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MOBILE COMMUNICATION AND USE BEHAVIOR OF THE URBAN POOR IN A DEVELOPING COUNTRY: A FIELD STUDY IN MALAYSIA

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Abstract

We developed a contextualized model to predict the use of technology among the urban poor. Based on the core idea that, in developing countries, the urban poor face different challenges from those of the rural poor, we argued that five key facilitating conditions (FC)—namely, infrastructure, technical and support services, legal and regulatory framework, financial factors and affordability, and self-efficacy—are the central drivers of both non-instrumental and instrumental use of mobile devices. Situated in the unified theory of acceptance and use of technology (UTAUT), these FC were found to be important drivers in our study conducted among 396 mobile phone users in a poor urban area in Malaysia. In addition to extending a key UTAUT construct to an important context, our results have important practical implications in that to increase non-instrumental and instrumental use careful attention should be given to co-development of mobile phone friendly policies pertaining to FC in developing countries.

Keywords**:** UTAUT, facilitating conditions, urban poor, developing countries

1. Introduction

According to the United Nations, 55% of the world's population belonged to urban communities in 2018; projections are that by 2050, over two-thirds of the world's population will be urbanized, of which more than 80% will be in developing nations (United Nations, 2019). Baker and Gadgil (2017) estimated that currently, 75 million people live below the poverty line of approximately USD 3 per day. The urban poor mostly live in dire conditions and life is a constant struggle for them (Awumbila, 2015; Baker & Gadgil, 2017). Although extant research on urbanization acknowledges that the urban poor in developing countries possibly face similar challenges to those faced by the urban poor in developed nations, there are key differences between developed and developing countries regarding the living conditions of the urban poor—specifically, the digital inequality is not the same in developing vs. developed countries (see Hsieh, Rai, & Keil, 2008). For example, lacking basic infrastructure in many developing nations imposes limitations on governments and organizations attempting to provide technology-centered initiatives (see Gichoya, 2005; Hsieh et al., 2008; United Nations, 2018). Thus, research on the urban poor in developing countries and interventions to improve their quality of life is of practical significance to various stakeholders including policymakers and service providers. Such research should also offer suggestions for access to infrastructure and services in urban environments, and for the successful implementation of the United Nations' 2030 Agenda for Sustainable Development (United Nations, 2018).

Much prior research on developing countries has focused on the rural poor populations, with little or no emphasis on the urban poor—that is, the work either considers these two populations as similar or focuses only on the rural poor. For instance, whereas there is an abundance of research on the adoption of ICTs to promote socio-economic development among the rural poor in these countries (e.g., Srivastava & Shainesh, 2015; Venkatesh, Shaw, Sykes, Wamba, & Macharia, 2017; Venkatesh & Sykes, 2013), there is considerably less on the urban poor. The contexts in

which the rural and the urban poor in developing countries, as well as the urban poor in developed countries, live are vastly dissimilar (Duflo, Galiani, & Mobarak, 2012; Heeks, 2008). This emphasizes the need to examine effects specific to the context of the urban poor. Johns (2006) defines context as situational opportunities or constraints, which includes a collection of situational features and/or situational strengths that can shape behavior (see Johns, 2017 for a recent review). IS research also recommends that researchers consider the importance of contextual factors or contextual effects in theorizing (Hong, Chan, Thong, Chasalow, & Dhillon. 2014). This is because context effects are central to understanding phenomena and can help researchers understand and explain observed findings (Johns, 2006; Whetten, 2008). Context has been shown to have powerful effects, for example, restricting range, changing causal direction, threatening validity, prompting curvilinear effects, and changing relationships (Johns, 2006; Rousseau & Fried, 2001). Thus, together, the specific issue of the urban (vs. rural) context and the general importance of context suggest the need for a deeper investigation of the urban poor.

Research on information communication technologies (ICTs) among poor populations in these countries has recognized that the adoption and use of ICTs, such as the Internet and mobile phones, present tremendous opportunities for social, economic, and education advancement (Berger & Nakata, 2013; Hsieh et al., 2008). The rising pace by which goods, services, and information are transacted across an increasingly digitalized supply-chain has resulted in a polarizing impact on social mobility—individuals and enterprises that have access to ICTs are empowered to better participate in the economy and grow in terms of socioeconomic indicators (Hsieh et al., 2008; Marler, 2018). In contrast, those who do not are not only denied prospects for social mobility, but also often unable to begin attaining such capabilities (Hemeson, 2008; Jacucci, Shaw, & Braa, 2006; Watson, 2013) such as embracing online systems (Veeramootoo, Nunkoo, & Dwivedi, 2018). However, researchers have acknowledged that poor people in developing countries are more concerned about their basic survival and meeting their daily needs, thus have little left for spending on technology (Gonzales, 2016; Helsper, 2012). While people struggling to

eke out a daily living are generally not likely to own an Internet-enabled computer, studies have shown that mobile phones are indeed widely distributed among the urban and rural poor, enabling them access to telephony and associated services that they otherwise might not have been able to access (Hemeson, 2008; Jacucci et al., 2006; Watson, 2013). An integral part of these services is the digital payment platforms including Internet banking (Sharma, Singh, & Sharma, 2020) and payment applications (Patil, Tamilmani, Rana, & Raghavan, 2020) available as applications on mobile phones, especially with developing countries increasingly jumping onto the bandwagon of a cashless society. Developing countries are especially susceptible to such broadening economic/productive gaps across society, given the relative volatility in market dynamics that accelerate the rise and/or collapse of communities. Intervening policies are thus paramount in bridging this inequality, and this eventually means guiding a broader proliferation and adoption of the relevant capabilities for economic participation across all classes of society.

While association between ICT adoption and quality of life improvement has been studied (e.g., Srivastava & Shainesh, 2015; Venkatesh, Bala, & Sambamurthy, 2016a; Venkatesh, Bala, & Sykes, 2010; Venkatesh, Rai, Sykes, & Aljafari, 2016b; Venkatesh, et al., 2017; Venkatesh & Sykes, 2013; Venkatesh, Sykes, Rai, & Setia, 2019), we believe an added distinction must be made between purpose of use of technology, that is, for hedonic and/or utilitarian use by this segment of the population. Mobile communication and use have been shown to be effective indicators for such an exercise—notably, Kim and Han (2011) draws linkages between ICT and mobile data services to model both behaviors, and Srivastava and Chandra (2018) alludes to mobile phone use as a lynchpin for emergent use intention of an existing technology in new areas not previously envisioned.

Having established these fundamental research premises, we will use the unified theory of acceptance and use of technology (UTAUT) to build a contextualized model for mobile communication and use by the Malaysian urban poor. UTAUT has recently emerged as the dominant theory explaining adoption in a variety of settings and contexts (Sharma et al., 2020).

Venkatesh, Thong, and Xu (2016c) identified several different directions of importance in this domain, and reaffirms contextualization as one of its principal pillars. Baishya and Samalia (2020) recently pointed out that few studies extend UTAUT to the context of the low-income people termed as 'bottom of the pyramid'. We build on this call to focus on the urban poor, with a particular focus on the facilitating conditions (FC) in UTAUT. Prior research has found that FC positively influences technology adoption and use (e.g., Awa, Ojiabo, & Orokor, 2017; Liew, Vaithilingam, & Nair, 2014). However, only a few studies have specifically tried to conceptualize FC (see Taylor & Todd, 1995), especially in specific contexts and most of these studies have taken a narrow definition of FC. Thus, addressing this gap in the extensive prior research on adoption and use of technology and theories of adoption, including UTAUT, this paper will incorporate context-specific FC that encompasses a more inclusive definition of FC that has not been examined in other studies to determine the use of technology among the urban poor. Hence, the following research questions are addressed in this paper to shed more light on technology adoption among the urban poor population:

(1) What are the factors that encompass FC based on the context-specific framework? and
(2) What is the relationship between FC and the purpose of mobile phone use?

Against this backdrop, our objectives are:

(1) to develop a model of technology adoption and use by contextualizing UTAUT to the urban poor in a developing country;
(2) to develop a conceptualization of FC; and
(3) to empirically test the model in a study with data related to the use of mobile technology in an urban poor sample in Malaysia.

We followed Johns (2006) who advises that contextualizing a research study can be done at various stages, namely (1) at the research design stage, using cross-level or comparative research, by collecting qualitative data or by studying processes and events, (2) during the measurement and analysis phase, or (3) during the reporting phase by addressing the elements

of the context in adequate detail. Combined with context-specific theorizing, we use structural equation modelling (SEM) to empirically test the model.

Our work contributes to the understanding of ICT use and adoption patterns among the urban poor in developing countries. We aim to examine how increasing technology adoption would directly and indirectly improve the quality of life of the urban poor in developing countries, resulting in more effective, directed policies for technological enablement that differentiate impoverished rural and urban communities. By theorizing about the contextual aspects of a specific environment, we have also enriched our understanding of technology adoption by the urban poor, thus contributing to research on UTAUT (Venkatesh et al., 2016c). In so doing, our work is intended to increase adoption that in turn can have an impact on the socio-economic development of the urban poor in developing countries.

The rest of the paper is organized as follows. An outline of UTAUT is provided in Section 2. Next, we present a detailed theoretical background and hypotheses in Section 3. In Section 4, we explain the methodology and our findings are presented in Section 5. The discussion of these results and their implications, as well as the limitations of the study are presented in Section 6. Lastly, we present our conclusions in Section 7.

2. Unified Theory of Acceptance and Use of Technology

A good starting point to understand the adoption and use of technology by the urban poor is the vast body of research on technology adoption. Such prior research has resulted in a number of technology adoption models (e.g., theory of reasoned action (TRA) and technology acceptance model (TAM)), all of which have attempted to explain information systems adoption and use behavior. UTAUT was developed by capturing the essential elements of eight established technology adoption models, to combine and integrate them and thus formulate a unified view to explain user intentions and subsequent use behavior (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). UTAUT is one of the most widely used theoretical perspectives

examining use behavior in different settings (see Venkatesh et al., 2016c for a review) and has gained popularity among researchers in recent years compared to other dominant theories of technology adoption (Chhonker, Verma, & Kar, 2017; Chhonker, Verma, Kar, & Grover, 2018). In the technology adoption literature, Venkatesh et al. (2016c) call for consideration of context. Hong et al. (2014) demonstrated that models considering contextualization provided a richer explanation than more general models of technology adoption. Examples of such models highlight the difference between technology adoption in developing vs. developed countries (e.g., Venkatesh et al., 2016a; Venkatesh et al., 2010). More broadly, despite such calls for studying context (see Johns, 2006), Johns (2017) lamented the limited progress in our focus on context and this limitation extends to technology adoption as well (Hong et al., 2014).

In UTAUT, the construct of FC is one of four determinants of technology adoption. It is of central interest to us. UTAUT describes four core determinants of technology use, namely performance expectancy (PE), effort expectancy (EE), social influence (SI) and FC, as well as up to four moderators of key relationships (see Figure 1). FC refers to the degree to which an individual believes that an enabling environment exists to support the use of a system (Venkatesh et al., 2003). Such FC can be used to study various enablers of use in a specific context. The beliefs that individuals have about the presence of these FC will determine their adoption and use of the particular technology. The unique context-specific factors that make up the conditions in which the urban poor of developing countries live deserve consideration. In line with the notion of context that Johns (2006) put forward about extending theory (see Brown, Kelley, & Schwarz, 2006; Hong et al., 2014), our work extends UTAUT to incorporate context-specific factors that determine the FC relevant to technology adoption among the urban poor in developing countries. While this study is framed in the context of the socio-demographics of the users, other studies on mobile communication adoption have examined the topic from a mobile applications (apps) or services context such as m-government (Shareef, Archer, & Dwivedi, 2012) and mobile wallet (Grover & Kar, 2020).

UTAUT is an appropriate theory for this investigation because by analyzing the FC surrounding mobile phone use among the urban poor, we can theorize about and empirically examine context effects. The robustness of UTAUT has allowed researchers to extend the original model through the integration of other theories and constructs, making it applicable to a wide range of context (Baishya & Samalia, 2020; Hossain, Quaresma, & Rahman, 2019; Patil et al., 2020; Queiroz & Wamba, 2019). The resulting extended versions of the model have been expected to perform better in predicting technology adoption (Slade, Williams, Dwivedi, & Piercy, 2015). We do not hypothesize about PE, EE, and SI, because prior literature has repeatedly shown them to have a significant role in determining individual acceptance and use of technology (e.g., Chhonker et al., 2018; Erez & Isen, 2002; Heikkilä & Smale, 2011; Venkatesh et al., 2003). For a detailed review of the recent research on UTAUT, we refer readers to Venkatesh et al. (2016c).

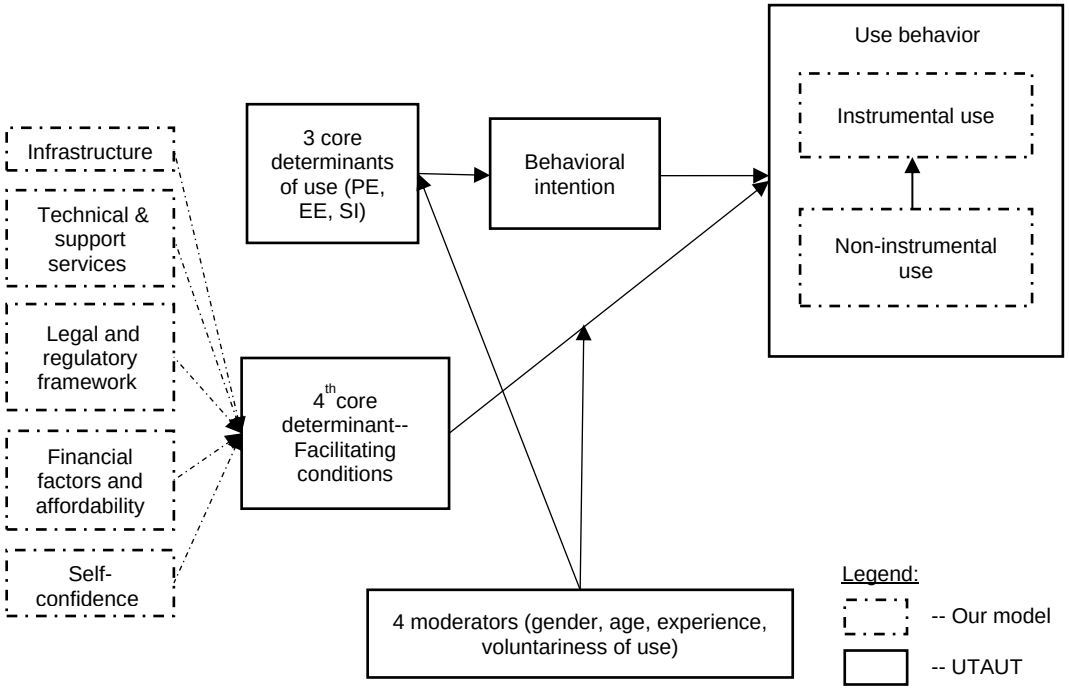


Figure 1. Basic elements of UTAUT and how our model fits with UTAUT

3. Theory Development

3.1. Contextualizing Facilitating Conditions

Much of the literature that discusses FC has identified training and support as the primary FC for technology adoption in organizational settings (see Taylor & Todd, 1995; Venkatesh et al., 2003, 2012). A few others identify physical/organizational infrastructure and technology access/technical infrastructure as important FCs that lead to region-specific variations in technology or Internet adoption (e.g., Agarwal, Animesh, & Prasad, 2005; Seethamraju, Diatha, & Garg, 2018). Other FCs discussed in prior literature include governmental initiatives and interventions (e.g., Hsieh, Rai, & Keil, 2011; Keil, Meader, & Kvasny, 2003; Lynne, Casey, Hodges, & Rahmani, 1995), affordability, and regulatory environment (Liew et al., 2014). Table A1 (see Appendix A) lists the relevant prior publications on FCs related to technology adoption in a societal context and/or in developing countries.

Developing the mobile communication environment is critical for facilitating the migration of the poor to an information and knowledge economy. Although the Malaysian government has initiated major programs to assist the poor in accessing technology to improve their socio-economic well-being, the urban poor community still judges these initiatives to be insufficient (Nair & Vaithilingam, 2013). According to a hand phone users' survey conducted by the Malaysian Communications and Multimedia Commission (MCMC) in 2017, only 9% of all smartphone[1] users were from the low-income group (RM 1000 per month and less). In contrast, 47.6% of feature phone[2] users by income category were from the same low-income group. This suggests that there are strong obstacles for low-income groups to shift from feature phones to smartphones. The MCMC survey also reported that close to two-thirds of feature phone users stated no desire to switch to smartphones. Further, only 20.6% of feature phone users access the Internet via their phones, whereas 94.8% of smartphone users access the Internet via their phones. Mishra and

[1] The International Telecommunication Union (ITU) defines 'smartphone' as "a mobile handset used as a person's primary phone device, that has capabilities to perform Internet-based services and can function like a computer, including having an operating system capable of downloading and running applications, also those created by third-party developers" (MCMC, 2017, p. 9).
[2] The ITU defines 'feature phone' as a mobile handset that "has limited functionality and proprietary operating systems such as Bluetooth, Wireless Application Protocol (WAP)-based phone browsers, the ability to install and run Java applets and applications, and a camera. This device primarily uses narrowband 2G EDGE/EDGE+ speeds for mobile data access" (MCMC, 2017, p. 8).

Bisht (2013) highlighted the importance of Internet access, especially access to banking services. Their study showed that having a strong mobile communication environment has important implications for financial inclusion of the urban poor.

Our contextualized theory development regarding the mobile communication use of the urban poor community was done in three stages. The first stage comprised an exploratory field study to identify the FC necessary for the urban poor to use mobile technology to complement our literature review. In the second stage, we developed the model and conducted a quantitative survey using validated scales from prior research to test the proposed model. The third stage involved conducting interviews to corroborate and confirm the findings of the quantitative survey.

Considering our objective is to develop a model for predicting technology adoption among the urban poor by contextualizing UTAUT, we follow the principle of theoretical sampling. We conducted interviews (the specific interview questions we used are provided in Appendix D1) to gauge the urban poor community's sentiments toward the mobile communication environment. However, before the interviews, we conducted a literature review of prior research on FC in technology adoption research to identify the key factors that encompass facilitating conditions. These factors were then included in the interview questions. Through these interviews, we also gained insights on the influence of FCs on mobile phone adoption and use that assisted in further expanding our theory of the key FC dimensions that drive mobile phone adoption and use in a contextualized urban poor setting (see Wunderlich, Veit, & Sarkar, 2019; Zhang & Venkatesh, 2017). We conducted interviews until our data reached saturation in that no new FC dimensions were emerging from the data. All the interviews were semi-structured, using mostly open-ended questions. Without deviating from the essential questions, wording and ordering of the questions changed according to the flow of conversation. Based on the interviewees' responses, we asked follow-up questions to clarify unclear statements and we allowed respondents to elaborate if meaningful new topics arose that we had not covered in our protocol. We validated our interview protocol through discussions with peer researchers.

We randomly selected 40 individuals across four urban-poor localities in the Klang Valley of greater Kuala Lumpur in Malaysia. We gathered data using informal conversations and open-ended unstructured interviews of approximately 30 minutes each with the selected interviewees. The first and second authors of this paper conducted the interviews in person on a one-to-one basis. Prior to the interviews, respondents were uneasy when we mentioned the possibility of recording the interview process. Therefore, to maintain a safe and comfortable environment for the respondents to speak openly, the interviews were not recorded (Karnieli-Miller, Strier, & Pessach, 2009). Researchers kept field notes based on the interviews with respondents, and the major themes were extracted from the notes.

The respondents highlighted the key factors that they perceived to be conditions that would facilitate both instrumental and non-instrumental use of mobile devices. The excerpts given below in Table 1, affirm four major external factors and one internal factor that respondents cited as key FC. These findings were subsequently used to design the FC construct used to build a model in the second stage of the theory development. Table 1 provides excerpts from the interviews and maps to the FC construct that we discuss later.

Table 1. Facilitating Conditions

Interview Excerpts	Qualitative Inference	Context	Questionnaire Items	
Facilities were *"outdated"* *"Telecommunication services are not there, or if present, they are not good"* *"not maintained well"* *"Vandalism and theft"* of existing facilities	Infrastructure is lacking and not in a well-functioning state, even if available.	Infrastructure (adapted from Venkatesh et al., 2012)	FC01	I believe I have the necessary telecommunication infrastructure to use the mobile phone (e.g., adequate network coverage)
"No one to help" *"Only know how to use it for talking and SMS"*	There is no clear support structure for people who with limited ICT skills, and when services break	Technical and support services (adapted from Thompson,	FC02	I believe guidance is available in the selection of mobile phones
			FC03	I believe specialized instructions regarding the mobile phone is available

"Scared to use in case got problem, no one to help" *"Don't know how to fix"*	down they feel helpless.	Higgins, & Howell, 1991)	FC04	I believe customer support is available for assistance with difficulties when using the mobile phone
"I'm afraid of people cheating me" *"unknown people sending too many messages and mostly not relevant"* *"Don't know who to trust"* *"worried that personal information will be stolen"* *"Complaint to whom"*	Respondents were not comfortable providing personal or financial information using their mobile phones. They are unaware of laws that would adequately protect their interests, hence they are skeptical about using mobile phones for advanced services like banking.	Legal and regulatory environment (adapted from Liew et al., 2014)	FC05	I believe there is adequate law and regulation governing unwanted mobile messages (e.g., spam)
			FC06	I believe there is adequate law and regulation to ensure the credibility of service providers
			FC07	I believe there is adequate consumer rights protection in place to keep consumers well informed
"It is too expensive" *"do not use mobile phone for calling as too expensive"* *"cannot afford"* *"Salary too low so cannot afford mobile data package"*	The cost of mobile communication devices (smartphones) and broadband services remains a high barrier to adoption.	Financial factors and affordability (adapted from Wu & Wang, 2005)	FC08	I think the cost of owning a mobile phone is affordable.
			FC09	I think the cost of using a mobile phone is affordable (e.g., to call, SMS, etc.).
"I don't know how to use it properly" *"I'm scared of doing something wrong"*	A perceived lack of competence, acts as a deterrent in the community for adopting technologies that could significantly impact their daily lives; this results in people sticking to "tried-and-trusted" traditional communication methods.	Self-efficacy (Venkatesh, 2000)	FC10	I believe I have the knowledge necessary to use the mobile phone on my own

More broadly, much of the organizational literature considers contextual factors that include ones of a political/national, economic (including labor pool), location, legal/institutional, social (including clients, competitors and contractors), and technological nature (Belassi & Tukel, 1996; Rousseau & Fried, 2001). Against this set of contextual factors, we map the identified FC. Figure 2 shows this mapping—political factors are represented as infrastructure; technological factors as

technical and support services; legal factors as the legal and regulatory framework; economic factors as financial matters and affordability; and social factors as self-efficacy. In the following section, we discuss these contextual factors.

