and employees in both private (31%) and public sectors (53%). The number of respondents varied between four and six for each of the 37 countries. All respondents were local, had requisite computer efficacy and had adopted some form of information technology in the last 2 years. Of the respondents, 15.3% were female and 84.7% were male. Their ages ranged from 32 to 51, with an average of 39.2 years (SD = 4.3). Country representation was as follows: 12 were from Africa, 16 from Asia, 4 from the Balkans and the Commonwealth of Independent States, and 3 from North America and 2 from South America. The average GDP of these countries was about $5133 (SD = $1131.4), ranging between $1532 and $13 111. The sample frame in the study seems consistent with the overall developing country statistics (UNCTAD, 2005), thus supporting our assumption that the respondents were possibly representative of the population. Furthermore, we compared the respondent sample with the non-respondents in the panel on aspects such as experience with computers, income and gender. Apart from gender, there appeared to be no non-respondent bias.

Whenever possible, measures were based on existing scales except for actual adoption behaviour measured by the Networked Readiness Index. The Networked Readiness Index is

an index developed annually by the World Economic Forum (2006) that measures the level of internet readiness in terms of actual usage. Because the index measures a country's internet adoption readiness and because ecommerce commonly relates to product and information transactions using the internet, the index is apt for gauging actual ecommerce adoption. Moreover, first-hand data collected for facilitating conditions was compared with available secondary statistics from ITU (2006) and World Bank (2006) databases. Individual responses based on country seemed to be highly correlated (*minimum* $r_i > 0.78$, *where* i = *available data on facilitating conditions*) with the macroeconomic data. Cross validation was performed by checking whether a user's view of facilitating conditions (e.g. perceptions of policy) generally matched public data on approximates and proxy measures for policy conditions for a country as per ITU and WTO databases. In addition, because facilitating conditions check for the overall macroeconomic climate, user responses from the same country were also checked for correlation and high loadings confirmed similar perceptions. However, the study relied on first-hand data collection given the general paucity of and missing macroeconomic data on facilitating conditions from secondary data sources. The simultaneous use of archival data from secondary data sources reduced potential common method bias from investigating both antecedents and the outcome from the same participant pool. The primary sources of the other survey item measures are shown below (Table 1).

The preliminary instrument was pilot tested and refined using NGO personnel and senior undergraduate students for face validity and clarity of construction. Particular emphasis was given on clearly defining ecommerce to the respondents. The preface to the survey contained the following paragraph that was further emphasized for effect:

> Before responding to the survey, we request the participants that that they thoroughly understand our definition of Ecommerce. Please consider Ecommerce as online product and information transfers and transactions facilitated by the Internet or any value-added electronic-network to include participation by businesses, consumers, and/or the government. Please consider Ecommerce services to include online search, online/e-procurement, online auctions and bidding, online government and non-governmental activities, online health information, online education, online product sales, online services such as social networks, file-sharing, instant messaging, downloads, and browsing.

Table 1. Primary sources of survey item measures

Measure	Source
Performance expectancy	Venkatesh *et al.* (2003); Davis *et al.* (1989); Thompson *et al.* (1991); Moore & Benbasat (1991); Compeau & Higgins (1995)
Social influence	Venkatesh *et al.* (2003); Davis *et al.* (1989); Thompson *et al.* (1991); Moore & Benbasat (1991);
Facilitating conditions	Taylor & Todd (1995); Venkatesh *et al.* (2003); Thompson *et al.* (1991); Moore & Benbasat (1991); Kirkman *et al.* (2002)
Technological opportunism	Srinivasan *et al.* (2002)

In addition, please consider Ecommerce regardless of device, connectivity, and purpose: PCs, mobile handheld devices, wired or wireless, narrowband or broadband, to be used for business or pleasure

All items were measured on Likert-type scales anchored at 1 for 'strongly disagree', 5 for 'neither agree nor disagree' and 7 for 'strongly agree'. All items were re-coded and transformed to a seven-scale metric to assure consistency and eliminate indeterminancy (Chin *et al.*, 2003).

DATA ANALYSIS

In the predicted model, performance expectancy, social influence and facilitating conditions are formative second-order constructs. The research model was analysed using partial least squares (PLS). PLS was used for testing formative second-order constructs and for building the overall measurement and structural models. PLS was found to be particularly useful given that PLS uses a principal component-based estimation that is useful for model testing. In addition, given our sample size of 172, PLS allowed us to test our model while placing minimal restrictions on sample size or residual distributions. Finally, PLS was valuable in testing moderating effects of latent variables including second-order constructs.