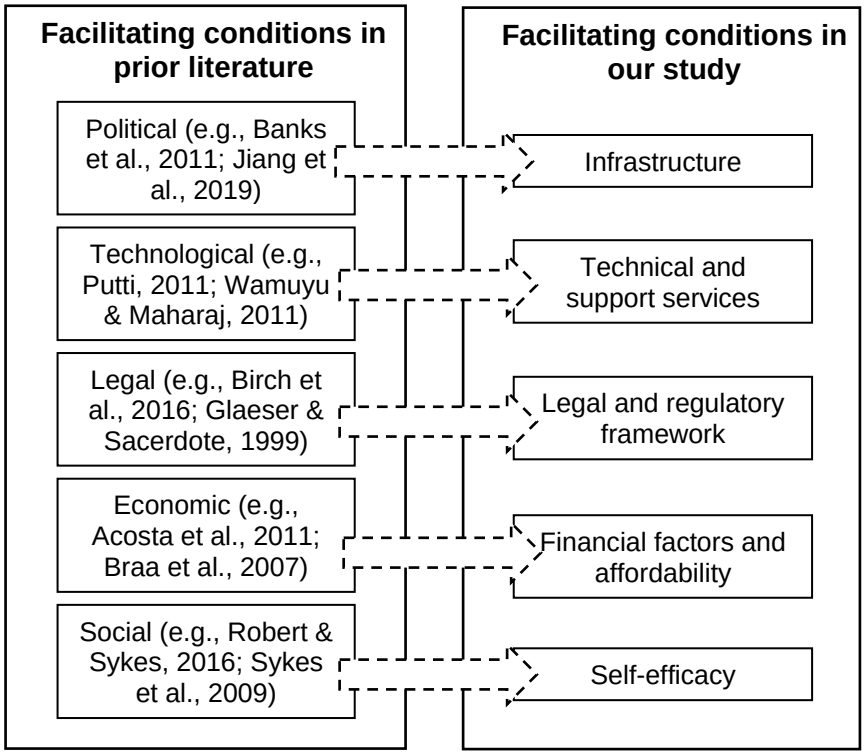


Figure 2. How FC in Prior Literature Map onto Those in Our Study

3.1.1. Infrastructure (FCI)

In many developing countries, a lack of basic infrastructure is a general problem (Braa, Hanseth, Heywood, Mohammed, & Shaw, 2007). In urban areas, the problem is compounded by the temporary nature of dwellings and severe congestion (Florida, 2014; Marx, Stoker, & Suri, 2013) that is uncommon in rural areas. Investing in infrastructure requires high capital intensity, long investment periods and high transaction costs, and is thus vulnerable to political and regulatory interference (Jiang, Martek, Hosseini, & Chen, 2019). This is because political instability, weaker institutions, laws and policies, and the possibility of internal conflicts found in some developing countries make it risky to invest in infrastructure projects. Meanwhile, local governments often consider slums and other such dwellings to be illegal, associating the urban poor areas with crime

and squalor. As a result, they do not always include such localities in planning, except when they plan to demolish them (Banks, Roy, & Hulme, 2011; Shetty, 2011). The transience of the urban poor's dwellings affects service provision to such an extent that providers are reluctant to install expensive equipment in areas where, without much prior warning, people could, for example, be relocated to government urban renewal projects (Habitat for Humanity, 2007). Further, expensive equipment is at risk of vandalism, theft, and associated service disruptions (Wamuyu & Maharaj, 2011). It is not uncommon for government, policy makers, and government institutions in developing countries to ignore the plight of the urban poor, even while they focus on the rural poor, targeting them for development programs. For example, Banks et al. (2011) found that in Bangladesh "urban poverty was neglected in research, policy and action on poverty reduction" (p. 487).

In contrast, homes in rural areas are associated with more permanence and social harmony. In many developing countries, government programs are geared toward rural development as if the rural poor are more deserving of poverty reduction programs than others (Banks et al., 2011; Hossain, 2005). In rural areas, due to having lived there for generations and cultivated close ties, the local authorities know most families; also, local officials are more visible to rural citizens (Brinkerhoff, Wetterberg, & Wibbels, 2018). Many of the urban poor, however, are transplants from rural areas and are not known to their neighbors, let alone to local leaders (Narag, 2013; Nayak, Werthmann, & Aggarwal, 2015). Besides, urban poor communities tend to be suspicious of government (Narag, 2013; Rashid, 2004), which makes it more difficult to implement projects, including those focused on infrastructure.

3.1.2. Technical and Support Services (FCT)

Congestion is more prevalent in urban areas than in rural areas. This constrains technical support engineers in accessing problem installations or equipment that has failed to resolve problems quickly. For the same reason, faulty equipment is not repaired for extended periods, eventually even becoming non-functional (Wamuyu & Maharaj, 2011). As a result, fewer, if any, initiatives

are created to provide technical services in slums and other places where the urban poor live. For example, many developing countries have rural electrification agencies dedicated to providing access to electricity in rural areas, whereas the cities' slums are largely ignored (Aklin, Bayer, Harish, & Urpelainen, 2015; Bernard, 2010; Brass, Carley, MacLean, & Baldwin, 2012; Cabraal, Barnes, & Agarwal, 2005; Putti, 2011). Assumptions that all urban dwellers have access to electricity prevail, thus justifying attention to rural electrification.

Nevertheless, statistics show that access to electricity among the urban poor in slums in developing countries is a myth, especially because large portions of such urban poor live in non-governmentally sanctioned, illegal dwellings (Putti, 2011). The urban poor tend to live in underserved areas and often have lower levels of access to technical support services than the affluent groups (World Bank, 2011). Additionally, when urban poor areas experience technology-related problems, technical support is not at hand because technical support centers are rarely located in the poorer sections. Low levels of literacy, as well as low confidence in their abilities, further underscore the urban poor's need for technical support.

3.1.3. Legal and Regulatory Framework (FCR)

Adding greater depth to our reflection on slums, we note that, by their very nature, as spaces where the majority of the urban poor in developing countries live, slums are unregulated. Made up of a mass of informal dwellings and shelters clustered together, they crop up without conforming to "local land-use regulations" (Birch, Chattaraj, & Wachter, 2016, p. 144). Further, slums are usually not "listed in government records, official maps or titling registries" (Birch et al., 2016, p. vii). As a result, their residents have no land titles, little or no security of tenure, and they exist in legal limbo (Birch et al., 2016).

Compared to the rural areas, in the urban poor areas, crime and violence tend to be higher (Glaeser & Sacerdote, 1999; Wamuyu & Maharaj, 2011; Wratten, 1995). Bharadwaj (2014) found that this is mainly because of rural-urban migration that, due to population pressure, can result in dropping living standards. Also, though to a lesser extent, violence comes from tensions rising

due to increased cultural diversity among people living together in urban areas (Bharadwaj, 2014). Tolerance for various forms of diversity tends to be fairly low in developing countries and especially among the poor. In rural areas, where communities from around similar religious, tribal, or cultural groups, differences appear to be more manageable, which is not the case among the urban poor, where discord, quarrels, and crime abound.

Research shows that social networks are weaker in the urban poor environments than they are in rural areas. This is ascribed to the lack of permanence in the urban poor areas. The urban poor thus rarely know their neighbors well, compared to the rural poor who often have known each other's families for generations (Amato & Zuo, 1992; House, Umberson, & Landis, 1988). This makes the urban poor vulnerable to crimes, including crimes perpetrated by gangs. In addition, the congestion commonly found in the urban poor environment obstructs law enforcement officers' access to the neighborhood, which in turn allows criminals to impose their own control and systems of justice (Rashid, 2004). To compound the problem, in many developing countries the legal and regulatory environment often is either too weak or not developed well enough to protect the rights of the urban poor.

Levels of cybercrime in most developing countries are still comparatively low, but their growth potential is high. At the same time, law enforcement agencies often lack the capacity or capability to deal with such cybercrime (Barclay, 2014; Kshetri, 2010; World Bank & United Nations, 2017). People in developing countries generally fear cybercrime and is exacerbated among the urban poor (Świątkowska, 2020).

3.1.4. Financial Factors and Affordability (FCC)

Studies show that the urban poor in developing countries often live a hand-to-mouth existence in desperate conditions with limited access to financial services or credit facilities. In China, for example, the "new" urban poor is composed of unemployed or laid-off workers, poor workers and retirees from failing or bankrupt enterprises, and poor rural migrants (Caparas, 2011). Nevertheless, some researchers characterize the urban areas as "rich" (e.g., Braa et al., 2007;

Cohen, 2006). Such a representation can have detrimental effects because the resulting generalizations and assumptions about urban residents could cause researchers, policymakers, and government institutions to ignore the urban poor. Consequently, the programs put in place tend to benefit the rural poor more than they do the urban poor.

Typically, banks do not have branches in areas proximal to the urban poor dwellings, and even if they do, the slum dwellers are not likely to use their services because many are not able to provide the collateral needed for loans. Also, most programs for the poor (e.g., loans) are specifically targeted at the rural poor (UN-Habitat, 2004). Further, the rural poor often have better access to microcredit and loans (Acosta, Kim, Melzer, Mendoza, & Thelen, 2011). For example, Acosta et al. (2011) found that rural poor households in Guatemala had better access to microcredit and loans than the urban poor households did. To obtain microcredit, one has to form a group with others who act as guarantors of the loan (Armendáriz & Morduch, 2010). People in poor urban areas, compared to those in rural areas, find this more difficult due to the temporary nature of their dwellings, resulting in people not knowing each other well enough to support each other. Studies show that people living in slums tend to be suspicious of strangers, including community workers and any service providers (Kerubo, 2015; Rashid, 2004). In rural areas, people more often know each other because families have been long established in particular villages. In contrast, in urban areas, the transient nature of poor urban life entails mobility that frequently brings newcomers to one neighborhood as others move elsewhere. This problem is compounded by the fact that the urban poor often lives in make-shift dwellings that are assembled in various parts of the city. From time to time, governments clean up such settlements, either by evicting the slum dwellers—who then move to different locations—or moving the dwellers to government project dwellings.

The urban poor typically depend on cash income for basic needs such as food, water, housing, and transport, whereas those living in rural areas have the option to fall back on agriculture as a source of income (Ruel, Garrett, Hawkes, & Cohen, 2010). For the urban poor, this is a challenge

because they have limited cash. In addition, they generally pay higher prices than their rural counterparts due to the significantly higher cost of living in urban areas. Thus, the urban poor are particularly vulnerable to price and fuel shocks. For example, compared to what is prevalent in rural areas, urban food prices are more susceptible to international prices, trade practices, and government policies (Ruel et al., 2010; Wurwarg, 2014). The urban poor are also more vulnerable to disease and health problems than the rural poor are because they live in congested, unsanitary conditions and mostly eat more 'street food' or processed, ready-to-eat food when cooking fuel prices rise (Ruel et al., 2010).

3.1.5. Self-efficacy (FCS)

A significant number of the urban poor are newcomers in the cities, usually having migrated from rural areas (UN-Habitat, 2004). For many of them, it means a first exposure to city living, including to things like computers and the Internet, escalators, traffic lights, and public transport (Pheko, Monteiro, Tlhabano, & Mphele, 2014); often this wears down people's confidence. These conditions, combined with the problems outlined earlier, cause the urban poor considerable stress (Amato & Zuo, 1992). In contrast, as noted earlier, people in rural areas have generally been long established and life has, for the most part, remained unchanged over time. For them, everything is familiar and routine. Compared to the urban areas, kinship and social network relationships are thus stronger in rural areas due to better social interaction and social support. This means that the urban poor have less interpersonal resources available (Amato & Zuo, 1992; House et al., 1988). Self-efficacy is an important factor for those with limited computer literacy. High levels of illiteracy are prevalent in many developing countries. World Bank statistics indicate that 53% of the global illiterate population live in South and West Asia, and 24% live in sub-Saharan Africa (World Bank, 2010). Congruently, studies show that income and education account for 63% of the digital divide between urban and rural areas (Agarwal et al., 2005). More importantly, in developing countries, which typically have a strong collectivist culture, self-efficacy is much more likely to be built through the available social support, and especially among the poor such social

support is well established as a driver of novel behaviors (e.g., technology use) (Venkatesh & Sykes, 2013; Venkatesh et al., 2016b; Venkatesh et al., 2017). Social support is distinct from social influence that reflects peer pressure but not necessarily support (see Robert & Sykes, 2016; Sykes, Venkatesh, & Gosain, 2009). We argue social support will manifest in self-efficacy, because it can be built through community support in environments where citizens have limited knowledge and ability.

3.2. Model Development

3.2.1. Instrumental/non-instrumental use of technology and the link to UTAUT

With our focus on the urban poor, as shown in Figure 1, we distinguish between non-instrumental and instrumental uses of technology (Thüring & Mahlke, 2007; Turel, Serenko, & Bontis, 2010). Instrumental use (IU) refers to pragmatic aspects of using technology, whereas non-instrumental use (NIU) refers to a combination of symbolism (meanings and associations a product elicits in the minds of its users) and aesthetics (the sensual experience the product entails) (see Thüring & Mahlke, 2007; Turel et al., 2010). Instrumental needs motivate users to seek informational content, make calls for appointments and meetings, and order products and services, whereas non-instrumental needs (e.g., hedonism) drive users to seek diversionary content or content that serves curiosity, personal advice-seeking, need for adventure, and community (Joo & Sang, 2013). In the information systems (IS) literature, the utilitarian value of IS has been shown to influence individual acceptance because the system helps to achieve certain user goals (Matook & van der Heijden, 2013). In the context of mobile phones, NIU could include, listening to/downloading music on the mobile phone, playing online games, or short message texting/chatting with friends, and IU could include, using banking services or paying for goods and/or services.

Prior research shows that the key motivations for using mobile phones and smartphones are talking, messaging or chatting (i.e., communication), video/photo sharing, and entertainment (Albarran, 2009; Kang, 2014; Park, 2010). That is, people use mobile phones for various non-

instrumental purposes. Among the urban poor, a mobile phone can provide an escape from the harsh realities of their everyday lives. For example, a study of the urban poor in New Delhi showed that they were most interested in obtaining entertainment through technology (e.g., watching a movie) because they believed that their quality of life could be improved by greater access and exposure to new means of communication and information (Pigato, 2001). Recent literature on emergent use intention supports this, showing the intention to use features of an existing technology in new areas not previously envisioned (Srivastava & Chandra, 2018). For example, although virtual worlds were originally created and intended for recreational use, research has shown that individuals' emergent use intention demonstrates their intention to use the capabilities of virtual worlds for future collaboration in organizational workspaces (Srivastava & Chandra, 2018).

Researchers propose that the NIU of technology is important in developing countries because it fosters innovation and creativity with technology, as well as teaching people, especially those with less formal education, not only to collaborate, but also to improve their language skills (Kolko & Putnam, 2009). The ability of the urban poor to use technology for NIU could drive the IU of technology. With familiarity that stems from NIU, the scope of use could expand to use for instrumental purposes. Further, given the availability of mobile technology, with higher levels of NIU, when opportunities for IU present themselves, new users are likely to embrace such opportunities. Thus, we hypothesize:

H1*: NIU of technologies will have a positive effect on IU of technology.*

Studies reveal that the identified FC, particularly the organizational and technical infrastructures that exist to support use of a technology, play a key role in determining individual acceptance and use (Agarwal et al., 2005; Bhattacherjee, Perols, & Sanford, 2008; Hsieh et al., 2008; Venkatesh et al., 2003). We expect the urban poor to depend on FC for mobile phone use, for non-instrumental and instrumental purposes (Triandis, 1980). As noted earlier, we conceptualized the

FCs as drivers on five dimensions, of which the first four make up the external environment, and the last one describes the internal environment.

Infrastructure. Although in many developing countries, infrastructure is better in urban than in rural areas, it usually does not extend to the areas where the urban poor live. These are generally poorer sections made up of low-income dwellings, some so run down that they are identified as slums (World Bank, 2011). However, in developing countries, including Malaysia, access to mobile services does not require significant hardware installation in the home. Besides electricity, which is available in the typical urban poor dwellings, albeit with some interruptions in provision, no other infrastructure is needed. Thus, we contend that providing adequate mobile infrastructure and electricity infrastructure will facilitate favorable use outcomes.

Technical and support services. Unlike rural settings, urban settings offer the advantage of being able to deliver technical support at shops that sell mobile devices and/or mobile services. Although such outlets are limited availability in urban poor areas, they could be located in nearby neighborhoods and their locations advertised in surrounding areas. In developing countries, top-up services for pre-paid mobile services are often available at street-side vendors. Such vending stations become excellent locations to provide technical and support services. Technical support is possible via inexpensive tablets with FAQs and videos that are stored at local stores, therefore, no special data service requirements need to be imposed on the vendors/stores. Additionally, video calls can be facilitated from such central locations where the user need not pay for bandwidth and data use so that their own device limitations (including operating problems) become irrelevant. Similarly, support services can be provided to explain new features and/or services that become available. By supporting greater levels of easily accessible technical and support services, greater levels of use can be facilitated.

Legal and regulatory environment. Considering that mobile technologies are new technologies, they are better regulated than evolving older technologies. Further, increasing cybercrime has propelled the building of strong protective and policing infrastructure in developed countries;

developing countries can learn from them. Nonetheless, threats of identity theft, cybercrimes, and available recourses are important matters on which the urban poor should be suitably informed. Similar to technical and support services, there are uncomplicated educational opportunities, and it is a matter of leveraging them to produce desirable outcomes. Given that many citizens in developing countries do not have bank accounts and/or credit cards, if the appropriate supporting legal and regulatory environment is provided, mobile money can facilitate higher levels of use.

Financial factors and affordability. Developing country markets are richly supplied with locally manufactured phones that are significantly cheaper and sturdier than their branded counterparts. This, paired with low-cost arrangements, including pre-paid plans that tie cost to use, rather than to set contract amounts, could bring much more affordable technology to the urban poor. Further, with growing competition in the crowded and densely populated urban markets of developing countries, inexpensive mobile service plans can realistically be offered. Together, these financial factors can make mobile services affordable and so contribute favorably to use among the urban poor.

Self-efficacy. The concept of self-efficacy has a long history, dating back nearly two decades, having been identified in IS research as a key internal control factor in technology acceptance and use (e.g., Venkatesh, 2000). In developing country contexts, with little to no computer literacy, such a factor is likely to play a key role. With simple mobile phone designs readily available on the local market and apps—especially in the local languages—developed for the local market and supported via shops in urban areas, self-efficacy can be enhanced. Training programs developed to enhance computer literacy will build self-efficacy and encourage the urban poor to engage with technologies. One way to do this would be to encourage service providers to organize local awareness and training events and/or use referral promotional/discount campaigns at community levels. In return, they would accrue an increased number of subscribers (Agarwal et al., 2005). More importantly, as we detailed earlier, social support can function as a key factor underpinning

self-efficacy. Together, these drive to build users' confidence in their own ability, can favorably impact use.

We expect all these factors to impact both non-instrumental and instrumental uses of mobile technology, as UTAUT also posits that FC determine use. Thus, we hypothesize:

H2*: FCs will positively influence (a) the NIU, and (b) the IU of mobile technology.*

The NIU of mobile technology motivates individuals eventually to engage in more instrumental use of the technology (van der Heijden, 2004; Xu, Ryan, Prybutok, & Wen, 2012). For instance, across Africa, where Internet access is primarily via mobile phones, the installation of Internet fiber optic cable brought faster, more reliable Internet access (FCI). In turn, that enabled a growing mobile and video game development and gaming culture (NIU), which resulted in new career trajectories for young people exploring new entrepreneurial opportunities (IU; Callus & Potter, 2017). The NIU of mobile phones is the primary motivation for drawing people to use this technology, yet studies often ignore it. We argue that the NIU of technology can assist in developing the skills that build feelings of comfort and self-efficacy required for IU. Such skills include seeking information, particularly in the areas of employment and business development. IU of mobile phones can improve the socio-economic well-being of individuals in the urban poor segment of the population. We argue that the NIU of mobile technology can provide a mechanism or pathway toward using this technology for instrumental purposes. As such, the direction of the relationship examined here will be from the FCs to IU of mobile technology, with NIU acting as a mediator. Thus, we hypothesize:

H3: *NIU of mobile technology will mediate the relationship between FC and IU.*

4. Method

4.1. Context and Study Design

This is a study on an urban poor population in a developing country. The United Nations defines an urban poor population as one whose members fall below the national or urban poverty line

and are living in an urban area (United Nations, 2015). The Klang Valley in Malaysia comprises an area situated along the Klang river, comprising towns and suburbs in and near the capital city, Kuala Lumpur (Jain, Sandhu, & Sidhu, 2007). Due to its location, it has experienced rapid urbanization and population growth resulting in congestion, urban sprawl, and the emergence and spread of squatter and slum areas (Zainal, Kaur, Ahmad, & Khalili, 2012). Thus, it presents an appropriate context for our study.

Malaysia has been described as a collectivist society, thus as one that emphasizes human interdependence and a collective relationship (Bochner, 1994; Burns & Brady, 1992; Hofstede, 1980, 1984). In such cultures, values of cooperation, helpfulness, obedience, dependence, and strong interpersonal relationships are espoused (Kling, 1995). For this study, we regard Malaysia as representative of other collectivist societies, and typical of many in developing countries, including China and India. In many developing countries, rapid urbanization is often a result of "push factors" that drive people to cities. Such factors include war, natural disasters, and extreme rural poverty caused by limited employment, economic, and educational opportunities (Baqui, 2009; Florida, 2014). Meanwhile, these countries do not have the necessary structures to deal with the challenges accompanying this rapid urban population growth (Baqui, 2009; Florida, 2014)

The sampling frame consisted of a list of 500 randomly chosen heads of low-income households in major townships in the Klang Valley region—that is, among the "urban poor"—who were mobile phone users. In Malaysia, a family is considered poor if their income falls below RM 2,208 per month, which is the poverty line (Department of Statistics Malaysia, 2020). We followed this up with interviews to corroborate our findings.

4.2. Measures

The survey instrument was adapted from prior literature. It was created in English and translated first into Bahasa Malaysia, the local language in which the questionnaire was administered, and then translated back to English by a second individual. Minor discrepancies were discussed and

resolved. We gathered data on household information, demographic information (including age and gender), and individuals' perceptions of mobile phone adoption and use behavior.

The measures used to test the hypotheses were: NIU and IU from prior literature (e.g., van der Heijden, 2004; Hsieh et al., 2008), and PE, EE, and SI from Venkatesh et al. (2003). Table C1 and C2 (in Appendix C) lists the measures used in this study. To ensure the validity of all measures, we use previously validated items (Hossain et al., 2019) that needed minor modification to capture the context of this study, namely mobile phone use.

As discussed earlier, we argue that there are many different facets to measuring FCs. FCs are multi-dimensional by nature and can be measured parsimoniously (Law, Wong, & Mobley, 1998) as a representation that combines five dimensions presented earlier. Our FCs construct qualifies specifically as a Type II reflective first-order, formative second-order construct (Diamantopoulos, Riefler, & Roth, 2008; Jarvis, MacKenzie, & Podsakoff, 2003; Roldán & Sánchez-Franco, 2012). FC was conceptualized as a formative measure because the indicators are not interchangeable and do not necessarily covary (Petter, Straub, & Rai, 2007). The first-order dimensions were theorized to be the causes of FCs and therefore, do not necessarily always move in the same direction (Guillemette, Laroche, & Cadieux, 2014). This suggests a formative conceptualization rather than a reflective one (Polites, Roberts, & Thatcher, 2012). However, formative measurement has not been given adequate consideration in the operationalization of latent constructs where researchers have predominantly defaulted to reflective measurements (Bagozzi, 2007; Bollen & Diamantopoulos, 2017). Ignorance on the part of these researchers is often cited as the major reason for the prevalent lack of using formative indicators in construct operationalization (Hitt, Gimeno, & Hoskisson, 1998; Podsakoff, Shen, & Podsakoff, 2006). Indicators have customarily been assumed as effect indicators without considering their appropriateness as cause indicators (Diamantopoulos et al., 2008). Bollen and Davis (2009) suggested incorporating formative measurement into structural equation models is a challenge faced by researchers. Given the outstanding issues on the conceptualization, estimation, and

validation of formative measures, there was a call for further studies particularly on topics regarding the assessment of indicator validity, as well as the interpretation of formatively measured constructs (Howell, Breivik, & Wilcox, 2007; Wilcox, Howell, & Breivik, 2008; Diamantopoulos et al., 2008). More recent research has provided guidance to specify, estimate, and validate these models (Sarstedt, Hair, Cheah, Becker, & Ringle, 2019). Selected examples using formatively measured constructs are provided in Table B1 (in Appendix B).

For these reasons, an FC which refers to "consumers' perceptions of the resources and support available to perform a behavior" (Venkatesh et al., 2012, p. 159) is conceptualized as a multidimensional construct——that is, a formative second-order construct, measured by the lower-order components suggested by Diamantopoulus et al. (2008) and Jarvis et al. (2003): infrastructure (Venkatesh et al. 2012), technical and support services (Thompson et al., 1991; Venkatesh et al., 2012), legal and regulatory environment (Datta, 2011; Liew et. al., 2014; Lu, Liu, Yu, & Wang, 2008; Vaithilingam, Nair, & Liew, 2012; Venkatesh et al., 2012), financial factors and affordability (Liew et al., 2014; Wu & Wang, 2005), and self-efficacy (Venkatesh et al., 2012).

Both NIU and IU were conceptualized as reflective constructs because they are unidimensional constructs, and the exclusion of one item does not alter the meaning of the construct. In the case of a formative construct, each item jointly determines the meaning of the full construct and excluding one of the items could alter its meaning. One can expect mobile phone users who use their phones for various social purposes also to use their devices for a range of non-instrumental purposes, such as listening to music or taking photos. Similarly, users who use their mobile phones to get the latest news updates would be more likely to use their phones for other instrumental purposes such as obtaining information on current affairs or new services. In other words, individual indicators of the constructs exhibit covariation, arguing for a reflective specification of the constructs. The appropriateness of the reflective specification of NIU and IU is further validated using the confirmatory tetrad test, using CTA-PLS where the null hypothesis that the model implied tetrads were zero, was not rejected (Gudergan, Ringle, Wende, & Will,

2008; Hair, Ringle, & Sarstedt, 2011). Given this theoretical justification and these statistical properties, NIU and IU were operationalized with reflective indicators.

The questionnaire was divided into three parts: Section A captured household information, Section B demographic information, and Section C individuals' perceptions about mobile phone adoption and use behavior on a five-point Likert-type scale ranging from *strongly agree* (5) to *strongly disagree* (1), and frequency of use of a mobile phone from *every day* (5) to *never* (1). Section C also measured respondents' purpose of use and specific features of mobile phones.

4.3. Data Collection Procedure

The questionnaires were filled out by adult respondents (over 18 years), and the average completion time was 60 minutes. The first and second authors personally administered the questionnaires with five research assistants available to assist respondents in completing the survey. Of the 500 questionnaires we distributed, 396 were usable and returned, which represents a 79.2% response rate. Each respondent was offered an incentive of an electric kettle worth RM 28 (approximately USD 7).

5. Results

We used partial least squares (PLS), a structural equation modelling (SEM) technique, to test our measurement and structural models (Akter, Wamba, & Dewan, 2017; Shim, Lee, & Kim, 2018). PLS-SEM is a useful statistical procedure and gained popularity in the study of social sciences (e.g., Queiroz & Wamba, 2019), and its applications witnessed exponential growth in recent years. PLS-SEM is also widely used for exploratory studies and is considered a second generation technique which can account for measurement error (Raykov & Marcoulides, 2006) and also for modeling more complex structures (Hair, Sarstedt, & Ringle, 2019b) and non-normal data distribution (Hair, Hult, Ringle, & Sarstedt, 2017). Specifically, we used Smart PLS 3.0 software (Ringle, Wende, & Becker, 2015) to analyze the data. PLS is an appropriate technique for this analysis because, as a component-based method, it can handle formative measures as well as

analyze complex models in terms of the number of relationships and the levels of dimensionality (Hair et al., 2017; Ringle et al., 2015). This study adopts a two-stage approach, as suggested by Anderson and Gerbing (1988). First, the measurement model was assessed for reliability and validity. However, because reflective and formative measures were used in this study, the measurement model should be based on the respective measurement model assessment procedures (Hair et. al., 2017). Second, the structural model was used to test our hypotheses.

The specification of the second-order construct draws on the repeated indicators approach (Sarstedt et al., 2019). That is, we used the indicators of the lower-order components (FCI, FCT, FCR, FCC, and FCS) to identify the measurement model of the higher-order component (FCs). In line with Sarstedt et al. (2019), we used Mode B in estimating the higher-order component.

5.1. Measurement Model

Table 2 shows the results of the measurement model testing using PLS. Regarding the reflective measurement models, we found that all measures exhibited acceptable levels of internal consistency reliability, convergent validity and discriminant validity. The internal consistency reliability is assessed using Cronbach's alpha and composite reliability. As shown in Table 2, the Cronbach's alpha and composite reliability values were all above the suggested threshold value of 0.70 (with only one exception), providing evidence of internal consistency (Hair et al., 2017; Hair, Risher, Sarstedt, & Ringle, 2019a). The descriptive statistics are shown in Table 3A.

Convergent validity for each of the constructs, including the lower-order components (i.e., FCI, FCT, FCR, FCC, and FCS) was assessed based on the outer loadings of the indicators and average variance extracted (AVE). An AVE value of 0.50 or higher indicates that the construct explains at least 50 percent of the variance of the related indicators (Hair et al., 2017). Convergent validity was supported, as all AVEs exceeded 0.50 (see Table 2) (Hair, Black, Babin, Anderson, & Tatham, 2010).

To assess discriminant validity,[3] we used the Fornell and Larcker criterion and the heterotrait-monotrait criterion (HTMT) (Henseler, Ringle, & Sarstedt, 2015). For evidence of discriminant validity of measures, the AVEs of each construct must be greater than the squared correlations of the constructs (Fornell & Larcker, 1981). The results for the reflective constructs demonstrated high reliability. The AVEs were greater than the correlations and hence demonstrated discriminant validity, as shown in Table 3B (Roldán & Sanchez-Franco, 2012). The results given in Table 3C support the measures' discriminant validity, as all HTMT values obtained for each pair of constructs were below the conservative threshold of 0.85 (Henseler et al., 2015).

[3] The loadings and cross-loadings are shown in Table C3 (Appendix C).

Table 2: Summary of the Measurement Model

Construct / Dimension / Indicator	VIF	Weight	Loading	Cronbach Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
NIU (reflective)				0.651	0.795	0.513
UB01			0.347[4]			
UB02	N.A.	N.A.	0.706			
UB03			0.835			
UB04			0.856			
IU (reflective)				0.848	0.898	0.687
UB05			0.845			
UB06	N.A.	N.A.	0.851			
UB07			0.808			
UB08			0.811			
EE (reflective)				0.734	0.833	0.556
EE01			0.802			
EE02	N.A.	N.A.	0.705			
EE03			0.725			
EE04			0.746			
SI (reflective)				0.732	0.825	0.546
SS01			0.621			
SS02	N.A.	N.A.	0.644			
SS03			0.862			
SS04			0.799			
PE (reflective)				0.810	0.876	0.639
PE01			0.783			
PE02	N.A.	N.A.	0.837			
PE03			0.735			
PE04			0.839			
FC (reflective-formative second-order construct)			N.A.	N.A.	N.A.	N.A.
FCI (single item)	1.531	0.158***	N.A.	N.A.	N.A.	N.A.
FC01						
FCT (reflective)	1.614	0.354***		0.742	0.853	0.660
FC02			0.800			
FC03			0.858			
FC04			0.779			
FCR (reflective)	1.507	0.415***		0.836	0.901	0.753
FC05			0.865			
FC06			0.862			
FC07			0.876			
FCC (reflective)	1.510	0.281***		0.812	0.914	0.842
FC08			0.911			
FC09			0.924			
FCS (single Item)	1.217	0.119***	N.A.	N.A.	N.A.	N.A.
FC10						

Notes:
*** = p < 0.01; ** = p < 0.05; * = p < 0.1; N.A.: not applicable. NIU = Non-instrumental use, IU = Instrumental use, EE = Effort expectancy, SI = social influence, PE = Performance expectancy, FC = Facilitating conditions.

[4] Indicator was not deleted due to its impact on content validity (Hair et al., 2017).

Results from running the bootstrapping procedure with 5,000 subsamples and using the no sign change option (Hair, Sarstedt, Ringle, & Gudergan, 2018) showed that neither of the confidence intervals includes the value of 1.0, which provides further support for discriminant validity (Franke & Sarstedt, 2019). Hair et al. (2017) suggested a guideline for bootstrapping best practices in a PLS-SEM context where the number of bootstrap replications should be at least equal to the number of valid sample observations and as a rule, 5,000 bootstrap samples are recommended (see also Preacher and Hayes, 2008). The optimal choice in assessing PLS-SEM parameters is the bias corrected percentile bootstrap confidence intervals which is not under the assumption of standard normal bootstrap confidence interval. As such, the number of bootstrap samples should be high (Hair et al., 2017) and Streukens and Leroi-Werelds (2016) advised using at least 10,000 bootstrap samples. In our study, we adopted Hair et al.'s (2017) guideline of 5,000 bootstrap samples.

Table 3A. Descriptive Statistics

	Mean	S.D.
Performance expectancy	4.45	0.66
Effort expectancy	4.32	0.71
Facilitating conditions	3.97	0.73
Social influence	3.63	1.24
Non-instrumental use	2.42	1.13
Instrumental use	1.61	1.26
Overall Facilitating conditions	3.97	0.73
Infrastructure	4.08	1.02
Technical and support services	3.99	1.08
Legal and regulatory environment	3.86	1.14
Financial factors	4.09	0.98
Self-efficacy	3.92	1.08

Table 3B. Discriminant Validity using Inter-Item Construct Correlation Matrix—Fornell-Larcker Criterion

	Fornell-Larcker Criterion									
	EE	**IU**	**NIU**	**PE**	**SI**	**FCC**	**FCI**	**FC**	**FCS**	**FCT**
EE	**0.746**									
IU	0.098	**0.829**								
NIU	0.181	0.532	**0.716**							
PE	0.587	0.206	0.204	**0.799**						
SI	0.314	0.191	0.146	0.257	**0.739**					
FCC	0.361	0.135	0.192	0.474	0.252	**0.917**				
FCI	0.438	0.139	0.147	0.404	0.354	0.437	Single-Item			
FCR	0.355	0.216	0.241	0.408	0.337	0.473	0.414	**0.868**		
FCS	0.306	0.153	0.166	0.215	0.242	0.312	0.374	0.267	Single-Item	
FCT	0.370	0.182	0.182	0.427	0.438	0.467	0.492	0.492	0.311	**0.813**

Notes:

- Diagonals (in bold) represent the square root of the AVE of each construct while the off-diagonal elements are correlations between constructs.
- NIU = Non-instrumental use, IU = Instrumental use, EE = Effort expectancy, SI = social influence, PE = Performance expectancy.
- FCC = Financial factors and affordability, FCI = Infrastructure, FCR = Legal and regulatory framework, FCS = Self-efficacy, FCT = Technical and support services.

Table 3C. Discriminant Validity—Heterotrait-Monotrait Ratio (HTMT)

	Discriminant Validity—Heterotrait-Monotrait Ratio (HTMT)				
	EE	**IU**	**NIU**	**PE**	**SI**
EE					
IU	0.132 $CI_{0.95}$ [0.066; 0.184]				
NIU	0.284 $CI_{0.95}$ [0.180; 0.393]	0.680 $CI_{0.95}$ [0.584; 0.772]			
PE	0.749 $CI_{0.95}$ [0.610; 0.855]	0.248 $CI_{0.95}$ [0.149; 0.349]	0.317 $CI_{0.95}$ [0.183; 0.450]		
SI	0.482 $CI_{0.95}$ [0.358; 0.597]	0.220 $CI_{0.95}$ [0.125; 0.323]	0.206 $CI_{0.95}$ [0.098; 0.318]	0.360 $CI_{0.95}$ [0.229; 0.485]	
FCC	0.462 $CI_{0.95}$ [0.319; 0.603]	0.160 $CI_{0.95}$ [0.072; 0.263]	0.290 $CI_{0.95}$ [0.162; 0.415]	0.583 $CI_{0.95}$ [0.466; 0.686]	0.345 $CI_{0.95}$ [0.214; 0.470]
FCI	0.51 $CI_{0.95}$ [0.400; 0.617]	0.150 $CI_{0.95}$ [0.058; 0.233]	0.209 $CI_{0.95}$ [0.099; 0.324]	0.449 $CI_{0.95}$ [0.310; 0.562]	0.425 $CI_{0.95}$ [0.308; 0.539]

FCR	0.447 $CI_{0.95}$ [0.305; 0.581]	0.253 $CI_{0.95}$ [0.155; 0.346]	0.353 $CI_{0.95}$ [0.228; 0.474]	0.496 $CI_{0.95}$ [0.391; 0.605]	0.468 $CI_{0.95}$ [0.327; 0.588]
FCS	0.356 $CI_{0.95}$ [0.229; 0.473]	0.167 $CI_{0.95}$ [0.074; 0.269]	0.209 $CI_{0.95}$ [0.099; 0.335]	0.238 $CI_{0.95}$ [0.111; 0.363]	0.282 $CI_{0.95}$ [0.156; 0.408]
FCT	0.500 $CI_{0.95}$ [0.362; 0.630]	0.229 $CI_{0.95}$ [0.138; 0.325]	0.278 $CI_{0.95}$ [0.151; 0.410]	0.550 $CI_{0.95}$ [0.419; 0.667]	0.582 $CI_{0.95}$ [0.451; 0.704]

Notes:

- $CI_{0.95}$ = 95% Bias Corrected Confidence Interval.
- NIU = Non-instrumental use, IU = Instrumental use, EE = Effort expectancy, SI = social influence, PE = Performance expectancy.
- FCC = Financial factors and affordability, FCI = Infrastructure, FCR = Legal and regulatory framework, FCS = Self-efficacy, FCT = Technical and support services.
- FC = Facilitating conditions is a reflective-formative construct and is not subject to the HTMT criterion.

In line with Sarstedt et al. (2019), our assessment of the formatively specified higher-order construct of FC checks for potential multicollinearity among the lower-order components and the significance and relevance of the measurement weights.[5] To do so, we first evaluated the lower-order components' VIF values. The results in Table 2 show that all VIF values were clearly below the conservative threshold of 3, suggesting that multicollinearity does not substantially impact the model estimates (Hair et al., 2019a). In the second step, we determined the relations between the lower- and the higher-order components (i.e., the weights). The results of the bootstrapping procedure (5000 subsamples, no sign changes option; Hair et al., 2018) show that all lower-order component weights were significant (Table 2). Jointly, these results provide support for the validity of the higher-order construct FC (Sarstedt et al., 2019). Importantly, the weights of all five dimensions of FC were significant, thus supporting the second-order formative specification.

Common method variance (CMV) is a potential bias in cross-sectional survey data from a single source (Malhotra, Kim, & Patil, 2006; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Sharma, Yetton, & Crawford, 2009). CMV refers to "variance that is attributable to the measurement method rather than to the constructs the measures are assumed to represent" (Podsakoff et al.,

[5] Note that the criteria used to assess validity of the reflective constructs are not appropriate to validate the formative construct, *facilitating conditions* (Diamantopoulos & Winklhofer, 2001).

2003, p. 879), which has become an increasing concern for researchers. In this context, a recent study by Sarstedt et al. (2019) suggests that a robustness test in PLS-SEM is important and they provide CMV as one of the robustness checks, in addition to validity and reliability tests. To identify CMV, Kock and Lynn (2012) proposed the full collinearity test that considers both the vertical and lateral collinearity (Kock & Gaskins, 2014). While vertical or 'classic' collinearity is usually assessed in multivariate analyses for predictor-predictor relationships, the lateral collinearity, which assesses the predictor-criterion relationship is not explicitly tested in multivariate analyses (Kock & Lynn, 2012). We use one of the approaches of Kock and Lynn (2012) termed the "full" collinearity test in which all latent variables in the model are included as predictors, and all are directed to one single criterion, a dummy variable generated at random (see Kock & Lynn, 2012 for details). The results for the full collinearity test (see Table 3D) show that all the VIFs are less than 3.3, which indicates low levels of collinearity; hence the VIFs are free of common method variance.

Table 3D. Full Collinearity Estimates

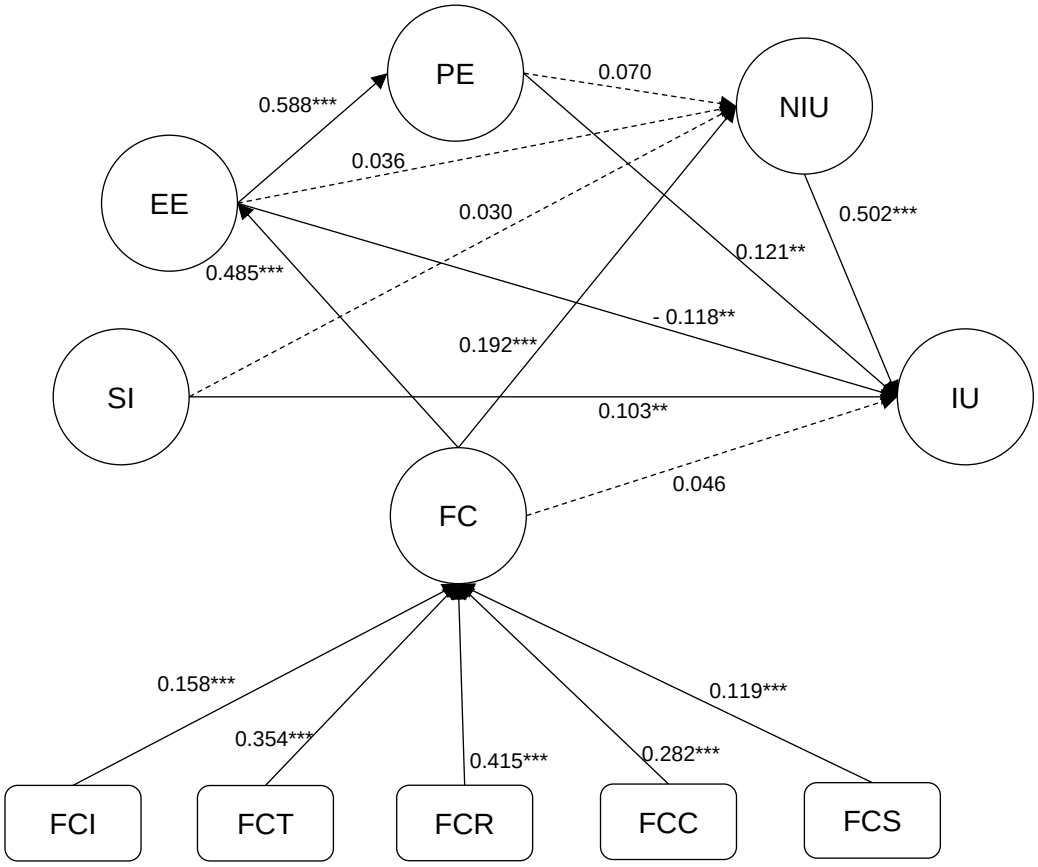
	EE	FC	IU	NIU	PE	SI
Variance Inflation Factor (VIF)	1.640	1.277	1.423	1.371	1.759	1.234

Note:
- VIF values are shown for original latent variables.
- The "dummy" latent variable criterion was used and the VIFs for all the latent variables are shown.