Reliability was assessed using internal consistency reliability scores, where a score greater than 0.70 signifies acceptable reliability. Convergent and discriminant validity is verified by making sure that PLS indicator loadings on the hypothesized factor are greater than their cross-loading s on some other factor. A confirmatory factor analysis was conducted to test factor loadings and cross-loadings. Moreover, the average variance extracted (AVE) should be above 0.50 and higher than its correlations with other constructs (Chin, 1998; Pavlou & Gefen, 2004). The square root of the AVE for all constructs was calculated to be higher than 0.72 and higher than their correlations with other constructs, demonstrating satisfactory levels of internal consistency, convergent and discriminant validity (Fornell & Larcker, 1981; see Appendix 2 for factor loadings, correlation and AVE). As a precaution, antecedents were checked for multi-collinearity (using eigenvalues and variance inflation factor) and principal components were assessed for common method bias using Harman's one-factor test to see if each principal component explained approximately equal variance (Pavlou & Gefen, 2004). No potential problems were noted. The combination of sample size, indicators, and interaction terms provided requisite power and effect size (Chin, 2001).

As discussed earlier, the specified model has three second-order constructs: performance expectancy, social influence and facilitating conditions. Higher-level constructs use formative indicators, i.e. indicators that are independent of each other, even for the latent variable they represent. Although they explain the latent variable, they are, in essence, sub-constructs or independent dimensions of the higher-level construct. For instance, performance expectancy is made up by perceptions of social, economic, and strategic usefulness, although each of these dimensions is independent of each other and is likely not to covary, vis-à-vis reflective indicators. Higher-level constructs were tested by using principal components factor analysis