5.2. Structural model

Figure 3 shows the results of our structural model testing. Interestingly, the three other key predictors from UTAUT—PE, EE, and SI—had a direct effect on IU, but had no effect on NIU. The results showed that NIU had a positive effect on IU (β = 0.502, p < .01), thus supporting H1. The results also showed that FC had a positive effect on NIU (β = 0.192, p < .01), thus supporting H2a. The relationship between FC and IU was not significant (β = 0.046), thus H2b was not supported. Based on the pattern of relationships, however, the effect of FC on IU was via NIU,

thus supporting H3 (see Tables 4A and 4B that show the results of the direct and indirect effects, respectively).



Note: Standardized regression weight (critical ratio) significance level based on *p*-value where *** = p < 0.01; ** = p < 0.05; * = p < 0.1**;** The path is fixed at 1.0 for identification. The dotted arrows represent the insignificant path coefficient. R^2 = 0.31.

Figure 3. Full Model on Mobile Phone Adoption and Use

Table 4A. Direct Effects

Hypothesis	Effects on endogenous constructs	Path coefficient	95% Bias Corrected CI	Effect Size, f^2	Results
H1	NIU → IU	0.502***	[0.422; 0.575]	0.338	Supported
H2a	FC → NIU	0.192***	[0.062; 0.316]	0.023	Supported
H2b	FC → IU	0.046	[-0.044; 0.138]	0.002	Not Supported
Notes: *** = p < 0.01; ** = p < 0.05; * = p < 0.1					

Table 4B. Indirect Effects

Hypothesis	Effects on endogenous constructs	Path coefficient	95% Bias Corrected CI	Results

H2a	FC → NIU	0.038	[-0.019; 0.095]	Not Supported
H3	FC → NIU → IU	0.093**	[0.020; 0.169]	Supported

Notes:
(1) *** = p < 0.01; ** = p < 0.05; * = p < 0.1
(2) FC → IU is an indirect relationship

5.3. Qualitative Study: Corroboration and Confirmation

In this section, we report the results of our interviews to corroborate and confirm the results of the quantitative study. This provides an additional perspective to our understanding and gives deeper insight into mobile technology use (Hoehle, Aljafari, & Venkatesh, 2016; Venkatesh, Brown, & Bala, 2013; Venkatesh et al., 2016c). For this phase of the study, 25 respondents were randomly selected from 4 urban poor localities and these interviewees comprised a different set of respondents from the respondents in the quantitative survey. Such a parallel sample with similar characteristics is suitable for our purpose. The specific interview questions we used, are provided in Appendix D2. We ensured that the necessary validity, as suggested by Venkatesh et al. (2016a) was observed. We found that theoretical saturation was reached by the sixth interview. Nevertheless, we completed the full set of interviews as planned, compiled the responses, and analyzed the qualitative data based on the core focus of this study, the effect of FC on NIU and IU.

Below, we present a description of the inferences from the interviews in relation to the findings of the quantitative study.

Of the 25 respondents we interviewed, 70% were positive regarding the use of mobile phones for IU if they had already used their phones for NIU, provided the enabling conditions that the FC entail, are present. Commenting on this issue, a respondent remarked:

> *"My phone is part of me and I always use it. I have been using it for chatting and SMS but now I am slowly using it for other things, like lately I downloaded the Grab app and used it. I feel that if I can use it for entertainment like chatting and SMS, I should be able to use*

the phone for many other functions too. I am slowly learning to use for other things. But I will not use for banking and paying bills as the connectivity is very slow and many times the call drops. Very frustrating so will not use unless the connectivity is good. Also the cost of the mobile data package is high. I am also scared to use for such services, as every day I hear of scamming and not sure if got laws to regulate it. The place where I stay, difficult to get help. If there is a problem, it takes days to get it sorted out."

However, commenting on the role of NIU in complementing user perceptions of FC on IU, another respondent remarked:

"The notion of using mobile phones for entertainment helps me gain confidence and comfort in using it for more advance use, provided I have the right enabling environment to support my use. The environment should include the network coverage; the cost of the mobile data package must be cheaper so that it can be used for longer period and for more useful things that can help me for my everyday life. One thing I am scared of is too many scams, and I do not know what to do if it happens to me – that is why I am very careful with using my mobile phone. Authorities must solve this problem of cheating and scamming so that we are more confident to use our mobile phone.

I started using my phone for talking, SMS, and listening to music; but I keep getting "pop-ups" now and then on various services and buying online. In the first instance, I was scared to use them because of all the cheating using the platform. But over time, I became more confident, especially when my son showed me how to use my phone to buy things online and pay on delivery. Now I am more confident to download new apps … still I always consult my children first before I use them."

Our analysis of the interview responses supports the quantitative finding that the NIU acts as a mechanism that will foster mobile phone use for more pragmatic (instrumental) purposes, provided the facilitating environment exists. Thus, the qualitative responses confirm our findings on the mediating role of NIU on the relationship between FC and IU.

About 30% of the interviewees were not interested in using mobile phones for IU because either they could see no need for IU or they feared using it due to their level of education.

One such respondent remarked:

> *"I do not need to use my phone for information as I don't need it. I am happy using it for chatting only … I know that my friends and relatives send wedding invitations, death anniversary invitation via SMS and WhatsApp, but I will not do it. I rather call or go personally."*

Another respondent noted:

> *"Fear of using and I am more satisfied when I go directly. Yes, that's more time consuming and can be troublesome, but still prefer this way. I am not educated. So many things on the mobile phone need to read and very difficult to understand, so I just use it for what I can for now – which is only for chatting and SMS."*

Many others commented about "fear that our transaction will not go through within the time limit", others mentioned "call drop" and *"*fear that we will be victim of fraud and there is no avenue to complain*".*

Some respondents expressed dissatisfaction in paying the same amount for mobile phone services regardless of how much they use, or do not use: "basic infrastructure not good. I live on the third floor, weak network coverage. But fifth floor is OK"; "patchy mobile coverage"; "slow Internet connectivity and not stable"; "too many procedures to follow for credit facility, but if I got good technical support, I may consider using it".

Others remarked on the cost of using the mobile phone: "very expensive"; "I use top-up, but before you know it GB[6] finish"; "due to intermittent service, sometimes a 3-day prepaid will finish within a day"; "too many notifications and alerts and many times I get calls from recorded messages and

[6] GB: Gigabyte (colloquial term for mobile data)

unidentified callers, so maybe I am not sure if our laws are not strict"; "very annoyed because we need to have landline for the fixed line broadband contract to get WiFi; prepaid very expensive and not good coverage. If the infrastructure can improve, I will certainly use for other purposes which will be beneficial to me"; "basic infrastructure not good."

The observations from the interviews provide a deeper understanding of the findings of the quantitative study, hence they corroborate the validity of the inferences (Srivastava & Chandra, 2018; Venkatesh et al., 2016a). A common theme among the respondents is that mobile communication devices remain primarily a tool for entertainment. Even so, most respondents recognized the growing role of mobile communication devices for IU. This echoes Srivastava and Chandra's (2018) findings that under the right conditions, NIU could facilitate IU as an emergent use. The results also show that 80% of the respondents find regulation to be a most important factor that affects their use. This aligns with our quantitative study results. The richness added by the interviews gives us confidence about our findings on how the effects of FC on IU are mediated by NIU.

6. Discussion and Implications

We set out to extend UTAUT to incorporate context-specific factors that constitute the FC for mobile device use among the urban poor in developing countries. We also sought to empirically test the model using data collected from a sample of urban poor in a developing country. We theorized about two different kinds of technology use, namely NIU and IU. Our findings are that all key UTAUT predictors (namely, PE, EE, and SI) played an important role in determining IU (see Table C4), and that the effects ultimately operated through NIU. We conceptualized FC as five dimensions termed infrastructure, financial factors, technical and support services, a sound legal and regulatory environment, and self-efficacy. The results show that all five dimensions of FC were crucial for mobile technology adoption and use in the urban poor context of developing countries. Improvement in access to and quality of all the FC could influence the engagement

with technology among the urban poor in developing countries. However, that legal and regulatory environment in which mobile phones are used and the presence of and access to technical and support services, were identified as the most important enabling factors in this context. In addition, the NIU of mobile phones contributed to IU. The more the urban poor engage with mobile phone technology for hedonic use (e.g., listening to music or chatting with friends), the more they are likely to use their mobile phones for utilitarian purposes such as looking for a job. In addition, we theorized that, because of the day-to-day struggles of urban living, studying adoption of technology among the urban poor could yield insight into an understudied context. We found that the different dimensions of FC predicted the NIU of mobile technology, and that such NIU had a positive effect on the IU of mobile technology.

Prior research on developing countries has shown that interventions are necessary to improve the quality of life for the poor, without which it would be difficult for even the most basic existence (United Nations, 2015). Extant IS research has shown that the adoption and use of ICTs (e.g., the Internet and mobile phones) as a means of intervention can go a long way in providing social, economic and education opportunities for these populations (e.g., Hsieh, et al., 2008). Furthermore, per UTAUT, there are context-specific factors (or facilitating conditions) that act as enablers for ICT use and adoption (Venkatesh et al., 2003). For example, some research shows that improving IT infrastructure and service quality (FCI) and changing regulations related to technology (FCR) facilitates use (e.g., Ahmad, Markkula, & Oivo, 2013; Liew et al., 2014). Other studies show the critical success factors for adoption as self-efficacy (FCS) and technical support (FCT; e.g., Al-Gahtani, 2004; Inmor, 2016; see Appendix A for an expanded list). Our study is consistent with these studies. Where our research departs from previous research on technology adoption in a societal context/developing countries is in articulating a collection of FCs and showing how they operate in an urban poor context. We were also able to tease apart use in this setting into NIU and IU and show the direct effect of FC on NIU and the mediating effect of NIU on the relationship between FC and IU.

6.1. Theoretical Implications

Our key contribution is the contextualization of UTAUT to the context of the urban poor in developing countries. Prior literature on UTAUT has conceptualized FC in a generic way, and UTAUT is typically treated as being universal in its application across technologies and contexts. We found that contextualization produced some interesting nuances. That the three other determinants in UTAUT (PE, EE, and SI) directly influenced IU, but not NIU, is telling. The accumulated wisdom of the importance of PE, EE, and SI being strong predictors of use in general is clearly not applicable in the context of the urban poor's technology adoption. Such a breakdown of the theory and the creation of this contextual boundary condition is an important theoretical contribution (see Alvesson & Karreman, 2007; Johns, 2006). Further, FC only influenced NIU directly and it had no direct effect on IU. In other words, the effect of FC on IU was through NIU. The five specific dimensions of FC that we developed and tested for this context provided a holistic measure of FC and are an important theoretical contribution that could serve as a starting point, as an idea for how future research can contextualize UTAUT in other contexts. Taken together, these findings suggest that contextualizing UTAUT is a possible way to add to this rich and mature body of work. Given that there are several other important contexts, rather than directly applying UTAUT, researchers will be well-advised to consider the interplay between the context and specific constructs in the theory.

Our results show that NIU had a strong effect on the IU. The urban poor, because of difficult living conditions, want to escape from the harsh realities of poverty and use mobile phones for various hedonic activities such as listening to music and chatting with friends. From a theoretical perspective, such use could be a critical contextual mediator without which more productive, life-changing IU cannot be achieved. Thus, our refinement of UTAUT for this context is an important theoretical contribution (see Brown et al., 2006; Hong et al., 2014; Johns, 2006) that also relates

broadly to the IS success model (see Rai, Lang, & Welker, 2002), as we have identified a pathway for positive outcomes from technology use.

Additional contributions and implications emerge from the investigation of context-specific FC. Limited research has studied these in context and/or delved into the various dimensions of FC (see Taylor & Todd, 1995). By providing such an exemplar and evidence of the effects, we believe there is now motivation for future research to investigate FC in different contexts. The contexts can vary, ranging from organizational contexts where there is a vast body of research (e.g., Robert & Sykes, 2016) to societal contexts where there is little to no research in terms of expounding on FC. In societal contexts, as we have demonstrated here, the role of FC and its potential impacts will be far-reaching. Future researchers can build on this work and on similar work in less developed countries (e.g., Venkatesh et al., 2016a; Venkatesh et al., 2017) to identify the specific FC that could foster use that in turn would lead to positive outcomes.

FC represent an important type of intervention that can have a positive impact on use and subsequent outcomes. Future research should investigate how various FC can work in tandem to create an impact. For instance, some FC could have amplification effects, some could have substitution effects, and others could have a negative interplay. Disentangling such FC and their interactions will be a significant theoretical contribution not only to the particular domain of investigation (e.g., ICT4D among the urban poor), but also to the broader topic of technology adoption. Together, such works have the potential to make a substantial scientific and practical impact (see Venkatesh & Bala, 2008).

6.2. Practical Implications

Many people living in developing countries face difficult situations brought about by poverty, including low income, poor housing conditions, and poor access to healthcare facilities. Our research highlights differences between the urban poor and other populations in developing countries. A major challenge faced by many developing countries is the mushrooming of “urban-ghettos”, where a segment of the population in urban localities are living in very poor conditions

due to the lack of necessary means to “pipe-into” an economy that is increasingly becoming information- and knowledge-driven. Hence, the primary development objective of policy-makers in these countries is to close the socioeconomic divide among the “haves” and “have-nots” in many of the urban localities by providing an adequate digital ecosystem to help them access the necessary information and resources to improve their quality of life (both instrumental and non-instrumental outcomes). In this context, mobile-phones play a critical role in closing the digital- and wealth-gap among the urban poor and other more affluent communities.

To ensure mobile phones become a key development tool to enhance the quality of life of urban communities in developing countries, policy-makers and key stakeholders must ensure a holistic approach in curating co-development policies initiatives pertaining to PE, EE, SI, and FC in increasing NIU and IU among this disadvantaged community. Based on our results, we present five key practical policies to increase both NIU and IU, so as to ensure that urban-poor communities are able to move up the socio-economic value chain using mobile phones.

First, one of the major challenges faced by many of the urban communities is the lack of affordable access to mobile phone services. This is due to the fact that mobile phone infrastructure does not provide stable and adequate bandwidth mobile phone coverage. As such, mobile phone calls drop or there are constant delays in downloading information. This tends to frustrate many of the users of these services in these localities. To overcome this challenge and to ensure this segment of the population gains access to affordable and high-speed bandwidth, priority should be given to improve the mobile phone infrastructure in the urban poor localities, as a key part of providing high quality and affordable public utilities such as clean water and electricity. Access to mobile networks should be part of the universal access to public services (such as water and electricity), as mandated in all low-cost housing projects in urban areas.

Second, affordable and stable coverage of mobile phone networks must be dovetailed with stronger technical and other support services in these localities. One of the common challenges faced by communities is high vandalism of technology infrastructure. This causes major disruption

of mobile phone services. To ensure the infrastructure is operating efficiently, better monitoring, surveillance and maintenance of public infrastructure is needed in urban poor localities. These support services will also ensure that adequate assistance is available to this segment of the population to troubleshoot any challenges they face in using this technology for both NIU and IU. Third, many of the urban poor population have very low levels of education and ICT literacy, hence suffer from technophobia. They tend to give up easily when they find it challenging to access the mobile phone network or have difficulty navigating the information highway using their mobile phones. To allay their fears, help-desks should be set up in urban poor localities to help their affinity use of mobile-phone for IU. The role of social support of various and especially informal support is well-established in the IS literature (see Sykes, 2015, 2020; Sykes & Venkatesh, 2017). Fourth, many of the urban poor communities are not aware of their legal rights pertaining to data privacy and are concerned about being victims of cyber-crimes. Hence, their use of mobile phones are primarily for NIU, mostly for chatting using tools such as WhatsApp. Many are reluctant to use their mobile phones for financial transactions or other IU. The problem is further exacerbated due to the fact that much of digital content is in English and many of them lack proficiency in the English language. To encourage greater use of the mobile phones, governments in partnership with community organizations should intensify awareness campaigns and the development of digital content in the local vernacular for the urban poor. The awareness campaigns, coupled with more digital content in the local languages will go a long way to increase self-efficacy and consequently, EE and PE. These will in turn increase NIU and IU among this segment of the population.

Fifth, SI was found to play a key role in IU. This result is not surprising, given the poor tend to rely on family, friends and other people in their social circles to assist them for use of mobile phones (IU). Hence, to encourage greater IU among the urban poor, greater effort is needed to nurture community champions and support the formation of social and support groups who will be able to provide greater awareness and support for them to use this medium for IU.

These recommendations for policy-makers in partnership with community organizations and industry can help the mobile phone ecosystem to support users in these marginalized communities to increase their IU for greater socio-economic development. A study by Delponte Grigolini, Moroni, Vignetti, Claps, and Giguashvilli (2015) showed that a sound mobile phone ecosystem will enable marginalized communities to obtain several tangible benefits that include access to digital platforms related to business development, banking, learning, health and other socio-economic support programs. In essence, the above discussion highlights that careful thought is given to co-development policies that will reinforce one another to increase greater NIU and IU among this segment of the population.

6.3. Limitations and Future Research Directions

We responded to calls for linking use of technology to outcomes in an ICT4D context and identify new context effects. Also, we refined the conceptualization and measurement of contextual factors, specifically FC, with respect to technology adoption. The study was, however, confined to only one region within Malaysia (the Klang Valley). Extending the survey to other parts of the country and to other developing countries could provide a more comprehensive analysis of the impact of technology adoption in developing countries.

We used cross-sectional data where mobile phone use was measured at a single point in time among users with prior experience of mobile technology. User perceptions over time could change as they gain more experience with use, and also in the early stages of adoption. In terms of future work, we suggest a longitudinal analysis to understand the long-term patterns of mobile phone use among the urban poor (Venkatesh, Maruping, & Brown, 2006; Venkatesh, Sykes, Aljafari, & Poole, 2021). Governments and their development partners often allocate budgets and resources to intervention projects targeted at different segments of the population. Our work has highlighted the need for specific interventions directed at the urban poor. A longitudinal study would also provide further insight into the effectiveness of such intervention strategies. A study

that shows the efficacy of targeted strategies will help governments and development agencies specifically to allocate resources where they will be most beneficial.

7. Conclusions

We contribute to research on adoption and use literature by extending UTAUT to the context of the urban poor. By incorporating context effects that arise from the conditions faced by the urban poor in specific developing countries by considering infrastructure, technical and support services, legal and regulatory frameworks, financial factors, and self-efficacy, we extend knowledge on the nature of FC that shape the use of technology through a causal mechanism that operates from NIU to IU. For example, we found that when financial services are provided through mobile phones, it allows the urban poor to have access to previously unavailable banking services; or access to government services becomes easier when the mobile network is reliable and technical support for mobile phones is available. Overall, with the various FC serving as levers, NIU is critical to fostering long-term socio-economic development of the urban poor.

References

Acosta, P., Kim, N., Melzer, I., Mendoza, R. U., & Thelen, N. (2011). Business and human development in the base of the pyramid: Exploring challenges and opportunities with market heat maps. *Journal of World Business*, *46*(1), 50–60. http://dx.doi.org/10.1016/j.jwb.2010.05.017.

Agarwal, R., Animesh, A., & Prasad, K. (2005). Social interactions and the “digital divide”: Explaining variations in Internet use. *Information Systems Research*, *20*(2), 277–294. http://dx.doi.org/10.2139/ssrn.796090.

Ahmad, M. O., Markkula, J., & Oivo, M. (2013). Factors affecting e-government adoption in Pakistan: A citizen's perspective. *Transforming Government: People, Process and Policy*, *7*(2), 225–239. https://doi.org/10.1108/17506161311325378.

Aklin, M., Bayer, P., Harish, S. P., & Urpelainen, J. (2015). Quantifying slum electrification in India and explaining local variation. *Energy*, *80*, 203–212. http://dx.doi.org/10.1016/j.energy.2014.11.063.

Akter, S., Wamba, S. F., & Dewan, S. (2017). Why PLS-SEM is suitable for complex modelling? An empirical illustration in big data analytics quality. *Production Planning & Control*, *28*(11–12), 1011–1021. https://doi.org/10.1080/09537287.2016.1267411.

Albarran, A. B. (2009). Young Latinos use of mobile phones: A cross-cultural study. *Revista de Communicacion*, *8*, 95–108. Retrieved from https://revistadecomunicacion.com/.

Al-Gahtani, S. S. (2004). Computer technology acceptance success factors in Saudi Arabia: An exploratory study. *Journal of Global Information Technology Management*, *7*(1), 5–29. http://dx.doi.org/10.1080/1097198X.2004.10856364.

Alvesson, M., & Kärreman, D. (2007). Constructing mystery: Empirical matters in theory development. *Academy of Management Review, 32*(4), 1265–1281. http://dx.doi.org/10.5465/amr.2007.26586822.

Amato, P. R., & Zuo, J. (1992). Rural poverty, urban poverty, and psychological well-being. *Sociological Quarterly, 33*(2), 229–240. http://dx.doi.org/10.1111/j.1533-8525.1992.tb00373.x.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*(3), 411–423. http://dx.doi.org/10.1037/0033-2909.103.3.411.

Armendáriz, B., & Morduch, J. (2010). *The economics of microfinance* (2nd ed.). Cambridge, MA: MIT Press.

Awa, H. O., Ojiabo, O. U., & Orokor, L. E. (2017). Integrated technology-organization-environment (TOE) taxonomies for technology adoption. *Journal of Enterprise Information Management*, *30*(6), 893–921. https://doi.org/10.1108/JEIM-03-2016-0079.

Awumbila, M. (2015). *World migration report 2015: Linkages between urbanization, rural-urban migration and poverty outcomes in Africa*. International Organization for Migration (IOM). Retrieved from https://www.iom.int/sites/default/files/our_work/ICP/MPR/WMR-2015-Background-Paper-MAwumbila.pdf.

Bagozzi, R. P. (2007). On the meaning of formative measurement and how it differs from reflective measurement: Comment on Howell, Breivik, and Wilcox (2007). *Psychological Methods*, *12*(2), 229–237. https://doi.org/10.1037/1082-989X.12.2.229.

Baishya, K., & Samalia, H. V. (2020). Extending unified theory of acceptance and use of technology with perceived monetary value for smartphone adoption at the bottom of the pyramid. *International Journal of Information Management*, *51*, Article 102036. https://doi.org/10.1016/j.ijinfomgt.2019.11.004.

Baker, J. L., & Gadgil, G. U. (2017). *East Asia and Pacific Cities: Expanding opportunities for the urban poor*. World Bank Group. Washington, DC: World Bank Publications. https://doi.org/10.1596/978-1-4648-1093-0.

Banks, N., Roy, M., & Hulme, D. (2011). Neglecting the urban poor in Bangladesh: Research, policy and action in the context of climate change. *Environment and Urbanization*, *23*(2), 487–502. http://dx.doi.org/10.1177/0956247811417794.

Baqui, A. (2009). *Global urbanization: Trends, patterns, determinants, and impacts* [PowerPoint slides]. Johns Hopkins Bloomberg School of Public Health. Retrieved from http://162.129.44.20/courses/UrbanHealth/PDFs/Urban-sec2_Baqui.pdf.

Barclay, C. (2014). Using frugal innovations to support cybercrime legislation in small developing states: Introducing the cyber-legislation development and implementation process model (CyberLeg-DPM). *Information Technology for Development*, *20*(2), 165–195. https://doi.org/10.1080/02681102.2013.841630.

Belassi, W., & Tukel, O. I. (1996). A new framework for determining critical success/failure factors in projects. *International Journal of Project Management*, *14*(3), 141–151. https://doi.org/10.1016/0263-7863(95)00064-X.

Berger, E., & Nakata, C. (2013). Implementing technologies for financial service innovations in base of the pyramid markets. *Journal of Product Innovation Management*, *30*(6), 1199–1211. https://doi.org/10.1111/jpim.12054.

Bernard, T. (2010). Impact analysis of rural electrification projects in sub-Saharan Africa. *World Bank Research Observer*, *27*(1), 33–51. http://dx.doi.org/10.1093/wbro/lkq008.

Bharadwaj, A. (2014). Is poverty the mother of crime? Empirical evidence of the impact of socioeconomic factors on crime in India. *Atlantic Review of Economics*, *1*(1), 1–40. Retrieved from https://www.econstor.eu/.

Bhattacherjee, A., Perols, J., & Sanford, C. (2008). Information technology continuance: A theoretic extension and empirical test. *Journal of Computer Information Systems*, *49*(1), 17–26. http://dx.doi.org/10.1080/08874417.2008.11645302.

Birch, E. L., Chattaraj, S., & Wachter, S. M. (Eds.). (2016). *Slums: How informal real estate markets work*. Philadelphia, PA: University of Pennsylvania Press.

Bochner, S. (1994). Cross-cultural differences in the self-concept: A test of Hofstede's individualism/collectivism distinction. *Journal of Cross-Cultural Psychology*, *25*(2), 273–283. https://doi.org/10.1177/0022022194252007.

Bollen, K. A., & Davis, W. R. (2009). Causal indicator models: Identification, estimation, and testing. *Structural Equation Modeling: A Multidisciplinary Journal, 16*(3), 498–522. http://dx.doi.org/10.1080/10705510903008253.

Bollen, K. A., & Diamantopoulos, A. (2017). In defense of causal-formative Indicators: A minority report. *Psychological Methods*, *22*(3), 581–596. https://doi.org/10.1037/met0000056.

Braa, J., Hanseth, O., Heywood, A. B., Mohammed, W., & Shaw, V. (2007). Developing health information systems in developing countries: The flexible standards strategy. *MIS Quarterly, 31*(2), 381–402. https://doi.org/10.2307/25148796.

Brass, J. N., Carley, S., MacLean, L. M., & Baldwin, E. (2012). Power for development: A review of distributed generation projects in the developing world. *Annual Review of Environment and Resources*, *37*, 107–136. https://doi.org/10.1146/annurev-environ-051112-111930.

Brinkerhoff, D. W., Wetterberg, A., & Wibbels, E. (2018). Distance, services, and citizen perceptions of the state in rural Africa. *Governance*, *31*(1), 103–124. https://doi.org/10.1111/gove.12271.

Brown, S. A., Kelley, H. M., & Schwarz, A. (2006). Reflections on the role of theoretical extensions in the IS discipline. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems, 37*(2-3), 8–14. https://doi.org/10.1145/1161345.1161349.

Burns, D. J., & Brady, J. (1992). A cross-cultural comparison of the need for uniqueness in Malaysia and the United States. *Journal of Social Psychology*, *132*(4), 487–495. https://doi.org/10.1080/00224545.1992.9924728.

Cabraal, R. A., Barnes, D. F., & Agarwal, S. G. (2005). Productive uses of energy for rural development. *Annual Review of Environment and Resources*, *30*, 117–144. https://doi.org/10.1146/annurev.energy.30.050504.144228.

Callus, P., & Potter, C. (2017). Michezo Video: Nairobi's gamers and the developers who are promoting local content. *Critical African Studies*, *9*(3), 302–326. https://doi.org/10.1080/21681392.2017.1371620.

Caparas, V. Q. (2011, June). *Work-family balance and family poverty in Asia: An overview of policy contexts, consequences and challenges*. Paper presented at the UN Expert Group Meeting, New York, NY. Retrieved from https://www.un.org/esa/socdev/family/docs/egm11/Caparas-paper.pdf.

Chhonker, M. S., Verma, D., & Kar, A. K. (2017). Review of technology adoption frameworks in mobile commerce. *Procedia Computer Science, 122*, 888–895. https://doi.org/10.1016/j.procs.2017.11.451.

Chhonker, M. S., Verma, D., Kar, A. K., & Grover, P. (2018). M-commerce technology adoption: Thematic and citation analysis of scholarly research during (2008-2017). *The Bottom Line, 31*(3/4), 208–233. https://doi.org/10.1108/BL-04-2018-0020.

Cohen, B. (2006). Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability. *Technology in Society*, *28*(1), 63–80. https://doi.org/10.1016/j.techsoc.2005.10.005.

Datta, P. (2011). A preliminary study of ecommerce adoption in developing countries. *Information Systems Journal, 21*(1), 3–32. https://doi.org/10.1111/j.1365-2575.2009.00344.x.

Delponte, L., Grigolini, M., Moroni, A., Vignetti, S., Claps, M., & Giguashvili, N. (2015, December). *ICT in the developing world*. European Parliamentary Research Service, European Parliament. Retrieved from https://www.europarl.europa.eu/RegData/etudes/STUD/2015/563482/EPRS_STU%282015%29563482_EN.pdf.

Department of Statistics Malaysia. (2020). *Household income and basic amenities survey report 2019*. Retrieved from https://www.dosm.gov.my/v1/index.php.

Diamantopoulos, A., Riefler, P., & Roth, K. P. (2008). Advancing formative measurement models. *Journal of Business Research*, *61*(12), 1203–1218. https://doi.org/10.1016/j.jbusres.2008.01.009.

Diamantopoulos, A., Winklhofer, H. (2001). Index construction with formative indicators: An alternative to scale development. *Journal of Marketing Research, 38*(2), 269–277. https://doi.org/10.1509/jmkr.38.2.269.18845.

Duflo, E., Galiani, S., & Mobarak, M. (2012). *Improving access to urban services for the poor: Open issues and a framework for a future research agenda*. Abdul Latif Jameel Poverty Action Lab. Retrieved from https://econweb.umd.edu/~galiani/files/usi-review-paper.pdf.

Erez, A., & Isen, A. M. (2002). The influence of positive affect on the components of expectancy motivation. *Journal of Applied Psychology*, *87*(6), 1055–1067. https://doi.org/10.1037/0021-9010.87.6.1055.

Florida, R. (2014). *The amazing endurance of slums*. CityLab. Retrieved from https://www.citylab.com/life/2014/01/amazing-endurance-slums/8120/.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104.

Franke, G., & Sarstedt, M. (2019). Heuristics versus statistics in discriminant validity testing: A comparison of four procedures. *Internet Research*, *29*(3), 430–447. https://doi.org/10.1108/IntR-12-2017-0515.

Gichoya, D. (2005). Factors affecting the successful implementation of ICT projects in government. *Electronic Journal of e-Government*, *3*(4), 175–184. Retrieved from https://academic-publishing.org/index.php/ejeg.

Glaeser, E. L., & Sacerdote, B. (1999). Why is there more crime in cities? *Journal of Political Economy*, *107*(S6), S225–S258. https://doi.org/10.1086/250109.

Gonzales, A. (2016). The contemporary US digital divide: From initial access to technology maintenance. *Information, Communication & Society*, *19*(2), 234–248. https://doi.org/10.1080/1369118X.2015.1050438.

Grover, P., & Kar, A. K. (2020). User engagement for mobile payment service providers – Introducing the social media engagement model. *Journal of Retailing and Consumer Services, 53*, Article 101718. https://doi.org/10.1016/j.jretconser.2018.12.002.

Gudergan, S. P., Ringle, C. M., Wende, S., & Will, A. (2008). Confirmatory tetrad analysis in PLS path modeling. *Journal of Business Research, 61*(12), 1238–1249. https://doi.org/10.1016/j.jbusres.2008.01.012.

Guillemette, M. G., Laroche, M., & Cadieux, J. (2014). Defining decision making process performance: Conceptualization and validation of an index. *Information & Management, 51*(6), 618–616. https://doi.org/10.1016/j.im.2014.05.012.

Habitat for Humanity. (2007). *A right to a decent home: Mapping poverty housing in the Asia-Pacific Region*. Retrieved from https://www.habitat.org/sites/default/files/a-right-to-a-decent_home-2007.pdf.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Thousand Oaks, CA: Sage.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice, 19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202.

Hair, J. F., Risher, J., Sarstedt, M., & Ringle, C. M. (2019a). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203.

Hair, J. F., Sarstedt, M., & Ringle, C. M. (2019b). Rethinking some of the rethinking of partial least squares. *European Journal of Marketing, 53*(4), 566–584, https://doi.org/10.1108/EJM-10-2018-0665.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2018). *Advanced issues in partial least squares structural equation modeling (PLS-SEM)*. Thousand Oaks, CA: Sage.

Heeks, R. (2008). ICT4D 2.0: The next phase of applying ICT for international development. *Computer*, *41*(6), 26–33. https://doi.org/10.1109/MC.2008.192.

Heikkilä, J. P., & Smale, A. (2011). The effects of 'language standardization' on the acceptance and use of e-HRM systems in foreign subsidiaries. *Journal of World Business*, *46*(3), 305–313. https://doi.org/10.1016/j.jwb.2010.07.004.

Helsper, E. J. (2012). A corresponding fields model for the links between social and digital exclusion. *Communication Theory*, *22*(4), 403–426. https://doi.org/10.1111/j.1468-2885.2012.01416.x.

Hemeson, C. J. (2008). *Digital divide: M-Africa*. Social Science Research Network. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1285231.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8.

Hitt, M. A., Gimeno, J., & Hoskisson, R. E. (1998). Current and future research methods in strategic management. *Organizational Research Methods, 1*(1), 6–44. https://doi.org/10.1177/109442819800100103.

Hoehle, H., Aljafari, R., & Venkatesh, V. (2016). Leveraging Microsoft's mobile usability guidelines: Conceptualizing and developing scales for mobile application usability. *International Journal of Human-Computer Studies*, *89*, 35–53. https://doi.org/10.1016/j.ijhcs.2016.02.001.

Hofstede, G. (1980). Motivation, leadership, and organization: Do American theories apply abroad? *Organizational Dynamics*, *9*(1), 42–63. https://doi.org/10.1016/0090-2616(80)90013-3.

Hofstede, G. (1984). The cultural relativity of the quality of life concept. *Academy of Management Review*, *9*(3), 389–398. https://doi.org/10.2307/258280.

Hong, W., Chan, F. K. Y., Thong, J. Y. L., Chasalow, L. C., & Dhillon, G. (2014). A framework and guidelines for context-specific theorizing in information systems research. *Information Systems Research*, *25*(1), 111–136. https://doi.org/10.1287/isre.2013.0501.

Hossain, N. (2005). Productivity and virtue: Elite categories of the poor in Bangladesh. *World Development*, *33*(6), 965–977. https://doi.org/10.1016/j.worlddev.2004.09.018.

Hossain, A., Quaresma, R., & Rahman, H. (2019). Investigating factors influencing the physicians' adoption of electronic health record (EHR) in healthcare system of Bangladesh: An empirical study. *International Journal of Information Management*, *44*, 76–87. https://doi.org/10.1016/j.ijinfomgt.2018.09.016.

House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *Annual Review of Sociology*, *14*(1), 293–318. https://doi.org/10.1146/annurev.so.14.080188.001453.

Howell, R. D., Breivik, E., & Wilcox, J. B. (2007). Reconsidering formative measurement. *Psychological Methods, 12*(2), 205–218. https://doi.org/10.1037/1082-989X.12.2.205.

Hsieh, J. P. A., Rai, A., & Keil, M. (2008). Understanding digital inequality: Comparing continued use behavioral models of the socio-economically advantaged and disadvantaged. *MIS Quarterly*, *32*(1), 97–126. https://doi.org/10.2307/25148830.

Hsieh, J. P. A., Rai, A., & Keil, M. (2011). Addressing digital inequality for the socioeconomically disadvantaged through government initiatives: Forms of capital that affect ICT utilization. *Information Systems Research*, *22*(2), 233–253. https://doi.org/10.1287/isre.1090.0256.

Inmor, S. (2016, April). The adoption of Facebook for educational purposes in Thailand. In I. Vrankic & D. Tomic (Eds.), *Economic and social development: Book of proceedings* (pp. 121–130). Barcelona, Spain: Varazdin Development and Entrepreneurship Agency. Retrieved from https://www.esd-conference.com/?page=past-conferences.

Jacucci, E., Shaw, V., & Braa, J. (2006). Standardization of health information systems in South Africa: The challenge of local sustainability. *Information Technology for Development*, *12*(3), 225–239. https://doi.org/10.1002/itdj.20044.

Jain, K. K., Sandhu, M. S., & Sidhu, G. K. (2007). Knowledge sharing among academic staff: A case study of business schools in Klang Valley, Malaysia. *Journal of the Advancement of Science and Arts, 2*, 23–29. Retrieved from https://www.academia.edu/8601983.

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research*, *30*(2), 199–218. https://doi.org/10.1086/376806.

Jiang, W., Martek, I., Hosseini, M. R., & Chen, C. (2019). Political risk management of foreign direct investment in infrastructure projects. *Engineering, Construction and Architectural Management, 28*(1), 125–153. https://doi.org/10.1108/ecam-05-2019-0270.

Johns, G. (2006). The essential impact of context on organizational behavior. *Academy of Management Review*, *31*(2), 386–408. https://doi.org/10.2307/20159208.

Johns, G. (2017). Reflections on the 2016 decade award: Incorporating context in organizational research. *Academy of Management Review*, *42*(4), 577–595. https://doi.org/10.5465/amr.2017.0044.

Joo, J., & Sang, Y. (2013). Exploring Koreans' smartphone usage: An integrated model of the technology acceptance model and uses and gratifications theory. *Computers in Human Behavior*, *29*(6), 2512–2518. https://doi.org/10.1016/j.chb.2013.06.002.

Kang, S. (2014). Factors influencing intention of mobile application use. *International Journal of Mobile Communications*, *12*(4), 360–379. https://doi.org/10.1504/IJMC.2014.063653.

Karnieli-Miller, O., Strier, R., & Pessach, L. (2009). Power relations in qualitative research. *Qualitative Health Research*, *19*(2), 279–289. https://doi.org/10.1177/1049732308329306.

Keil, M., Meader, G. W., & Kvasny, L. (2003). Bridging the digital divide: The story of the free Internet initiative in LaGrange, Georgia. In R. H. Sparge (Ed.), *Proceedings of the 36th Annual Hawaii International Conference on System Sciences 2003*. Los Alamitos, CA: The Institute of Electrical and Electronics Engineers. https://doi.org/10.1109/HICSS.2003.1174316.

Kerubo, N. D. (2015). *An investigation into the role of socioeconomic factors in slum management programmes: A case of Kibera-Soweto East Nairobi Kenya.* University of Nairobi. Retrieved from http://erepository.uonbi.ac.ke/handle/11295/94025.

Kim, B., & Han, I. (2011). The role of utilitarian and hedonic values and their antecedents in a mobile data service environment. *Expert Systems with Applications*, *38*(3), 2311–2318. https://doi.org/10.1016/j.eswa.2010.08.019.

Kling, Z. (1995). The Malay family: Beliefs and realities. *Journal of Comparative Family Studies*, *26*(1), 43–66. https://doi.org/10.3138/jcfs.26.1.43.

Kock, N., & Gaskins, L. (2014). The mediating role of voice and accountability in the relationship between Internet diffusion and government corruption in Latin America and Sub-Saharan Africa. *Information Technology for Development, 20*(1), 23–43. https://doi.org/10.1080/02681102.2013.832129.

Kock, N., & Lynn, G. (2012). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of the Association for Information Systems*, *13*(7), 546–580. https://doi.org/10.17705/1jais.00302.

Kolko, B. E., & Putnam, C. (2009). Computer games in the developing world: The value of non-instrumental engagement with ICTs, or taking play seriously. *Proceedings of the 3rd International Conference on Information and Communication Technologies and Development (ICTD) 2009* (pp. 46–55). https://doi.org/10.1109/ICTD.2009.5426705.

Kshetri, N. (2010). Diffusion and effects of cybercrime in developing economies. *Third World Quarterly*, *31*(7), 1057–1079. https://doi.org/10.1080/01436597.2010.518752.

Law, K. S., Wong, C., & Mobley, W. H. (1998). Toward a taxonomy of multidimensional constructs. *Academy of Management Review, 23*(4), 741–755. https://doi.org/10.2307/259060.

Liew, E. J. Y., Vaithilingam, S., & Nair, M. (2014). Facebook and socio-economic benefits in the developing world. *Behaviour and Information Technology*, *33*(4), 345–360. https://doi.org/10.1080/0144929X.2013.810775.

Lu, J., Liu, C., Yu, C. S., & Wang, K. (2008). Determinants of accepting wireless mobile data services in China. *Information & Management, 45*(1), 52–64. https://doi.org/10.1016/j.im.2007.11.002.

Lynne, G. D., Casey, C. F., Hodges, A., & Rahmani, M. (1995). Conservation technology adoption decisions and the theory of planned behavior. *Journal of Economic Psychology*, *16*(4), 581–598. https://doi.org/10.1016/0167-4870(95)00031-6.

Malaysian Communications and Multimedia Commission. (2017). *Hand phone users survey 2017*. Retrieved from https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/HPUS2017.pdf.

Malhotra, N. K., Kim, S. S., & Patil, A. (2006). Common method variance in IS research: A comparison of alternative approaches and a reanalysis of past research. *Management Science*, *52*(12), 1865–1883. https://doi.org/10.1287/mnsc.1060.0597.

Marler, W. (2018). Mobile phones and inequality: Findings, trends, and future directions. *New Media & Society, 20*(9), 3498–3520. https://doi.org/10.1177/1461444818765154.

Marx, B., Stoker, T., & Suri, T. (2013). The economics of slums in the developing world. *Journal of Economic Perspectives*, *27*(4), 187–210. https://doi.org/10.1257/jep.27.4.187.

Matook, S., & van der Heijden, H. (2013). Goal abstraction, goal linkage dependency, and perceived utilitarian value of information systems: A mixed-method study. *Journal of Organizational and End User Computing*, *25*(2), 41–58. https://doi.org/10.4018/joeuc.2013040103.

Mishra, V., & Bisht, S. S. (2013). Mobile banking in a developing economy: A customer-centric model for policy formulation. *Telecommunications Policy*, *37*(6-7), 503–514. https://doi.org/10.1016/j.telpol.2012.10.004.

Narag, R. E. (2013). *Mitigating crime in a slum community: Understanding the role of social structures, social pressures, and community culture in a neighborhood intervention program* [Doctoral dissertation, Michigan State University]. Retrieved from https://www.proquest.com/docview/1354441422/.

Nair, M., & Vaithilingam, S. (2013). Leap-frogging the urban-poor to a high-income economy: A case study from a developing country. *Journal of Emerging Economies and Islamic Research*, *1*(2), 1–24. Retrieved from https://myjms.mohe.gov.my/index.php/JEEIR/index.

Nayak, B. P., Werthmann, C., & Aggarwal, V. (2015). Trust and cooperation among urban poor for transition to cleaner and modern cooking fuel. *Environmental Innovation and Societal Transitions*, *14*, 116–127. https://doi.org/10.1016/j.eist.2014.09.002.

Park, N. (2010). Adoption and use of computer-based voice over Internet protocol phone service: Toward an integrated model. *Journal of Communication*, *60*(1), 40–72. https://doi.org/10.1111/j.1460-2466.2009.01440.x.

Patil, P., Tamilmani, K., Rana, N. P., & Raghavan, V. (2020). Understanding consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness,

anxiety, trust, and grievance redressal. *International Journal of Information Management, 54*, Article 102144. https://doi.org/10.1016/j.ijinfomgt.2020.102144.

Petter, S., Straub, D., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS Quarterly*, *31*(4), 623–656. https://doi.org/10.2307/25148814.

Pheko, M. M., Monteiro, N., Tlhabano, K. N., & Mphele, S. B. (2014). Rural-to-urban migrations: Acculturation experiences among university students in Botswana. *International Journal of Adolescence and Youth*, *19*(3), 306–317. https://doi.org.10.1080/02673843.2014.928782.

Pigato, M. (2001). *Information and communication technology, poverty, and development in sub-Saharan Africa and South Asia*. World Bank. Retrieved from https://documents1.worldbank.org/curated/en/802851468767657623/pdf/multi0page.pdf.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879.

Podsakoff, N. P., Shen, W., & Podsakoff, P. M. (2006). The role of formative measurement models in strategic management research: Review, critique, and implications for future research. *Research Methodology in Strategy and Management, 3*, 197–252. https://doi.org/10.1016/S1479-8387(06)03008-6.

Polites, G. L., Roberts, N., & Thatcher, J. (2012). Conceptualizing models using multidimensional constructs: A review and guidelines for their use. *European Journal of Information Systems, 21*, 22–48. https://doi.org/10.1057/ejis.2011.10.

Preacher, K. J. J., & Hayes, A. F. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879–891. https://doi.org/10.3758/brm.40.3.879.

Putti, V. R. (2011). *Energy access for poor in urban and peri-urban areas: An emerging challenge* [PowerPoint slides]. World Bank. Retrieved from http://siteresources.worldbank.org/EXTAFRREGTOPENERGY/Resources/717305-1327690230600/8397692-1327691245128/Urban_and_Peri_Urban_Challenges_AEI_Workshop.pdf.