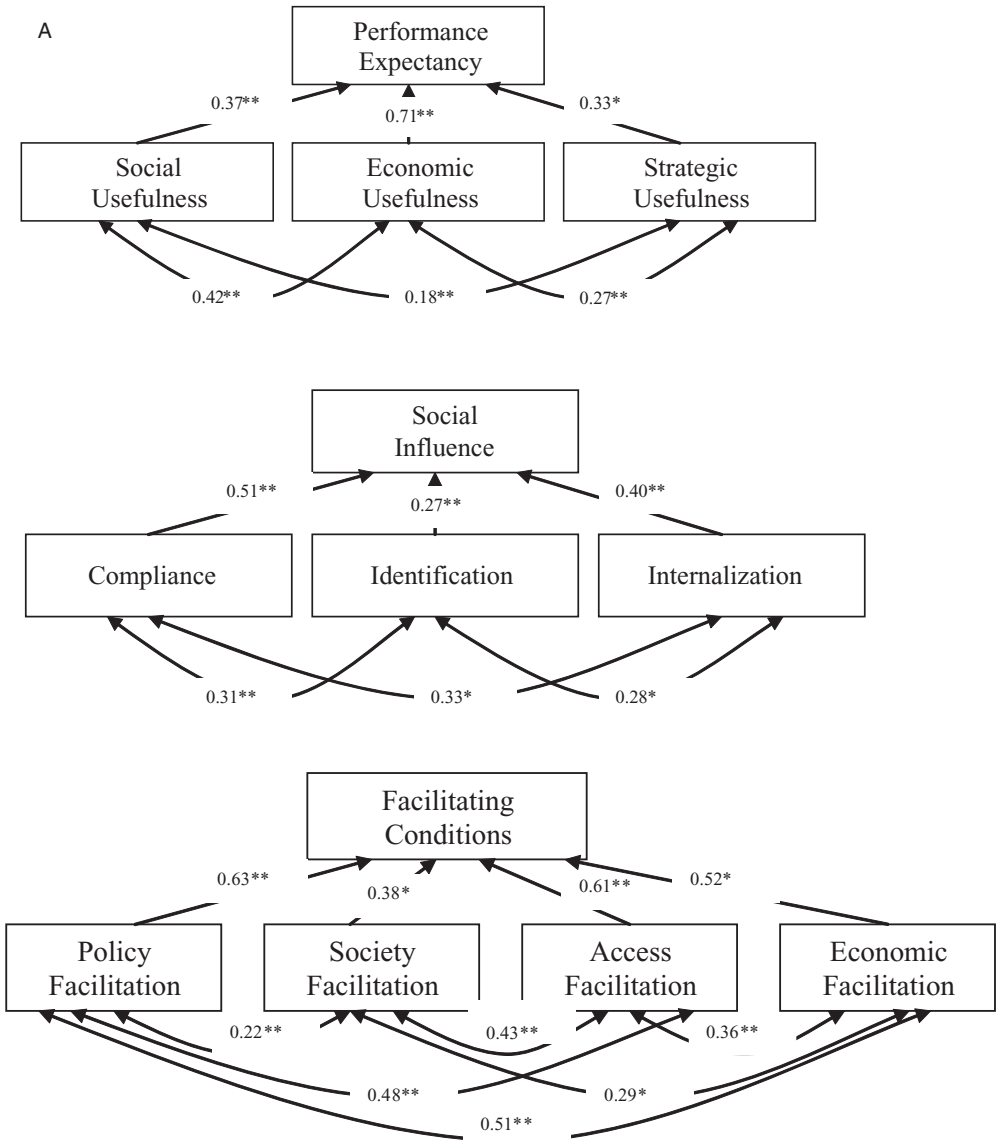

Figure 2. A. Structural model of relative weights for second-order constructs. B. Ecommerce adoption in developing countries: overall structural model.

(PCA) to model the paths between the lower-order and the higher-order constructs to determine the relative weight of each underlying factor (Chin, 1998; Pavlou & Gefen, 2004). The results from PCA are shown in Figure 2. Following Pavlou & Gefen (2004), we use the second-order factors as a three- or four-item scale by a weighted average of the first-order

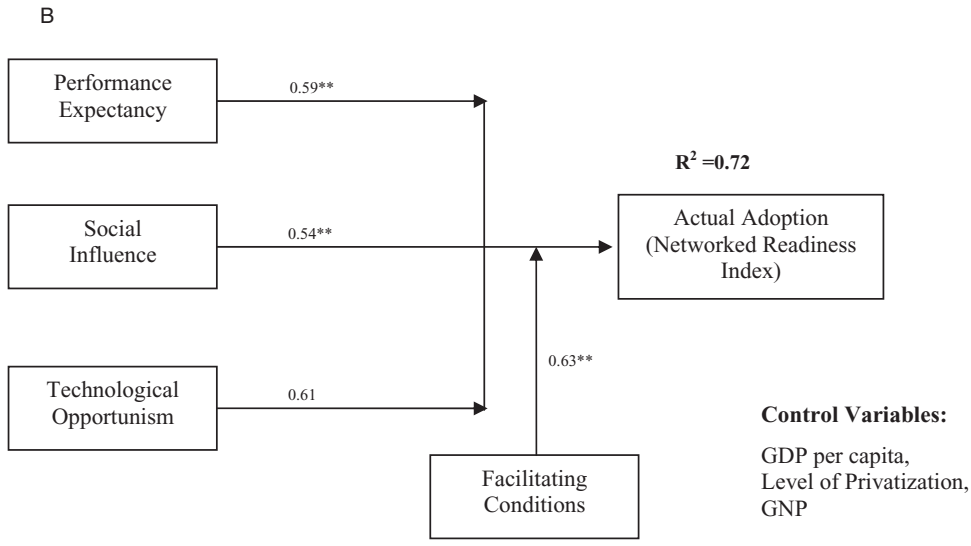

Figure 2. Continued

constructs; however, we make sure that the correlations between the original and averaged factors are high enough to yield similar results ($r > 0.88$). Standardized PLS path coefficients for the structural model are also shown in Figure 2. Figure 2A diagrams the second-order constructs and Figure 2B diagrams the overall structural model.

Results from our preliminary research offer strong overall support for the model where the latent factors accounted for 72% of the proportion of the cumulative Y-variance (actual ecommerce adoption). In general, most hypotheses received support. As expected, performance expectancy and social influence had significant direct impact on adoption behaviour. Unexpectedly, though, technological opportunism did not have a significant direct effect on actual adoption. Interestingly, in the presence of facilitating conditions, technological opportunism received strong support. In general, facilitating conditions significantly moderated all direct effects. Inter-construct correlations in Appendix 2 show a significant positive correlation between technology opportunism and performance expectancy, implying that in developing countries, individuals with entrepreneurial motivation and purpose share positive perceptions of ecommerce usefulness.

Among the control variables, individuals in countries with higher income levels (GDP per capita) and greater privatization experienced higher rates of ecommerce adoption. While the significance of privatization does not come as a surprise, the finding for GDP seems somewhat of a surprise. Ecommerce promised low entry barriers where developing countries could leapfrog economic constraints to innovate and compete contributing to development. It was promoted that to adopt ecommerce, developing countries simply needed a network connection and a computer to establish a presence and compete in the global village. Therefore, it is

surprising when findings positively correlate per capita income with ecommerce adoption. The finding dampens ecommerce promises, reaffirming the importance of capital availability and private investment inducements.