Queiroz, M. M., & Wamba, S. F. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. *International Journal of Information Management*, *46*, 70–82. https://doi.org/10.1016/j.ijinfomgt.2018.11.021.

Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research*, *13*(1), 50–69. https://doi.org/10.1287/isre.13.1.50.96.

Rashid, S. F. (2004). *Worried lives: Poverty, gender and reproductive health of married adolescent women living in an urban slum in Bangladesh* [Doctoral dissertation, The Australian National University, Canberra]. Retrieved from https://openresearch-repository.anu.edu.au/handle/1885/109799.

Raykov, T., & Marcoulides, G. A. (2006). *A first course in structural equation modeling* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Ringle, C. M., Wende, S., & Becker, J. M. (2015). *SmartPLS 3* [Computer software]. Bönningstedt, Germany: SmartPLS. Retrieved from http://www.smartpls.com.

Robert, L. P., & Sykes, T. A. (2016). Extending the concept of control beliefs: Integrating the role of advice networks. *Information Systems Research*, *28*(1), 84–96. https://doi.org/10.1287/isre.2016.0666.

Roldán, J. L., & Sánchez-Franco, M. J. (2012). Variance-based structural equation modeling: Guidelines for using partial least squares in information systems research. In M. Mora, O. Gelman, A. Steenkamp, & M. Raisinghani (Eds.), *Research methodologies,*

innovations and philosophies in software systems engineering and information systems (pp. 193–221). Hershey, PA: IGI Global.

Rousseau, D. M., & Fried, Y. (2001). Location, location, location: Contextualizing organizational research. *Journal of Organizational Behavior*, *22*(1), 1–13. https://doi.org/10.1002/job.78.

Ruel, M. T., Garrett, J. L., Hawkes, C., & Cohen, M. J. (2010). The food, fuel, and financial crises affect the urban and rural poor disproportionately: A review of the evidence. *Journal of Nutrition*, *140*(1), 170S–176S. https://doi.org/10.3945/jn.109.110791.

Sarstedt, M., Hair, J. F., Cheah, J. H., Becker, J. M., & Ringle, C. M. (2019). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal*, *27*(3), 197–211. https://doi.org/10.1016/j.ausmj.2019.05.003.

Seethamraju, R., Diatha, K. S., & Garg, S. (2018). Intention to use a mobile-based information technology solution for tuberculosis treatment monitoring – Applying a UTAUT model. *Information Systems Frontiers*, *20*(1), 163–181. https://doi.org/10.1007/s10796-017-9801-z.

Shareef, M. A., Archer, N., & Dwivedi, Y. K. (2012). Examining adoption behavior of mobile government. *Journal of Computer Information Systems, 53*(2), 39–49. Retrieved from https://www.tandfonline.com/toc/ucis20/current.

Sharma, R., Singh, G., & Sharma, S. (2020). Modelling internet banking adoption in Fiji: A developing country perspective. *International Journal of Information Management*, *53*, Article 102116. https://doi.org/10.1016/j.ijinfomgt.2020.102116.

Sharma, R., Yetton, P., & Crawford, J. (2009). Estimating the effect of common method variance: The method-method pair technique with an illustration from TAM Research. *MIS Quarterly*, *33*(3), 473–490. https://doi.org/10.2307/20650305.

Shetty, P. (2011). Health care for urban poor falls through the gap. *Lancet*, *377*(9766), 627–628. https://doi.org/10.1016/S0140-6736(11)60215-8.

Shim, S., Lee, B., & Kim, S. L. (2018). Rival precedence and open platform adoption: An empirical analysis. *International Journal of Information Management*, *38*(1), 217–231. https://doi.org/10.1016/j.ijinfomgt.2017.10.001.

Slade, E., Williams, M., Dwivedi, Y., & Piercy, N. (2015). Exploring consumer adoption of proximity mobile payments. *Journal of Strategic Marketing, 23*(3), 209–223. https://doi.org/10.1080/0965254X.2014.914075.

Srivastava, S. C., & Chandra, S. (2018). Social presence in virtual world collaboration: An uncertainty reduction perspective using a mixed methods approach. *MIS Quarterly*, *42*(3), 779–803. https://doi.org/10.25300/MISQ/2018/11914.

Srivastava, S. C., & Shainesh, G. (2015). Bridging the service divide through digitally enabled service innovations: Evidence from Indian healthcare service providers. *MIS Quarterly*, *39*(1), 245–267. https://doi.org/10.25300/MISQ/2015/39.1.11.

Streukens, S., & Leroi-Werelds, S. (2016). Bootstrapping and PLS-SEM: A step-by-step guide to get more out of your bootstrap results. *European Management Journal, 34*(6), 618–632. https://doi.org/10.1016/j.emj.2016.06.003.

Świątkowska, J. (2020). *Tackling cybercrime to unleash developing countries' digital potential*. Pathways for Prosperity Commission Background Paper Series (No. 33). Oxford, United Kingdom. Retrieved from https://pathwayscommission.bsg.ox.ac.uk/node/299.

Sykes, T. A. (2015). Support structures and their Impacts on employee outcomes: A longitudinal field study of an enterprise system implementation. *MIS Quarterly*, *39*(2), 473–496. https://doi.org/10.25300/MISQ/2015/39.2.09.

Sykes, T. A. (2020). Enterprise system implementation and employee job outcomes: Understanding the role of formal and informal support structures using the job strain model. *MIS Quarterly*, *44*(4), 2055–2086. https://doi.org/10.25300/MISQ/2020/11672.

Sykes, T. A., & Venkatesh, V. (2017). Explaining post-implementation employee system use and job performance: Impacts of the content and source of social network ties. *MIS Quarterly*, *41*(3), 917–936. https://doi.org/10.25300/MISQ/2017/41.3.11.

Sykes, T. A., Venkatesh, V., & Gosain, S. (2009). Model of acceptance with peer support: A social network perspective to understand employees' system use. *MIS Quarterly*, *33*(2), 371–393. https://doi.org/10.2307/20650296.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(2), 144–176. https://doi.org/10.1287/isre.6.2.144.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, *51*(1), 125–143. https://doi.org/10.2307/249443.

Thüring, M., & Mahlke, S. (2007). Usability, aesthetics and emotions in human-technology interaction. *International Journal of Psychology*, *42*(4), 253–264. https://doi.org/10.1080/00207590701396674.

Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior*. Nebraska Symposium on Motivation, 27,* 195–259. Lincoln, NE: University of Nebraska Press.

Turel, O., Serenko, A., & Bontis, N. (2010). User acceptance of hedonic digital artifacts: A theory of consumption values perspective. *Information & Management*, *47*(1), 53–59. https://doi.org/10.1016/j.im.2009.10.002.

UN-Habitat. (2004). The challenge of slums: Global report on human settlements 2003. *Management of Environmental Quality: An International Journal, 15*(3), 337–338. https://doi.org/10.1108/meq.2004.15.3.337.3.

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. Retrieved from https://www.un.org/pga/wp-

content/uploads/sites/3/2015/08/120815_outcome-document-of-Summit-for-adoption-of-the-post-2015-development-agenda.pdf.

United Nations. (2018). *Revision of* w*orld urbanization prospects 2018*. Retrieved from https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html.

United Nations. (2019). *World urbanization prospects: The 2018 revision*. Retrieved from https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf.

Vaithilingam, S., Nair, M., & Liew, E. J. Y. (2012). *Mobile communication ecology and socioeconomic development of urban poor communities in a developing country* [Unpublished manuscript]. Monash University Malaysia.

van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly, 28*(4), 695–704. https://doi.org/10.2307/25148660.

Veeramootoo, N., Nunkoo, R., & Dwivedi, Y. K. (2018). What determines success of an e-government service? Validation of an integrative model of e-filing continuance usage. *Government Information Quarterly*, *35*(2), 161–174. https://doi.org/10.1016/j.giq.2018.03.004.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, *11*(4), 342–365. https://doi.org/10.1287/isre.11.4.342.11872.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x.

Venkatesh, V., Bala, H., & Sambamurthy, V. (2016a). Implementation of an information and communication technology in a developing country: A multimethod longitudinal study in a bank in India. *Information Systems Research*, *27*(3), 558–579. https://doi.org/10.1287/isre.2016.0638.

Venkatesh, V., Bala, H., & Sykes, T. A. (2010). Impacts of information and communication technology implementations on employees' jobs in service organizations in India: A multi-method longitudinal field study. *Production and Operations Management*, *19*(5), 591–613. https://doi.org/10.1111/j.1937-5956.2010.01148.x.

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *MIS Quarterly*, *37*(1), 21–54. https://doi.org/10.25300/misq/2013/37.1.02.

Venkatesh, V., Maruping, L. M., & Brown, S. A. (2006). Role of time in self-prediction of behavior. *Organizational Behavior and Human Decision Processes*, *100*(2), 160–176. https://doi.org/10.1016/j.obhdp.2006.02.003.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478. https://doi.org/10.2307/30036540.

Venkatesh, V., Rai, A., Sykes, T. A., & Aljafari, R. (2016b). Combating infant mortality in rural India: Evidence from a field study of eHealth kiosk implementations. *MIS Quarterly*, *40*(2), 353–380. https://doi.org/10.25300/MISQ/2016/40.2.04.

Venkatesh, V., Shaw, J. D., Sykes, T. A., Wamba, S. F., & Macharia, M. (2017). Networks, technology, and entrepreneurship: A field quasi-experiment among women in rural India. *Academy of Management Journal*, *60*(5), 1709–1740. https://doi.org/10.5465/amj.2015.0849.

Venkatesh, V., & Sykes, T. A. (2013). Digital divide initiative success in developing countries: A longitudinal field study in a village in India. *Information Systems Research*, *24*(2), 239–260. https://doi.org/10.1287/isre.1110.0409.

Venkatesh, V., Sykes, T. A., Aljafari, R., & Poole, M. S. (2021). The future is now: Calling for a focus on temporal issues in information system research. *Industrial Management & Data Systems*, *121*(1), 30–47. https://doi.org/10.1108/IMDS-08-2020-0506.

Venkatesh, V., Sykes, T. A., Rai, A., & Setia, P. (2019). Governance and ICT4D initiative success: A longitudinal field study of ten villages in rural India. *MIS Quarterly*, *43*(4), 1081–1104. Retrieved from https://misq.org/.

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157–178. https://doi.org/10.2307/41410412.

Venkatesh, V., Thong, J. Y., & Xu, X. (2016c). Unified theory of acceptance and use of technology: A synthesis and the road ahead. *Journal of the Association for Information Systems, 17*(5), 328–376. https://doi.org/10.17705/1jais.00428.

Wamuyu, P. K., & Maharaj, M. M. (2011). Factors influencing successful use of mobile technologies to facilitate e-commerce in small enterprises: The case of Kenya. *African Journal of Information Systems, 3*(2), 48–71. Retrieved from https://digitalcommons.kennesaw.edu/ajis/.

Watson, R. T. (2013). Africa's contributions to information systems. *African Journal of Information Systems*, *5*(4), 126–130. Retrieved from https://digitalcommons.kennesaw.edu/ajis/.

Whetten, D. A. (2008). An examination of the interface between context and theory applied to the study of Chinese organizations. *Management and Organization Review*, *5*(1), 29–55. https://doi.org/10.1111/j.1740-8784.2008.00132.x.

Wilcox, J. B., Howell, R. D., & Breivik, E. (2008). Questions about formative measurement. *Journal of Business Research*, *61*(12), 1219–1228. https://doi.org/10.1016/j.jbusres.2008.01.010.

World Bank. (2010). *Literacy rate, adult total (% of people ages 15 and above*).Retrieved from http://data.worldbank.org/indicator/SE.ADT.LITR.ZS/countries/1W-ZF?display=graph.

World Bank. (2011). *Urban poverty: An overview.* Retrieved from https://www.worldbank.org/en/topic/poverty/overview.

World Bank & United Nations. (2017). *Combatting cybercrime: Tools and capacity building for emerging economies*. Retrieved from http://documents.worldbank.org/curated/en/355401535144740611/Combatting-Cybercrime-Tools-and-Capacity-Building-for-Emerging-Economies.

Wratten, E. (1995). Conceptualizing urban poverty. *Environment and Urbanization*, *7*(1), 11–38. https://doi.org/10.1177/095624789500700118.

Wu, J. H., & Wang, S. C. (2005). What drives mobile commerce? An empirical evaluation of the revised technology acceptance model. *Information & Management*, *42*(5), 719–729. https://doi.org/10.1016/j.im.2004.07.001.

Wunderlich, P., Veit, D. J., & Sarker, S. (2019). Adoption of sustainable technologies: A mixed-method study of German households. *MIS Quarterly, 43*(2), 673–691. https://doi.org/10.25300/MISQ/2019/12112.

Wurwarg, J. (2014). Urbanization and hunger: Food policies and programs, responding to urbanization, and benefiting the urban poor in three cities. *Journal of International Affairs*, *67*(2), 75–90. Retrieved from https://jia.sipa.columbia.edu/.

Xu, C., Ryan, S., Prybutok, V., & Wen, C. (2012). It is not for fun: An examination of social network site usage. *Information & Management, 49*(5), 210–217. https://doi.org/10.1016/j.im.2012.05.001.

Zainal, N. R., Kaur, G., Ahmad, N. A., & Khalili, J. M. (2012). Housing conditions and quality of life of the urban poor in Malaysia. *Procedia-Social and Behavioral Sciences*, *50*, 827–838. https://doi.org/10.1016/j.sbspro.2012.08.085.

Zhang, X., & Venkatesh, V. (2017). A nomological network of knowledge management system use: Antecedents and consequences. *MIS Quarterly*, *41*(4), 1275–1306. https://doi.org/10.25300/MISQ/2017/41.4.12.

Appendix A. Facilitating Conditions in Technology Adoption Research in the Societal Context

Table A1. Literature Review of Prior Research on Facilitating Conditions (FC) in Technology Adoption Research

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Ahmad, Markkula, & Oivo (2013)	Questionnaire survey	Citizens	eGovernment	Pakistan	Not articulated. However, improving IT infrastructure and service quality, as well as passing cyber laws are suggested.
Ahmed, Kader, Rashid, & Nurunnabi (2017)	Questionnaire survey	Banking customers	Mobile banking	Bangladesh	Not explained.
Alalwan, Dwivedi, Rana, & Simintiras (2016)	Questionnaire survey	Mobile users	Telephone/interactive voice response (IVR) system	Jordan	Not articulated.
Alalwan, Dwivedi, Rana, & Williams (2016)	Questionnaire survey	Banking customers	Mobile banking	Jordan	Not articulated.
Al-Athmay (2015)	Questionnaire survey	Citizens	e-Government	UAE	Not articulated.
Al-Gahtani (2004)	Questionnaire survey	Users	Computers	Saudi Arabia	Studied as critical success variables: organizational factors (e.g. support, training and culture), technical factors and individual factors.
Ali et al. (2018)	Questionnaire survey	Citizens	eGovernment	Developing countries	Not articulated
AlMutairi & Yen (2017)	Panel data	Mobile users	Cellular mobile subscription	7 Arab States (Kuwait, KSA, UAE, Lebanon, Iraq, Libya, Egypt)	Conceptualized as computer self-efficiency, perception of external control, computer anxiety and computer playfulness.
Al-Sammarraie, Rasheed, & Faieq (2016)	Questionnaire survey	Users	Telecenters	Saudi Arabia	Not articulated.
Alzubi, Alkhawlani, & El-Ebiary (2017)	Questionnaire survey	Website users	eCommerce	Jordan	Not articulated.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Arenas-Gaitán, Peral-Peral, & Ramón-Jerónimo (2015)	Questionnaire survey	Elderly banking customers	Internet banking	Spain	Not articulated.
Arora & Sandhu (2018)	Questionnaire survey	Banking customers	e-Banking	India	Not articulated.
Baabdullah (2018)	Questionnaire survey	Citizens	M-SNGs	Saudi Arabia	Not articulated.
Bankole, Bankole, & Brown (2017)	Questionnaire survey	Banking customers	Cell phone banking	South Africa	Not articulated.
Batara, Nurmandi, Warsito, & Pribadi, (2017)	Questionnaire survey	Government employees	eGovernment	Indonesia & Philippines	Studied as: process redesign, organizational structuring and cultural and behavioral change in the city government.
Boateng, Mbrokoh, Boateng, Senyo, & Ansong (2016)	Questionnaire survey	University students	eLearning	Developing countries/ Ghana	Not articulated.
Chan et al. (2010)	Two-stage survey	Citizens	Smartcard to access eGovernment services	Hong Kong	Not studied but conceptualized as user evaluations of usage environment.
Chaputula & Mutula (2018)	in-depth semi-structured interviews	University/college librarians and information and communications technology (ICT) directors	University library eReadiness	Malawi	Not studied but conceptualized as external task environment, industry characteristics and market structure, technology support infrastructure, government regulation.
Chatzoglou, Vraimaki, Diamantidis, & Sarigiannidis (2010)	Questionnaire survey	Employees working in SMEs	Computers	Greece	Not studied but conceptualized end-user training and organizational support as factors separate from FC.
Chawinga & Zinn (2016)	Survey, followed by interviews	University students and lecturers	Web 2.0	Malawi	Not studied but conceptualized as resource-FC (e.g., time, money) and technology-FC (e.g. software, hardware).
Chiwara, Chinyamurindi, & Mjoli (2017)	Questionnaire survey	Students	Online job search sites	developing countries, South Africa	Not articulated.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Choudrie, Pheeraphuttranghkoon, & Davari, (2018)	Online questionnaire survey	Older adults	Smartphones	UK	Not studied but conceptualized as affordability.
Chua, Rezaei, Gu, Oh, & Jambulingam (2018)	Questionnaire survey	Millennials	Social networking apps	Malaysia	Not articulated.
Cilliers & Flowerday (2013)	Questionnaire survey	Healthcare workers	Telemedicine	Eastern Cape, South Africa	Not studied but conceptualized as resource availability such as technical assistance, knowledge of the system and compatibility with other systems.
Datta (2011)	Longitudinal field study	Consumers	e-Commerce	37 countries	Studied as: - policy-related facilitation (i.e., level of competition allowed from privatization, entrepreneurship and competition, technology development subsidies and national legislative policies) - society-related facilitation (considers demographics, education and training) - access-related facilitation (i.e., the availability of telecommunications and information infrastructure and the availability of software, hardware and ICT services) - economic facilitation (i.e., the extent to which the technology is likely to be incorporated and integrated into the economic activity)
Dwivedi, Khoumbati, Williams, & Lal (2007)	Questionnaire survey	Consumers	Broadband	Pakistan	Not articulated, however, costs were studied as a separate construct from FC.
Eria (2018)	Semi-structured interviews	Users	GIS technology	Uganda	Broken down as: resources, knowledge, system compatibility and user assistant/s
Fakhoury & Baker (2016)	Online survey	Citizens	eGovernment	Lebanon	Conceptualized as management support, training and technical services.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
					Trust in government, active citizenship and changing consumer habit are studied as separate constructs.
Fan, Shao, Li, & Huang (2018)	Questionnaire survey	Consumers	Mobile payment	USA and China	Studied as payment culture.
Farah, Hasni, & Abbas (2018)	Cross-sectional survey	Banking customers	mobile banking	Pakistan	Not articulated.
Fetscherin & Lattemann (2008)	Online survey	Gamers	gaming	Virtual Worlds	Not articulated.
Gao & Bai (2014)	Questionnaire survey	Internet of Things (IoT) users	IoT	China	Not articulated.
Gupta & Dogra (2017)	Structured questionnaire survey	Travelers/tourists	Mapping or location-based travel apps	India	Not articulated.
Haba, Hassan, & Dastane (2017)	Online survey	Consumers	Smartphones	Kuala Lumpur	Not articulated.
Hobololo & Mawela (2017)	Mixed methods (questionnaires & semi-structured interviews)	Citizens	Mobile phones	Buffalo City, South Africa	Conceptualized as reduced capital expenditure.
Holzmann, Schwarz, & Audretsch (2020)	Questionnaire survey	High school teachers	3D Printing	The US and UK	Conceptualized as access to expertise, specific training and infrastructure.
Hossain (2016)	Questionnaire survey	Users of m-Health services	m-Health	Bangladesh	Not articulated.
Hossain & Jamil (2015)	Questionnaire survey	Consumers	More-than-voice (MTV) services	Bangladesh	Not articulated.
Ilorah, Ditsa, & Mokwena (2017)	Questionnaire survey	Rural health users	Mobile e-Healthcare	South Africa	Not articulated.
Inmor (2016)	Questionnaire survey	Students	Facebook for academic purposes	Thailand	Conceptualized as training, help support, subject infrastructure and available knowledge.
Iyer & Srivastava (2018)	Questionnaire survey	Citizens	eGovernment	India	Not articulated.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Khasawneh (2015)	Online self-administered survey	Banking customers	Mobile banking	Jordan	Not articulated.
Kumar, Sachan, Mukherjee, & Kumar (2018)	Qualitative semi-structured interviews	Citizens	eGovernment	India	Not articulated.
Liew, Vaithilingam, & Nair (2014)	Structured questionnaire survey	Users	Facebook	Developing countries/ Malaysia	Broken down to affordability and provision of regulation & legislation.
Lwoga & Questier (2014)	Cross-sectional questionnaire survey	Faculty (researchers and library staff)	Electronic procurement system (EPS)	Tanzania	Not articulated.
Madan & Yadav (2016)	Questionnaire survey	Consumers	Mobile phone payment/ mobile wallet	Developing countries	Not articulated.
Maduku (2015)	Questionnaire survey	Students in tertiary institutions	e-books	South Africa	Conceptualized as resources comprising expertise, help availability, user documentation
Makanyeza (2017)	Questionnaire survey	Banking customers	Mobile banking	Zimbabwe	Not articulated.
Makanyeza & Mutambayashata (2018)	Cross-sectional questionnaire survey	Consumers	Plastic money	Developing countries, Zimbabwe	Resources and knowledge necessary for users to use the technology.
Maldonado, Khan, Moon, & Rho (2011)	Questionnaire survey	Students	e-Learning	South America	Not articulated.
Mansoori, Sarabdeen, & Tchantchane (2018)	Questionnaire survey	Citizens	eGovernment public services	Abu Dhabi Emirate	Not articulated.
Masrek, Karim, & Hussein (2008)	Questionnaire survey	Employees	Corporate Intranet	Malaysia	Not articulated.
Mbrokoh (2016)	Questionnaire survey	Banking customers	Internet banking	Ghana	Not articulated.
Mikalef, Pappas, & Giannakos (2016)	Questionnaire survey	Learners	Video-based learning (VBL)/ massive open online courses (MOOCs)	VBL environments	Not articulated.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Moghavvemi, Mohd Salleh, Zhao, & Mattila (2012)	Questionnaire survey	New entrepreneurs	Adoption of IT innovation in SMEs	Kuala Lumpur, Malaysia	Not articulated.
Mohammadi (2015)	Questionnaire survey	Banking customers	Internet banking	Iran	Not articulated.
Mortimer, Neale, Hasan, & Dunphy (2015)	Questionnaire survey	Banking customers	Mobile banking	Australia and Thailand	Not articulated.
Mosweu, Bwalya, & Mutshewa (2016)	Census survey using questionnaires, interviews and documentary review	Government employees	Computerization of government business processes	Botswana	Conceptualized as the technical and infrastructural environment.
Mustafa & Waheed (2016)	Questionnaire survey	Banking customers	Mobile banking	Australia and Thailand	Not articulated.
Namahoot & Laohavichien (2018)	Online questionnaires	Banking employees	Internet banking	Thailand	Not articulated.
Narattharaksa, Speece, Newton, & Bulyalert (2016)	Questionnaire survey	Healthcare personnel	EMR systems	Thailand	Conceptualized as necessary resources, system compatibility, system fit needs, help availability and user documentation.
Nawi et al. (2017)	Questionnaire survey	University student entrepreneurs	Social media	Malaysia	Conceptualized as access to necessary resources.
Nel, Raleting, & Boshoff (2012)	Questionnaire survey	Low-income, non-users	Wireless Internet Gateway (WIG) mobile banking; Short Message Services (SMS)	Developing countries, South Africa	Conceptualized as environmental conditions.
Niehaves & Plattfaut (2014)	Mail survey	Elderly users	Internet adoption	The EU	Conceptualized as environmental conditions.
Nwagwu & Akeem (2013)	Questionnaire and a checklist	Medical practitioners	ICT in hospitals	Nigeria	Not articulated.
O'Connor, Heavin, & O'Donoghue (2016)	Paper-based survey	mHealth users	mHealth	Developing countries	Not articulated.
Offong & Costello (2017)	Questionnaire survey	Employees	Enterprise social media (ESM)	Lagos, Nigeria	Not articulated.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Olatubosun, Olusoga, & Shemi (2014)	Questionnaire survey	Students	eLearning services/ Learning Management System (LMS)	Nigeria	Not articulated.
Piabuo, Piendiah, Njamnshi, & Tieguhong (2017)	Self-administered questionnaire survey	Human Resource (HR) workers	HR IT	Cameroon	Not articulated.
Qasim & Abu-Shanab (2016)	Questionnaire survey	Customers	Mobile payment	Jordan	Conceptualized as objective factors within the environment.
Rana, Dwivedi, Lal, Williams, & Clement (2017)	Questionnaire survey	Citizens	eGovernment	India (districts of Aurangabad, Madhubani, Gaya and Nalanda in Bihar)	Studied as technical support and copyright clearance.
Rehman, Esichaikul, & Kamal (2012)	Online survey	Citizens	eGovernment	Pakistan	Not articulated.
Sahu & Gupta (2007)	Questionnaire survey	Government employees	eGovernment	India	Conceptualized as user support in terms of necessary computer hardware and software.
Sambasivan, Wemyss, & Rose (2010)	Questionnaire survey	Citizens	Electronic procurement system (EPS)	Malaysia	Conceptualized as appropriate laws, policies, service providers, training and incentives
Saxena (2018)	Questionnaire survey	Citizens	m-government services	India	Not articulated.
Seethamraju, Diatha, & Garg (2018)	Cross-sectional questionnaire survey	Healthcare workers	Mobile-based IT solution	India, TB-monitoring context	Not articulated.
Sharma & Pillai (2017)	Questionnaire survey	Full-time college instructors	Social media technology (SMT)	Oman	Not studied.
Sivathanu (2018)	Questionnaire survey	Citizens	DigiLocker cloud-based eGovernment	India	Not articulated.
Sugiharto, Suhendra, & Hermana (2010)	Questionnaire survey	Small business operators	Internet	Indonesia	Not articulated.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Suliantoro, Ghozali, & Wibowo (2015)	Questionnaire survey	University and government users	e-procurement	Central Java, Indonesia	Not articulated.
Sun, Wang, Guo, & Peng (2013)	Field survey	Elderly consumers	Mobile Health Services (MHS)	China	Conceptualized as response cost, i.e., money and effort spent on learning the MHS
Tak & Panwar (2017)	Structured questionnaire	Mobile shoppers	Mobile apps for shopping	India	Not articulated.
Tarhini, Masa'deh, Al-Busaidi, Mohammed, & Maqableh (2017)	Self-administrated questionnaire survey	University students	e-learning systems	Britain	Availability of training and provision of support.
Thompson, Higgins, & Howell (1991)	Questionnaire survey	Knowledge workers	Utilization of personal computers	An organization	Conceptualized as objective factors in the environment
Turan (2012)	Survey	university students	Internet shopping behavior	Turkey	Conceptualized as availability of resources needed to perform particular behavior
van Slyke, Ilie, Lou, & Stafford (2007)	Questionnaire survey	Users	Instant Messaging (IM)	US	Not articulated.
Venkatesh, Bala, & Sykes (2010)	Mixed methods (longitudinal field study, qualitative study)	Bank employees	ICTs in the service sector	India	Conceptualized as training and site support.
Venkatesh & Sykes (2013)	Field survey	Villagers	Computers	India	Conceptualized as the material, cognitive and social resources.
Widuri, O'Connell, & Yapa (2016)	Semi-structured interviews	Employees	Generalized Audit Software (GAS)	Indonesia	Not articulated.
Yu (2012)	Questionnaire survey	Banking customers	Mobile banking	Taiwan	Not articulated.
Yuen, Yeow, Lim, & Saylani (2010)	Questionnaire survey	Banking customers	Internet banking services (IBS)	Malaysia	Not articulated.

Author	Data Collection Method	Sample	Technology Adopted	Context	Facilitating Conditions (as conceptualized in the study)
Zhang, Chen, Liu, & Zhu (2018)	Questionnaire survey	Internet-only banking customers	Internet-only banks	China	Not articulated.
This study	Questionnaire survey, Interviews for corroboration and confirmation	Individuals from urban-poor households	Mobile phone	Malaysia	Conceptualized to consist of five dimensions – Infrastructure, technical and support services, legal and regulatory framework, financial factors and affordability, and self-efficacy.

Appendix B. Use of Formative Constructs

Table B1: Examples of Formatively Measured Constructs

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
Aldhaheri, Bakchan, & Sandhu (2018)	Engineering, Construction and Architectural Management	Effectiveness of engineering, procurement and construction (EPC)	End-user's engagement, alignment of objectives	Formative-formative second-order	SEM (PLS)	Previous studies illustrated that engaging end-users during project development and implementation are distinct facets of effectiveness in the EPC domain.	No prior research was conducted on the combined effects of end user engagement and aligning project and product objectives.
Barroso & Picón (2012)	Industrial Marketing Management	Perceived switching costs (PSC)	Benefits loss costs, personal relationship loss costs, economic risk costs, evaluation costs, set-up costs, monetary loss costs	Reflective-formative second-order	SEM (PLS)	PSC is a multidimensional construct where the costs can be subdivided into monetary, psychological and relational (Bitner, 1995, as cited in Barroso & Picón, 2012). To achieve adequate comprehension of a multidimensional concept or of its relationship with other concepts, the subdimensions should not be considered on a standalone basis. (Hu & Hwang, 2006, as cited in Barroso & Picón, 2012; Whitten	Previous studies postulated that dimensions of the PSC constructs covary rather than being independent. This assumption that underlies a reflective PSC construct is flawed as the costs involved are as perceived by the customer. Then changes in only one dimension is possible.

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
						& Wakefield, 2006, as cited in Barroso & Picón, 2012)	
Bruhn, Georgi, & Hadwich (2008)	Journal of Business Research	Customer equity management (CEM)	Customer equity analysis, customer equity strategies, customer equity actions	Formative-formative second-order	MIMIC model (LISREL)	Systematic conceptualization of CEM construct which represents all firm activities that aims to maximize customer equity.	Extant literature lacks empirical studies on CEM activities and the activities that contribute to successful CEM.
Datta (2011)	Information Systems Journal	Facilitating conditions (FC)	Policy facilitation, society facilitation, access facilitation, economic facilitation	Reflective-formative second-order	SEM (PLS)	FC represent the overall adoption environment that is independent of the individual adopter. It reflects the objective preconditions for successful ecommerce adoption. This study uses the four distinct subdimensions of FC in Kirkman, Osorio, and Sachs' (2002; as cited in Datta, 2011) study	FC have traditionally been treated as first-order constructs although the concept overall has multiple dimensions.
Darrow & Behrend (2017)	Journal of Vocational Behaviour	Person-Environment (PE) fit	Person-vocation (PV) fit, person-organization (PO) fit, person-group (PG) fit, person-job (PJ) fit, person-supervisor (PS) fit, person-environment (PE) fit	Formative-formative second-order	SEM (MPlus)	The levels of fit (PV, PO, PG, PJ, PS and PE) signify different aspects of the work environment which according to Jansen and Kristof-Brown (2006; as cited in Darrow & Behrend, 2017) affect the	Prior studies suffer from limitations including treating PE fit as a reflective construct using unidimensional measures of fit.

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
						overall experience of PE. Employees may fit well in one of the levels but do not fare well in another. Hence, the fits are not conceptually interchangeable, they covary with each other and have the same consequences.	
Delcourt, Gremler, van Riel, & van Birgelen (2016)	Journal of Service Research	Employee emotional competence (EEC)	Perception of customer emotions, understanding of customer emotions, regulation of customer emotions	Reflective-formative second-order	SEM (PLS)	The first order dimensions are not highly correlated, with each capturing a unique aspect of the construct domain; also an employee can only be perceived as emotionally competent through scoring high on all dimensions.	Customer satisfaction studies using employee emotional intelligence (EEI), a reflective formation, show conflicting results due to emotional intelligence (EI) being a measure self-reported by the employee, assessed by a supervisor, assumed to be context independent with a focus on intrapersonal EI rather than interpersonal EI.
Dickinger & Stangl (2013)	Journal of Business Research	Website performance	Usefulness, ease of use, enjoyment, website design, trust, content quality, navigational	Reflective-formative second-order	MIMIC Model	Website performance measures overall are appealing from a consumer's point of view.	Performance literature suggests the causality direction is from indicators to performance hence formative measures are more appropriate.

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
			challenge, system availability				
Guillemette, Laroche, & Cadieux (2014)	Information & Management	Decision making process performance (DMPP)	Procedural reliability, exhaustivity of information, effort, openness of spirit	Reflective-formative second-order	MIMIC Model	Based on the authors' observation, DMPP consists of distinct factors that actually have causality effects and do not always move in the same direction. DMPP conceptualization is performed using the 7-step model established in Polites et al. (2012) whereby the content domain of the construct is first determined followed by deciding the dimensionality of the construct's facets guided by theories.	Performance evaluation is undermined in terms of complexity and diversity by conceptualizing the DMPP construct as unidimensional using a reflective approach. Procedural rationality is the most common feature that is studied while other process characteristics are being neglected.
Kim (2011)	Journal of Public Administration Research and Theory	Public Service Motivation (PSM)	Attraction to policy making (APM); commitment to public interest (CPI); compassion (COM); self-sacrifice (SS)	Reflective-formative second-order	SEM (ADF)	As cited in Kim's (2011) study, Perry's (1996) model measures PSM on a multidimensional scale which consists of four separate dimensions where changes in the individual dimension affect PSM outcome but have no impact	Most studies use a reflective specification of PSM (Coursey et al., 2008a, as cited in Kim, 2011). Coursey et al., 2008b (as cited in Kim, 2011) employ a formative specification of PSM but leave out APM which is one of the components of

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
						on the other dimensions.	Perry's (1996; as cited in Kim, 2011) PSM model.
Kyle & Jun (2015)	Journal of Leisure Research	Leisure constraints	Intrapersonal, interpersonal, structural	Formative-formative second-order	CB-SEM (LISREL)	Authors argue a formative instead of reflective measurement model is more consistent to measure constraints indicators.	Reflective conceptualization of leisure constraints is invalid because variation in the indicators that include crowded settings, access to transportation, and financial resources is unlikely to originate from a single latent construct.
Liu, Fu, Chao, & Li (2019)	Tourism and Hospitality Research	Service Quality	Water quality, customer service, facility, surrounding, alternative activity, convenience	Reflective-formative first-order	SEM (PLS)	This study acknowledges that service quality is a multidimensional construct and should consider multiple service quality cues.	Service quality in hot spring resorts are largely conceptualized is reflective construct. This specification is problematic since water quality, facilities, and surroundings are not 'caused' by a common latent service quality construct. The opposite is however true.
Lobschat, Zinnbauer, Pallas, &	Long Range Planning	Social Currency	Conversation, advocacy, information,	Reflective-formative second-order	SEM (PLS)	Social currency needs to be conceptualized in a multidimensional	Extant studies overlooked the complexity of a brand's social value

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
Joachimsthaler (2013)			affiliation, utility, identity			construct so that all facets of a brand's social value derived from social interactions are captured.	where the multidimensional nature of the concept was not fully captured. Reasons include that consumer-to-consumer interaction as a driver of brand value is ignored, or that only one individual communication channel is considered.
Luftman, Lyytinen, & Zvi (2017)	Journal of Information Technology	IT-Business Alignment	Communications, value analytics, IT governance, partnering, dynamic IT scope, business, IT skills development	Formative-formative second-order	SEM (PLS)	Only when IT-business alignment is conceptualized as a formative construct of its six dimensions, will it have the greatest possible positive impact on company performance.	Generalizing the benefits of IT-business alignment across different industries, competitive contexts and/or firm characteristics is hard to achieve given the limitations of previous studies in terms of sample size and sampling bias. This is due to their focus on one industry, company type or geographic location.
Pee, Woon, & Kankanhalli (2008)	Information & Management	Facilitating Conditions	N/A. FC is a first order formative construct.	Formative first-order	SEM (PLS)	Each indicator jointly determines the meaning of FC and exclusion of any	N/A.

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
						indicator would distort the construct's meaning.	
Roberts, Thatcher, & Grover (2010)	International Journal of Production Research	Cooperation	Flexibility, voluntary exchange, problem solving, restraint	Reflective-formative second-order	SEM (PLS)	In theory, cooperation between buyer and supplier as a construct is a function of four distinct dimensions/sources (Heide & Miner, 1992, as cited in Grover, 2010). Exclusion of one of the dimensions will substantially alter the meaning of the construct.	N/A.
Ruiz, Gremler, Washburn, & Carrión (2008)	Journal of Business Research	Service value	Service quality, service equity, confidence benefits, perceived sacrifice	Reflective-formative second-order	MIMIC model	Zeithaml's (1998, as cited in Ruiz et al., 2008) framework for conceptualizing value which is multidimensional is used; it consists of various benefits and sacrifices.	Service value in a trade-off (benefits & sacrifices) framework should not be conceptualized as a reflective construct due to: (i) causality from benefits and sacrifices to service value; (ii) benefits and sacrifices that are unique, hence not interchangeable; (iii) the requirement for benefits and sacrifices to covary that lacks theoretical reasoning.

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
Theodosiou, Katsikea, Samiee, & Makri (2019)	Journal of Interactive Marketing	e-Service Quality (e-SQ)	Security/Privacy, fulfillment/ reliability, customer service, website design, informativeness, customization	Formative-formative second-order	SEM	Customers' attitudes and behavior are influenced by overall service quality perceptions. Hence, the need for a robust measurement approach for overall e-SQ.	The e-SQ scale developed using reflective indicators results in model misspecification and in turn delivers biased results (Collier & Bienstock, 2006, as cited in Theodosiou et al., 2019).
Thornton, Henneberg, & Naudé (2014)	Industrial Marketing Management	Organizational networking	Information acquisition, opportunity enabling, strong-tie resource mobilization, weak-tie resource mobilization	Reflective-formative second-order	MIMIC Model	Organizational networking is conceptualized as an anticipated- outcome driven interaction consisting of activities/routines/practices which enables firms to leverage their networks of relationships.	Empirical and quantitative studies on organization networking is lacking in the literature.
Wang & Haggerty (2011)	Journal of Management Information Systems	Individual Virtual Competence (IVC)	Computer self-efficacy, remote work self-efficacy, virtual social skill, virtual media skill	Formative-formative second-order	PLS	Individual virtual competence is treated because a formative construct as its dimensions aggregately form it rather than reflect it as an overarching construct.	Prior studies were limited to highly virtual settings with specific virtual work outcomes.
Willems et al. (2012)	Journal of Social Service Research	Governance Quality Index (GQI)	External shareholder involvement (ESI), consistent planning (CP), structures and	Formative-formative second-order	MIMIC Model	The concept of governance quality is described to have several conceptual levels or subdimensions.	A reflective approach in measuring governance quality is inappropriate because it is the degree of compliance

Author(s)	Journal	Formative Construct(s)	Dimension(s)	Model	Estimation Method	Justification	Critique
			procedures (SP), continuous improvement (CI), leadership team dynamics (LTD)			These subdimensions are unlikely to be captured by a single indicator.	to various standards operationalized through codes of conduct that determine the governance quality of an organization.
Yang & Wu (2016)	Government Information Quarterly	Facilitating Conditions	N/A. FC is a first order formative construct.	Formative first-order	SEM (PLS)	N/A. Justification for conceptualizing FC as a formative construct is not explicitly stated.	N/A.
Yoganathan & Kajanan (2014)	Creating Value for All Through IT (Book)	Facilitating Conditions	N/A. FC is a first order formative construct.	Formative first-order	SEM (PLS)	Each indicator jointly determines the meaning of FC and exclusion of any indicator would distort the construct's meaning.	N/A.
This study		Facilitating Conditions	Conceptualized to consist of five dimensions – Infrastructure, technical and support services, legal and regulatory framework, financial factors and affordability, and self-efficacy.	Reflective-formative higher-order construct	SEM (PLS)	Contextualize the UTAUT and the FC construct amongst individuals from urban-poor community.	

Appendix C. Constructs and Measurement Model

Table C1. Constructs and Items

Construct	Code	Measurement Items
Performance expectancy (Adapted from Davis, 1989)	PE01	I believe using a mobile phone enables me to be better connected
	PE02	I believe using a mobile phone makes it easier for others to contact me
	PE03	I believe using a mobile phone enables me to exchange information anytime and anywhere there is mobile coverage
	PE04	I believe using a mobile phone at a location other than hone is useful (e.g., workplace, overseas)
Effort expectancy (Adapted from Venkatesh, Morris, Davis, & Davis, 2003)	EE01	I believe a mobile phone is easy to use
	EE02	I believe a mobile phone seems very user friendly
	EE03	I would feel comfortable using mobile phone on my own
	EE04	I believe I clearly understand how to use a mobile phone
Social influence (Adapted from Venkatesh et al., 2003)	SI01	I use the mobile phone because my family members/friends/colleagues use it
	SI02	I believe people who are important to me influence me to use the mobile phone
	SI03	I believe hearing about the mobile phone from other media *(e.g. radio, TV)* influences me to use the mobile phone
	SI04	I believe hearing about the mobile phone from other community groups *(e.g. religious institutions, political bodies, cultural associations, NGOs)* influences me to use the mobile phone
Non-instrumental use (NIU) (Adapted from van der Heijden, 2004; Hsieh, Rai & Keil, 2008)	UB01	Basic talk for social purposes
	UB02	SMS
	UB03	Taking photos
	UB04	Listening to music
Instrumental use (IU) (Adapted from van der Heijden, 2004; Hsieh et al., 2008)	UB05	Products & services
	UB06	News updates
	UB07	Credit facility
	UB08	Education purposes

Table C2. Measurement of Facilitating Conditions

Construct	Context	Code	Questionnaire Item
Facilitating conditions (Adapted from Thompson et al., 1991; Venkatesh, Thong, & Xu, 2012; Wu & Wang, 2005)	Infrastructure (Adapted from Venkatesh et al., 2012)	FC01[7]	I believe I have the necessary telecommunication infrastructure to use the mobile phone (e.g., adequate network coverage)
	Technical and support services (Adapted from Thompson et al., 1991)	FC02	I believe guidance is available in the selection of mobile phones
		FC03	I believe specialized instructions regarding the mobile phone are available
		FC04	I believe customer support is available for assistance with difficulties when using the mobile phone
	Legal and regulatory environment (Adapted from Liew et. al., 2014; Venkatesh et al, 2012; Lu, Liu, Yu, & Wang, 2008; Datta, 2011; Vaithilingam et al., 2012)	FC05	I believe there is adequate law and regulation governing unwanted mobile messages (e.g., spam)
		FC06	I believe there is adequate law and regulation to ensure the credibility of service providers
		FC07	I believe there is adequate consumer rights protection in place to keep consumers well informed
	Financial factors and affordability (Adapted from Liew et al., 2014; Wu & Wang, 2005)	FC08	I think the cost of owning a mobile phone is affordable
		FC09	I think the cost of using a mobile phone is affordable (e.g., to call, SMS, etc.)
	Self-efficacy (Adapted from Venkatesh et al., 2012)	FC10[8]	I believe I have the knowledge necessary to use the mobile phone on my own

[7] In this study, we used a single item (SI) scale to measure SI as it is still a viable option in exploratory research situations (Diamantopoulus, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). In terms of infrastructure, as explained in the section discussing NIU and IU and its link to UTAUT (on page 13), mobile use in Malaysia require significant hardware installation and electricity, both of which are typically available in urban poor dwellings, albeit with some interruptions. Thus, the main limitations vis-a-vis infrastructure would be adequate mobile and electricity infrastructure. Similarly, self-efficacy was captured with a single 'global' item for survey respondents in this study. Generally, they had a low education level and limited understanding of several domains of self-efficacy which brought about some confusion in this segment of the population. Hence, a single "global" item was used, as it allows respondents to "consider all aspects of the construct being measured" (Nagy, 2002, p. 79).