Results from the analyses of the second-order constructs were also interesting. Economic usefulness was the most important dimension of performance expectancy, compliance was the most important dimensions of social influence, and access and policy-related facilitation were the most important dimensions of facilitating conditions. Altogether, the results are suggestive of the strength of contingencies (moderators) surrounding ecommerce adoption in the developing world.

DISCUSSION OF RESULTS

While the need for IT-based solutions in developing nations has been inarguably established, the reasons behind the tremendous variance in adoption behaviour have rarely been explicated. Building on previous research, the study investigates the conditions and contingencies surrounding ecommerce adoption in developing countries by capturing the essential dimensions that define actual adoption. First, we identified and established the need to understand ecommerce adoption behaviour in developing countries. Second, constructs from previous work were recast to investigate ecommerce adoption in developing countries. Finally, the model was empirically tested using data collected from 172 respondents from 37 developing countries. Furthermore, care was taken to remove common method bias by measuring actual adoption from objective data though the use of the 'Networked Readiness Index'.

The findings provide overall support for the framework. The present study shows that performance expectancy and social influence directly influence ecommerce adoption; technology opportunism does not. However, the facilitating socio-economic climate plays a crucial role as a moderator, adding credence to all three antecedents including technological opportunism. Such a finding has particular merit. In developing countries, the mechanics of affect in exercising proactive and opportunistic ecommerce adoption are often undermined by environmental conditions. While it is true that technologically opportunistic users are more likely to adopt ecommerce technologies, actual adoption hinges on conditions beyond individual perceptions and traits and relies on the overall socio-economic state of affairs. If macroeconomic conditions are less favourable, individual propensity to capitalize on emerging technologies will fail to, independently, stimulate actual adoption. We believe that had this paper examined 'adoption intentions' rather than actual adoption, technological opportunism would have a significant direct effect, partly owing to a common method bias.

The study draws on information systems, sociology, and economics to identify, conceptually propose, operationalize, and empirically investigate ecommerce adoption in developing countries. This study pays attention towards restructuring and examining Venkatesh *et al.*'s (2003) UTAUT in the context of developing countries. Previous research on IT adoption predominantly examined the underlying behavioural mechanisms in the context of organizations in developed

countries, assuming that the same conditions would hold true globally. This study, on the other hand, redefines popular adoption beliefs, offering multiple contributions and implications for theory and practice.

First, in developing countries, facilitating conditions play the role of catalysts in actual ecommerce adoption. While facilitating conditions have essentially been taken for granted in the developed world, they are generally in a decrepit condition in developing countries. Any change in the underlying infrastructure is indicative of a show of support. While social influence and performance expectancy play an important role, having requisite facilitating conditions in place smoothens the adoption. For example, the Indian government's recent policy on economic liberalization provided an impetus for socio-cultural changes in adoption of foreign technology such as GIS (Barrett *et al.*, 1998). In a once protectionist society where foreign goods could only be smuggled into the country, it was more policy facilitation than performance perception that acted as a critical inducement.

Second, from a descriptive standpoint, this study helps surface and evidence the underlying dimensions of the causes pertaining to IT adoption. Previous research generally treated performance expectancy, facilitating conditions and social influence as individual first-order constructs even though they had multiple dimensions. This study contributes tremendously by creating second-order constructs by separating the underlying dimensions, creating and/or refining measures, validating, them, and finally testing them to find the relative weights of these dimensions as a part of the greater model. The findings highlight some important aspects:

Performance expectancy comprises of expectancies of economic, social or strategic usefulness. For developing countries, positive perceptions of economic usefulness are essential to ecommerce adoption. What is interesting to note is that economic rationalism seems to foreshadow social issues in developing countries (UNCTAD, 2004). Under a bleak economic condition, economic progress triumphs strategic and social usefulness. Simply put, in developing countries, ecommerce adoption hinges on instrumental economic benefits over strategic and social uses. Consider Kenya's rapid adoption of M-PESA, an online micro-finance and payment service where funds can be sent via text message to a subscriber's phone number or email, creating tremendous economic efficiencies by allowing anyone (e.g. casual workers, taxi drivers) with a cellular phone to send and receive money for services (Technology Quarterly, 2008). Analogous to Paypal in the USA where a transaction is tied to an email address, M-PESA ties the transaction to a cellular number. While economically useful, M-PESA has contributed to rampant money laundering and illegal cross-border transfers. ven more than social usefulness perceptions of bridging the digital divide. Therefore it is not surprising why developing countries promote socially useful ecommerce services under the guise of economic benefits. For example, the African Committee of Development Information used the phrase 'information as an economic resource' as a prelude to the launch of social services through telemedicine and tele-education (Wambui, 2005). In the age of globalization, Friedman (1999) remarks on how the economic progress and prosperity through ecommerce often conflict with and surpass forces of culture, identity, and tradition. Perhaps developing countries feel the need to herald in ecommerce as a unique opportunity to dramatically jump-start their economies, with a belief in Adam Smith's 'invisible hand' where economic

progress will ultimately create positive social spillovers – bridging the digital divide in the long run.

Social influence is understood by the dimensions of compliance, identification and internalization (Kelman, 1958). The fact that compliance is found to be the strongest social influence, even greater than identification, holds some merit. Unlike adoption dynamics in the Western world where affect is typically the cue, developing countries are the largest aid recipients in the world, including technology aid handed down by NGOs and donor nations who require a few adoption and trade conditions for the aid (Odedra *et al.*, 1993). Even more so, the donors assume the position of demigods and the recipient the pariah seeking identification with the donor by adopting likewise (Prah, 2001). The effects of compliance over internalization and identification are disconcerting. If developing countries adopt ecommerce technologies because they are required to rather than because they feel a need to or like to, adoption practices can simply be cosmetic. For example, countries such as Saudi Arabia control ecommerce and the internet based on a religious decree to limit pornography, gambling, or discussions related to sexuality or religion (Ambah, 1995), dampening the widespread use and access in fear of loss of control.

The four facilitating conditions are based on economy, society, policy, and access, among which policy and access are the strongest indicators followed by society and economy. In developing countries, policy is essential for changing adoption behaviour. The Chinese state-sponsored market reforms and 'Golden Projects' agenda in 1997 led to a favourable climate for ecommerce adoption, leading to a perception of the internet as an enabler rather than a haven for derelicts and conspirators. This was linked to providing better access for the population, increasing support and training, and incorporating ecommerce into the social fabric. Project Golden Bridge would create infrastructure, Project Golden Tax would collect tax online, Project Golden Key would create online payment facilities and Project Golden Customs would streamline the supply chain (China Internet Information Center, 2002).

These findings offer important implications. First, developing countries are driven by economic benefits because they relate economic development with strategic power, as articulated by developmental theorist Amartya Sen. Second, developing countries perceive technology to have a Western connotation and are more likely to develop positive intentions if the Western world requires them to adopt it or if they feel that it would raise their self-image in front of the developed world. Third, countries with a favourable IT policy offer a more conducive environment for adoption, implicating a belief that the technology will promote infrastructure growth, be made available and be incorporated within the functioning of the society. Consider a recent article on South Africa by the Economist Intelligence Unit (2007). According to the article, 'Growth in e-commerce in South Africa is fuelled by the realization that online procurement and supply-chain management can trim costs and improve customer relationships . . . Electronic-government initiatives also appear to be gathering momentum. Comprehensive, up-to-date content is readily available online from state and local governments. New offerings are being added to facilitate transactions such as tax payments'. This growth in ecommerce in South Africa was positively influence by facilitating conditions created by the South African government. For example, the Information Technology Agency Act 88 of 1998 in 2002 was amended

to set up an electronic services subsidiary for online procurement and delivery of services to the public. Similarly, the Electronic Communications and Transactions Act of 2002 provided legislation supporting electronic transactions. In addition, the South African government has opened up its ecommerce infrastructure, increased access to the public and offered economic incentives for ecommerce ventures. In fact, in 2008, the South African government's positive posturing towards using cellular services for AIDS education and support helped create mHealth, an initiative between American academics and MTN, a South African cellular service provider, to deliver AIDS awareness and support using short message services (SMS), thus prompting adoption (The Economist, 2009).

Fourth, the study shows that given positive facilitating conditions, technological opportunism can herald in successful ecommerce initiatives (i.e. through adoption). This signifies the importance of technological opportunism. Failure to acknowledge the potential and proactively respond to the opportunity is perhaps what demarcates thoughts from action (i.e. adoption). In countries like South Africa, technological opportunism among users is promoting ecommerce adoption and entrepreneurship, but only when facilitating conditions are in place. Technological opportunism therefore becomes a necessary but not sufficient condition for ecommerce adoption in developing countries. Users can be opportunistic about technology but remain dependent on policies and infrastructure to adopt ecommerce. Dutta *et al.*'s (2008) Global Information Technology Report corroborates the important interplay between technological opportunism and facilitating conditions by noting how a sense of competition and achievement coupled with holistic policies drive ecommerce. The authors cite the case of Israel where an economy based on citrus exports repositioned itself to compete in software service leadership. The authors emphasize on how software entrepreneurship was facilitated by the Israeli government by creating ICT powerhouses and through market-friendly interventions. Similarly, India's technological opportunism allowed it to shift its resource and budget allocations from subsistence agriculture to ecommerce-driven software services. Consider the tremendous ecommerce adoption in China after market and infrastructure reforms were put in place for facilitating adoption. The same is true for Andhra Pradesh, an entrepreneurial state in south India. In an attempt to bypass the notoriously inefficient bureaucracy related to bill payments, the state government seized the technological opportunity and opened *e-seva* kiosks for electronic public service payments, thus increasing the adopter base by 20% each year (The Economist, 2008a). We can assume with some certainty that technology opportunism was existent even in the absence of facilitating conditions. However, with reforms in place to facilitate ecommerce adoption, users became keener about adopting and using ecommerce. Simply put, without the presence of facilitating conditions, technology opportunism may not be actionable. An article on ecommerce entrepreneurship in emerging countries remarks 'Much of the difference between countries such as America, where entrepreneurship thrives, and those where it does not is cultural rather than regulatory' (The Economist, 2008b).

Underscoring the strong moderating influence of facilitating conditions does not undermine the role of technological opportunism. Instead, it highlights the finding that ecommerce adoption requires both conditions simultaneously. A lack of technological opportunism suggests a lack of zeal towards adopting new technological solutions and a dampened view of techno-

logical entrepreneurship. Lacking internal motivation towards leveraging technology, users are likely to forego adoption. This is a serious issue and often a key towards understanding the digital divide among developing countries, where some countries such as China, Kenya, and Brazil have successfully adopted ecommerce technologies but countries such as Senegal, Mali, and Uganda have not even though similar efforts have been made towards creating conducive conditions (Datta & Mbarika, 2006).

Finally, the moderating role of facilitating conditions adds an important clue towards understanding actual ecommerce adoption in developing countries. A fundamental assumption has been the controlled treatment of extraneous facilitators in technology adoption models. Indeed, in studying organizations in the Western world, the general infrastructure, policy, economy and access do not show much variance. However, the mechanics of adoption change as we shift our focus to the global stage. Needless to say, the effect is acute, as marked by the findings. One could safely argue that if countries can transpire a sense of reform and facilitation, actual ecommerce adoption will perhaps ground the notion of the 'Internet as an equalizer'.

LIMITATIONS, REFLECTIONS AND CONCLUSION

This study has limitations despite general support for the model. First and foremost, given that this is a preliminary attempt to understand user behaviour in ecommerce adoption in developing countries, the respondent sample may not be representative of the population. Even though this study relies on an *ad hoc* panel identified by agencies, the issue of selection bias can wane some of our findings. Although we have tried to combine objective and subjective data to reduce common method bias and assist us in our findings, the issue of how representative the sample is of the population remains the biggest concern and a limitation of this study. In particular, the sample size limits us from being able to generalize our findings. Given that this is a preliminary study to gauge user adoption, we sincerely hope that future studies will be able to build on a larger sample that is more representative of the population.

Second, the use of UTAUT to assess adoption decisions among users in developing countries has certain limitations. It is assumed that UTAUT can be recast into different scenarios alike. However, it could well be that user adoption in developing countries is contingent upon other factors not considered by the UTAUT. The study is further limited by its consideration of general ecommerce technologies. Data may very well yield different behaviours if the context domain is changed to a different or even a more specific IT-related solution, e.g. internet telephony, mobile applications and collaborative systems, among others. Because different IT solutions and sample frames may prompt different adoption behaviour, generalizing conclusions from this study should be considered with caution. Future research needs to revisit our arguments, particularly in light of mobile ecommerce. In reviewing the referent literature, Donner (2008) notes how the evolving landscape of mobile ecommerce in developing countries. The author remarks on how a surge in mobile ecommerce is providing voice and access to those marginalized by a lack of access to other ICTs. In his review, Donner (2008) remarks on how adoption in developing countries is a complex artefact, yielding distinct modes

of adoption and use across varying regions, cultures and communities. If mobile telephony is redefining ecommerce adoption dynamics in developing countries, it deserves particular attention in future research.

Third, the study attempts to establish a causal model of ecommerce adoption but conducts a cross-sectional investigation to do so. For the sake of parsimony, the framework tried to incorporate only those factors that tend to explain most variance. That required a trade-off of other factors, particularly some subtleties such as cultural attitudes and beliefs that may mediate, reinforce or attenuate the adoption behaviour process that may have been overlooked (Venkatesh *et al.*, 2003). Our 'factors' approach may have other confounds that need proper investigation in the future. They are issues including the complexity and size of the project, the time taken to implement ecommerce projects, and the underlying implementation process (Cooper & Zmud, 1990).

A fourth limitation of this study is the scope and context of orient ecommerce adoption in developing countries. Responses that drive our results are perceptions captive to, and often tainted by, socio-economic disparities and constraints. Avgerou (2002, p. 2) rightly remarks how ICT and ecommerce adoptions in developing countries 'suggest slow and tortuous processes with ambiguous outcomes'. Even for continents home to a majority of developing countries, internet penetration statistics are dismal: 5.3% in Africa, 15.3% in Asia, and 24.1% in Latin America and the Caribbean (Internet World Statistics, 2008). Stagnant economies, a lack of surplus income (including rampant subsistence and poverty), failing infrastructure, and unreliable governance, accounting, and payment mechanisms are everyday realities in which adoption decisions are made. These circumstances and conditions limit the conclusions drawn by this study. First, there is selection bias when considering ecommerce adoption in developing countries. In countries with meager connectivity, adoption perceptions of the privileged few may not represent the population where deep-seated income disparities stagnate a tremendous digital divide. Exclusionary adoption environments create biases and confounds. Second, while ecommerce consumption in developed countries includes consumption of products and services, a dearth of established financial institutions, a lack of ecommerce vendors such as Amazon.com, patchy online security, and an absence of legislative recourse (e.g. repudiation, fraud) confines ecommerce practices to information consumption, e.g. basic email, search, chats, and news delivery, information dissemination by the government, and basic storefront web sites designed for promotion rather than product transactions. Therefore, responses that drive our findings are scoped by a constrained view of ecommerce practices. Although the construct of 'facilitating conditions' tries to accommodate some of the constraints (e.g. policy, infrastructure), limitations and confounds may arise owing to inherent disparities and ecommerce consumption patterns.

A fourth limitation lies in the phenomenon and context of this study. Ecommerce, like other ICTs, is constantly in flux. Ecommerce innovations are rapid, and so are their corresponding business models. Because punctuated shifts in adoption are frequent and common for ICTs, results for an ecommerce model from data in 2006 are likely to shift over time. For example, this study does not capture post-2006 initiatives such as mHealth (Mobile Health), an SMS for AIDS awareness in Africa, M-PESA in Kenya, or MediCall, a flat-fee doctor consultation in

Mexico, that have triggered a wide adoption of cellular phones for ecommerce (The Economist, 2009). Unfortunately, temporal limitations remain at the heart of any study related to ICTs where rapid innovations constantly lead to substantial changes, thus rendering inferences (e.g. from the 3-year-old data in this study) somewhat ineffectual.

Finally, this study lumps a variety of countries under the umbrella of developing countries. However, there are tremendous variances between these countries. Any future research that traces adoption behaviour across different developing countries will offer tremendous insights into the subtleties and nuances that make technology adoption interesting. In addition, it would be helpful to consider adoption behaviour cues not only laterally (across sectors and organizations) but also vertically (hierarchically within organizations from a meso- to a micro-level unit of analysis). This study is directed towards a preliminary understanding user adoption of ecommerce technologies; a shift in the analysis would hold tremendous merit. In particular, longitudinal and interpretive research could enable us to better understand the adoption behaviour process, such as Gilbert *et al.*'s (2004) research on e-government adoption. In their research, Gilbert *et al.* (2004) surface a rich tapestry of barriers and benefits behind e-government. The authors find how issues such as a lack of trust, financial security, and effort and time expectancies became elemental in the adoption and use of e-government. While analogies can be drawn to our research in terms of compliance, internalization and expectancies, we realize that a more granular treatment can offer the intricacies that sometimes escape the attention of positivist research. Nevertheless, we believe that the present work advances technology acceptance research on developing countries. It is a puny step in the right direction: unraveling the dynamics of adoption in the 'majority world' that has remained mostly unnoticed over the years.

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Biography

Pratim Datta holds an MS and PhD in Information Systems and Decision Sciences from Louisiana State University and is currently an Assistant Professor of Information Systems at Kent State University. Dr Datta's research interests include technology reengineering, information economics, IT infrastructure design and performance, and global issues related to information systems. Dr Datta has several years of industry and consulting experience. He has 18 refereed publications in journals including the *Journal of the AIS* (Association of Information Systems), *European Journal of Information Systems*, *Information Systems Journal*, *Information Resources Management Journal*, *Communications of the AIS*, *IEEE Transactions*, *Journal of the American Society of Information Systems and Technology*, *IS Frontiers* and the *Journal of End-User Computing*.

APPENDIX 1: MEASUREMENT ITEMS FOR STUDY

1 Performance Expectancy

I believe that using Ecommerce technologies will . . .

a Economic Usefulness

i increase my *productivity*

ii increase my *economic growth*

iii *save capital* by *reducing costs*.

b Social Usefulness

i make it *easier* to benefit society

ii *simplify* social upliftment

iii *enhance* social quality
iv *hasten* social development

c Strategic Usefulness
i offer me a *competitive advantage*
ii increase my *effectiveness*
iii increase my *competence*

2 Social Influence

I will adopt Ecommerce technologies if . . .

a Compliance
i *I am asked to* by my peers, colleagues, or associates (include peers and colleagues in other developed countries).
ii *I am required to* by my peers, colleagues, or associates (include peers and colleagues in other developed countries)
iii *I am rewarded by* my peers, colleagues, or associates (include peers and colleagues in other developed countries).

b Identification
i my peers, colleagues, or associates (include peers and colleagues in other developed countries) *already use* the same.
ii my peers, colleagues, or associates (include peers and colleagues in other developed countries) *intend to use* the same.
iii It makes me *feel closer* to my peers, colleagues, or associates (include peers and colleagues in other developed countries).

c Internalization
i I feel that using Ecommerce is *important* for me.
ii I feel that using Ecommerce technologies will be a *source of pride*
iii I feel that Ecommerce *does not conflict* with my own values

3 Facilitating Conditions

As a technology user, I intend to adopt Ecommerce if . . .

a Policy
i trade restrictions are not too high
ii entrepreneurship is supported by the government
iii the government promotes Ecommerce and IT in general

b Access
i there is wide availability of IT support
ii hardware and software are readily available
iii connectivity (data network) is reliable

c Society
i there is a level of literacy and support
ii there is a good availability of training
iii there is a general interest for IT

d Economy
  i it is used to help the general population
  ii becomes a part of everyday life
  iii it facilitates governance

4 Technological Opportunism

I believe that . . .

a I am one of the first among my peers to *detect* IT related opportunities
b I actively *seek* information on latest IT related opportunities
c I *respond swiftly* to IT related opportunities
d I am *not resistant* towards IT related opportunities

APPENDIX 2: CONFIRMATORY FACTOR ANALYSIS LOADING

Constructs	Items	Loadings λ	ICR	AVE
Social Usefulness	1	0.863	0.89	0.68
Social Usefulness	2	0.812		
Social Usefulness	3	0.832		
Economic Usefulness	1	0.777	0.8	0.57
Economic Usefulness	2	0.715		
Economic Usefulness	3	0.781		
Strategic Usefulness	1	0.767	0.83	0.63
Strategic Usefulness	2	0.788		
Strategic Usefulness	3	0.821		
Compliance	1	0.764	0.8	0.58
Compliance	2	0.719		
Compliance	3	0.799		
Identification	1	0.786	0.81	0.59
Identification	2	0.772		
Identification	3	0.754		
Internalization	1	0.733	0.79	0.56
Internalization	2	0.741		
Internalization	3	0.775		
Technological Opportunism	1	0.745	0.84	0.56
Technological Opportunism	2	0.75		
Technological Opportunism	3	0.729		
Technological Opportunism	4	0.772		
Society Facilitation	1	0.734	0.83	0.62
Society Facilitation	2	0.799		
Society Facilitation	3	0.823		
Access Facilitation	1	0.705	0.82	0.6
Access Facilitation	2	0.831		
Access Facilitation	3	0.79		
Policy Facilitation	1	0.806	0.84	0.64
Policy Facilitation	2	0.801		
Policy Facilitation	3	0.768		

Measurement Model Estimation, Cross Validation, and AVE

Constructs	PE	SI	FC	TO
Performance Expectancy (PE)	**0.63**			
Social Influence (SI)	–0.10	**0.58**		
Facilitating Conditions (FC)	0.21	0.11	**0.63**	
Technology Opportunism (TO)	0.22*	–0.14	0.15	**0.56**

Note: *significant correlations at $P < 0.05$;
Diagonal Elements in bold represent AVE; AVE for higher order constructs averaged from lower order constructs.