[8] Ibid

Table C3. Loadings and Cross-loadings

	EE	FC	FCC	FCI	FCR	FCS	FCT	IU	NIU	PE	SI
EE01	**0.799**	0.390	0.276	0.357	0.295	0.180	0.285	0.088	0.104	0.572	0.188
EE02	**0.705**	0.359	0.224	0.314	0.240	0.211	0.300	0.042	0.054	0.388	0.268
EE03	**0.726**	0.322	0.241	0.321	0.204	0.161	0.215	0.086	0.157	0.387	0.251
EE04	**0.749**	0.447	0.329	0.313	0.307	0.358	0.299	0.074	0.223	0.379	0.246
FC01	0.438	0.771	0.437	**1.000**	0.414	0.374	0.492	0.139	0.147	0.404	0.354
FC02	0.306	0.584	0.353	0.401	0.326	0.277	**0.808**	0.187	0.150	0.298	0.383
FC03	0.315	0.606	0.381	0.425	0.410	0.271	**0.855**	0.094	0.129	0.403	0.329
FC04	0.279	0.592	0.405	0.374	0.462	0.210	**0.773**	0.165	0.166	0.338	0.356
FC05	0.281	0.650	0.394	0.394	**0.862**	0.200	0.425	0.142	0.200	0.382	0.276
FC06	0.298	0.663	0.371	0.342	**0.863**	0.263	0.428	0.211	0.185	0.288	0.359
FC07	0.343	0.700	0.463	0.342	**0.878**	0.230	0.427	0.208	0.242	0.392	0.245
FC08	0.294	0.605	**0.908**	0.402	0.419	0.222	0.403	0.118	0.188	0.431	0.223
FC09	0.365	0.671	**0.926**	0.401	0.449	0.345	0.453	0.129	0.166	0.438	0.238
FC10	0.306	0.618	0.312	0.374	0.267	**1.000**	0.311	0.153	0.166	0.215	0.242
PE01	0.427	0.409	0.344	0.326	0.350	0.144	0.328	0.180	0.175	**0.783**	0.204
PE02	0.505	0.411	0.394	0.299	0.309	0.162	0.360	0.149	0.140	**0.837**	0.210
PE03	0.471	0.427	0.406	0.317	0.329	0.235	0.313	0.169	0.184	**0.735**	0.181
PE04	0.468	0.421	0.366	0.349	0.318	0.145	0.362	0.159	0.153	**0.839**	0.227
SI01	0.334	0.318	0.183	0.240	0.316	0.134	0.249	0.073	0.070	0.257	**0.621**
SI02	0.307	0.412	0.296	0.315	0.363	0.190	0.319	0.097	0.094	0.245	**0.644**
SI03	0.188	0.351	0.193	0.256	0.257	0.177	0.398	0.193	0.147	0.201	**0.862**
SI04	0.207	0.294	0.121	0.273	0.150	0.218	0.309	0.160	0.101	0.123	**0.799**
UB01	0.148	0.214	0.169	0.156	0.197	0.073	0.131	0.131	0.349	0.208	0.083
UB02	0.186	0.231	0.149	0.155	0.211	0.168	0.130	0.352	**0.708**	0.185	0.077
UB03	0.104	0.176	0.166	0.101	0.154	0.074	0.142	0.458	**0.834**	0.137	0.131
UB04	0.115	0.173	0.103	0.058	0.169	0.156	0.135	0.486	**0.855**	0.113	0.125
UB05	0.032	0.152	0.081	0.086	0.169	0.059	0.100	**0.844**	0.476	0.128	0.153
UB06	0.080	0.241	0.146	0.140	0.217	0.163	0.184	**0.851**	0.472	0.180	0.165
UB07	0.162	0.228	0.136	0.132	0.177	0.162	0.194	**0.808**	0.440	0.222	0.189
UB08	0.049	0.167	0.077	0.100	0.147	0.124	0.121	**0.811**	0.361	0.151	0.121

Table C4. Results for PE, EE, SI and FC

Effects on endogenous constructs	Path coefficient	95% Bias Corrected CI	Effect Size, f^2
PE → NIU	0.070	[-0.072; 0.209]	0.003
PE → IU	0.121**	[0.009; 0.230]	0.012
EE → NIU	0.036	[-0.091; 0.157]	0.001
EE → IU	-0.118**	[-0.218; -0.013]	0.012
EE → PE	0.588***	[0.472; 0.674]	0.528
SI → NIU	0.030	[-0.093; 0.132]	0.001
SI → IU	0.103**	[0.000; 0.188]	0.012
FC → EE	0.485***	[0.388; 0.561]	0.308
Notes: *** = p < 0.01; ** = p < 0.05; * = p < 0.1			

Table C5. Post-hoc Comparison of Alternative model with Individual Dimensions for FC with Current Model with FC as Second-order Reflective-formative Construct

Relationships for Alternative Model	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics Alternative Model (FC as individual dimensions)	Relationships for Current Model	T Statistics Current Model (FC as second order—parsimonious model)
EE → IU	-0.126	-0.130	0.054	2.346**	EE → IU	2.359**
EE → NIU	0.037	0.031	0.064	0.579	EE → NIU	0.415
EE →PE	0.587	0.594	0.051	11.558***	EE → PE	11.619***
FCC → EE	0.113	0.118	0.066	1.729*	FC → EE	11.826***
FCI → EE	0.246	0.244	0.060	4.116***		
FCS → EE	0.114	0.114	0.052	2.203**		
FCR → EE	0.122	0.119	0.092	1.322		
FCT → EE	0.100	0.109	0.064	1.563		
FCC → IU	-0.059	-0.058	0.052	1.119	FC → IU	1.374
FCI → IU	0.005	0.006	0.052	0.089		
FCS → IU	0.051	0.052	0.049	1.039		
FCR → IU	0.056	0.055	0.043	1.290		

FCT → IU	0.023	0.024	0.058	0.397		
FCC → NIU	0.040	0.040	0.06	0.677	FC → NIU	2.643**
FCI → NIU	-0.035	-0.037	0.064	0.543		
FCS → NIU	0.084	0.084	0.056	1.501		
FCR → NIU	0.147	0.149	0.058	2.513**		
FCT → NIU	0.018	0.015	0.064	0.280		
NIU → IU	0.497	0.500	0.039	12.781***	NIU →IU	13.065***
PE → IU	0.137	0.137	0.057	2.404**	PE → IU	2.129**
PE → NIU	0.081	0.087	0.072	1.117	PE → NIU	1.163
SI → IU	0.095	0.099	0.051	1.857*	SI → IU	1.990*
SI → NIU	0.038	0.048	0.058	0.654	SI → NIU	0.580
Notes: *** = p < 0.01; ** = p < 0.05; * = p < 0.1; NIU = Non-instrumental use, IU = Instrumental use, EE = Effort expectancy, SI = social influence, PE = Performance expectancy, FC = Facilitating conditions.						

Table C6a: Assessment of Normality

We followed Cain, Zhang, and Yuan (2017), where both univariate and multivariate skewness and kurtosis were assessed to test for significance of nonnormality[9] in the data

	Skewness	Kurtosis
EE	-1.389	2.700
FC	-1.090	2.750
FCC	-1.290	2.029
FCI	-1.367	2.175
FCR	-1.293	2.140
FCS	-1.036	0.608
FCT	-1.392	3.326
IU	0.575	-0.978
NIU	-0.244	-0.989
PE	-1.832	4.528
SI	-0.585	-0.454
Mardia's multivariate skewness and kurtosis		

[9] . Web application developed by Cain et al. (2017) was used and is available at http://psychstat.org/kurtosis.

	b	p-value
Skewness	29.930	0.000
Kurtosis	205.461	0.000

"A general guideline for skewness is that if the number is greater than +1 or lower than -1, this is an indication of skewed distribution. For kurtosis, the general guideline is that if the number is greater than +1, the distribution is too peaked. Likewise, a kurtosis of less than –1 indicates a distribution that is too flat. Distributions exhibiting skewness and/or kurtosis that exceed these guidelines are considered nonnormal." (Hair et al., 2017, p. 61).

From the results shown in the table above, we conclude that the constructs are individually non-normal based on z-test (at 95% significance level) where the skewness and kurtosis were found to be significantly larger than zero. For the multivariate case, the *p*-values calculated based on a chi-square test for both the skewness and kurtosis were approximately zero, indicating significant departure from a multivariate normal distribution. Therefore, PLS-SEM is used in lieu of CB-SEM which requires the assumption of normality.

Table C6b: Assessment of Linearity

For linearity assessment, we followed the two-step approach outlined in Sarstedt et al. (2020). Based on the latent variable scores of the converged model estimated using the PLS-SEM algorithm, Ramsey's (1969) Regression Equation Specification Error Test (RESET) test was conducted to test for quadratic effects in the model. Although the RESET test considers cubic effects by default, a cubic term is not included in our testing process because the theoretical grounds underpinning a cubic relationship is rare, especially in the social sciences (Hair et al., 2018). We conclude from the results of the RESET tests that the constructs in the model were not subject to nonlinearities.

The absence of nonlinear effects was further confirmed by adding interaction terms to represent quadratic effects between the constructs. Results from 5000 bootstrapped samples provide further evidence that nonlinear effects were nonsignificant. The linear effects model was therefore found to be robust.

Nonlinear relationship	Coefficient	p value	Ramsey's RESET

FC*FC -> EE	0.017	0.678	$F\ (1{,}393)\ = 0.528, p = 0.468$
EE*EE -> PE	0.004	0.950	$F\ (1{,}393)\ = 0.031, p = 0.860$
FCC*FCC -> FC	0.001	0.834	$F\ (5{,}385)\ = 2.000, p = 0.078$
FCI*FCI -> FC	0.001	0.855	
FCR*FCR -> FC	−0.007	0.178	
FCS*FCS -> FC	0.001	0.873	
FCT*FCT -> FC	0.003	0.427	
EE*EE -> NIU	−0.007	0.863	$F\ (4{,}387)\ = 0.878, p = 0.477$
FC*FC -> NIU	−0.045	0.200	
PE*PE -> NIU	0.043	0.264	
SI*SI -> NIU	0.000	0.996	
EE*EE -> IU	−0.024	0.392	$F\ (5{,}385)\ = 1.416, p = 0.218$
NIU*NIU -> IU	0.056	0.221	
PE*PE -> IU	0.042	0.189	
SI*SI -> IU	−0.036	0.400	
FC*FC -> IU	0.027	0.270	

Table C6c: Assessment of Endogeneity

Sarstedt et al. (2020) provide an application of Hult et al.'s (2018) systematic procedure to test potential endogeneity.

Step 1: Verify the latent scores of the independent variables are nonnormally distributed using the Kolmogorov-Smirnov test with Lilliefors correction. Results of the Kolmogorov-Smirnov test indicated that all the independent variables' latent scores deviate significantly from a normal distribution (p-value < 0.05).

Step 2: Checking the variables for endogeneity using the Gaussian copula analysis. Given a large number of combinations of possible Gaussian copula, we focus on the model, which includes the copula for all the independent variables. Because the p-values for all the Gaussian copulas were not significant as shown in the table below, we concluded that endogeneity was not an issue in our study, thus lending robustness to our model.

Construct	Coefficient	p-value
FC	0.032	0.643
SI	0.059	0.431

EE	-0.086	0.247
PE	0.094	0.207
NIU	0.538	0.000
^{C}FC	0.032	**0.488**
^{C}SI	0.023	**0.525**
^{C}EE	-0.022	**0.384**
^{C}PE	0.009	**0.678**
^{C}NIU	-0.028	**0.593**

Note 1: ^{C} indicates the copula term in the model
Note 2: The associated R-codes are available on https://www.pls-sem.net/pls-sem-academy/gaussian-copula-files/
Note 3: All other combinations of Gaussian copulas were also tested and found to be nonsignificant.

Table C6d: Assessment of Unobserved Heterogeneity

In addition to testing for normality, linearity and endogeneity, assessment of unobserved heterogeneity in the data were performed using the Finite Mixture Partial Least Squares (FIMIX-PLS) method as part of robustness checks of the structural model, following recommendations in Sarstedt et al. (2020).

	Number of segments				
Criteria	1	2	3	4	5
AIC	2979.68	2783.90	2712.03	2552.43	**2517.59**
AIC_3	3000.68	2826.90	2777.03	2639.43	**2626.59**
AIC_4	3021.68	2869.90	2842.03	**2726.43**	2735.59
BIC	3063.29	2955.10	2970.83	**2898.81**	2951.56
CAIC	3084.29	2998.10	3035.83	**2985.81**	3060.56
HQ	3012.80	2851.72	2814.56	2689.65	**2689.52**
MDL_5	**3565.73**	3983.90	4525.99	4980.34	5559.46
LnL	-1468.84	-1348.95	-1291.02	-1189.21	-1149.80
EN	na	0.58	0.66	0.68	0.71
NFI	na	0.64	0.67	0.67	0.68
NEC	na	165.75	135.10	125.62	116.19

Number of segments	Segment 1	Segment 2	Segment 3	Segment 4	Segment5
1	1.000				

2	0.539	0.461			
3	0.468	0.444	0.088		
4	0.412	0.227	0.187	0.174	
5	0.373	0.226	0.190	0.124	0.087

Note: This table shows the relative segment sizes for N=396 are declining for each of the two to five segment solutions.

According to Sarstedt, Becker, Ringle, and Schwaiger (2011), a specific segmentation solution exists when AIC_3 and CAIC suggest the same number of segments. However, based on the results of our analysis, AIC_3 and CAIC indicated different segment numbers of five and four respectively. Hence, we conclude that there was no one definite segmentation solution and the one-segment solution used in our study was appropriate.

Appendix D. Interview Questions

Appendix D1: Interview Questions

1. Do you have the necessary facilities to use mobile phones?
2. How is the network reception/service in your area?
3. Is there anyone who can help you when you face difficulties when using mobile phones?
4. What do you use your mobile phones for? (e.g. Do you use it to pay bills? If yes/no, why?)
5. Are you subscribed to a mobile phone package with any network providers?
6. What are your thoughts about these packages?
7. How would you perceive your knowledge and competency in using mobile phones?

Appendix D2: Interview Questions

1. What do you use your mobile phone for (entertainment, social media, payment, banking, reading news, education) and how often do you use it for such purposes?
2. Do you think that your increased use of mobile phones for entertainment or social media could lead to increased use for more instrumental purposes such as using banking services, paying for goods and/or services, seek educational material? Why/Why not?
3. What would be some of the main factors that would facilitate your mobile phone use for more instrumental purposes?
4. Do you think it is important for mobile phone services to be reliable to use it for instrumental purposes?
5. If there are better support services and cybersecurity education and protection, does this encourage you to use mobile phones for instrumental purposes?
6. Would you use mobile phones more if the cost of owning and maintaining one is lower?
7. Do you believe that your ability in using mobile phones affects how you use them? If so, what are some of the ways that could increase your confidence of using mobile phones?

8. If the facilitating conditions above are improved, would you be more willing to learn and use mobile phones for more instrumental purposes?
9. Please give any other suggestions you may have for increasing your use of mobile phones for more instrumental purposes.

References for Appendixes

Ahmad, M. O., Markkula, J., & Oivo, M. (2013). Factors affecting e-government adoption in Pakistan: A citizen's perspective. *Transforming Government: People, Process and Policy*, *7*(2), 225–239. https://doi.org/10.1108/17506161311325378.

Ahmed, Z., Kader, A., Rashid, H. U., & Nurunnabi, M. (2017). User perception of mobile banking adoption: An integrated TTF-UTAUT model. *Journal of Internet Banking and Commerce*, *22*(3), 1–19. Retrieved from https://www.icommercecentral.com/open-access/user-perception-of-mobile-banking-adoption-an-integrated-ttfutaut-model.pdf.

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., & Simintiras, A. C. (2016). Jordanian consumers' adoption of telebanking: Influence of perceived usefulness, trust and self-efficacy. *International Journal of Bank Marketing*, *34*(5), 690–709. https://doi.org/10.1108/IJBM-06-2015-0093.

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., & Williams, M. D. (2016). Consumer adoption of mobile banking in Jordan: Examining the role of usefulness, ease of use, perceived risk and self-efficacy. *Journal of Enterprise Information Management*, *29*(1), 118–139. https://doi.org/10.1108/JEIM-04-2015-0035.

Al-Athmay, A. A. A. R. A. (2015). Demographic factors as determinants of e-governance adoption: A field study in the United Arab Emirates (UAE). *Transforming Government: People, Process and Policy*, *9*(2), 159–180. https://doi.org/10.1108/TG-07-2014-0028.

Aldhaheri, M., Bakchan, A., & Sandhu, M. A. (2018). A structural equation model for enhancing effectiveness of engineering, procurement and construction (EPC) major projects: End-user's perspective. *Engineering, Construction and Architectural Management, 25*(9), 1226–1252. https://doi.org/10.1108/ECAM-07-2017-0130.

Al-Gahtani, S. S. (2004). Computer technology acceptance success factors in Saudi Arabia: An exploratory study. *Journal of Global Information Technology Management*, *7*(1), 5–29. https://doi.org/10.1080/1097198X.2004.10856364.

Ali, U., Mehmood, A., Majeed, M. F., Muhammad, S., Khan, M. K., Song, H., & Malik, K. M. (2018). Innovative citizen's services through public cloud in Pakistan: User's privacy concerns and impacts on adoption. *Mobile Networks and Applications, 24*(1), 47–68. https://doi.org/10.1007/s11036-018-1132-x.

AlMutairi, S. M., & Yen, D. (2017). International diffusion of digital innovations: Mapping the mobile telephony of the Arab States. *The Bottom Line*, *30*(4), 310–329. https://doi.org/10.1108/BL-08-2017-0020.

Al-Sammarraie, M. K. F., Rasheed, M. M., & Faieq, A. K. (2016). Determinants of the long-term factors and effects of sustainability on usage of electronic government services: Evidence from the Kingdom of Saudi Arabia. *International Journal of Economic Perspectives*, *10*(4), 622–633. https://www.researchgate.net/publication/319304667/.

Alzubi, M. M., Alkhawlani, M. A., & El-Ebiary, Y. A. B. (2017). Investigating the factors affecting university students' e-commerce intention towards: A case study of Jordanian universities. *Journal of Business and Retail Management Research*, *12*(1), 189–194. https://doi.org/10.24052/JBRMR/V12IS01/ITFAUSEITACSOJU.

Arenas-Gaitán, J., Peral-Peral, B., & Ramón-Jerónimo, M. (2015). Elderly and Internet banking: An application of UTAUT2. *Journal of Internet Banking and Commerce*, *20*(1), 1–23. Retrieved from http://www.arraydev.com/commerce/jibc/.

Arora, S., & Sandhu, S. (2018). Usage based upon reasons: The case of electronic banking services in India. *The International Journal of Bank Marketing*, *36*(4), 680–700. https://doi.org/10.1108/IJBM-03-2017-0060.

Baabdullah, A. M. (2018). Factors influencing adoption of mobile social network games (M-SNGs): The role of awareness. *Information Systems Frontiers*, 22(2), 411–427. https://doi.org/10.1007/s10796-018-9868-1.

Bankole, F. O., Bankole, O. O., & Brown, I. (2017). Influences on cell phone banking adoption in South Africa: An updated perspective. *Journal of Internet Banking and Commerce*, *22*(3), 1–16. Retrieved from https://www.icommercecentral.com/.

Barroso, C., & Picón, A. (2012). Multi-dimensional analysis of perceived switching costs. *Industrial Marketing Management, 41*(3), 531–543. https://doi.org/10.1016/j.indmarman.2011.06.020.

Batara, E., Nurmandi, A., Warsito, T., & Pribadi, U. (2017). Are government employees adopting local e-government transformation? The need for having the right attitude, facilitating conditions and performance expectations. *Transforming Government: People, Process and Policy*, *11*(4), 612–638. https://doi.org/10.1108/tg-09-2017-0056.

Boateng, R., Mbrokoh, A. S., Boateng, L., Senyo, P. K., & Ansong, E. (2016). Determinants of e-learning adoption among students of developing countries. *The International Journal of Information and Learning Technology*, *33*(4), 248–262. https://doi.org/10.1108/IJILT-02-2016-0008.

Bruhn, M., Georgi, D. & Hadwich, K. (2008). Customer equity management as formative second-order construct. *Journal of Business Research, 61(12)*, 1292–1301. https://doi.org/10.1016/j.jbusres.2008.01.016.

Cain, M. K., Zhang, Z., & Yuan, K. H. (2017). Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation. *Behavior Research Methods, 49*, 1716–1735. https://doi.org/10.3758/s13428-016-0814-1.

Chan, F. K. Y., Thong, J. Y. L., Venkatesh, V., Brown, S. A., Hu, P. J., & Tam, K. Y. (2010). Modeling citizen satisfaction with mandatory adoption of an e-government technology.

Journal of the Association for Information Systems, *11*(10), 519–549. https://doi.org/10.17705/1jais.00239.

Chaputula, A. H., & Mutula, S. (2018). eReadiness of public university libraries in Malawi to use mobile phones in the provision of library and information services. *Library Hi Tech*, *36*(2), 270–288. https://doi.org/10.1108/LHT-10-2017-0204.

Chatzoglou, P. D., Vraimaki, E., Diamantidis, A., & Sarigiannidis, L. (2010). Computer acceptance in Greek SMEs. *Journal of Small Business and Enterprise Development*, *17*(1), 78–101. https://doi.org/10.1108/14626001011019143.

Chawinga, W. D., & Zinn, S. (2016). Use of Web 2.0 by students in the faculty of information science and communications at Mzuzu University, Malawi. *South African Journal of Information Management*, *18*(1), 1–12. https://doi.org/10.4102/sajim.v18i1.694.

Chiwara, J. R., Chinyamurindi, W. T., & Mjoli, T. Q. (2017). Factors that influence the use of the Internet for job-seeking purposes amongst a sample of final-year students in the Eastern Cape province of South Africa. *SA Journal of Human Resource Management*, *15*(1), 1–9. https://doi.org/10.4102/sajhrm.v15i0.790.

Choudrie, J., Pheeraphuttranghkoon, S., & Davari, S. (2018). The digital divide and older adult population adoption, use and diffusion of mobile phones: A quantitative study. *Information Systems Frontiers*, 1–23. https://doi.org/10.1007/s10796-018-9875-2.

Chua, P. Y., Rezaei, S., Gu, M. L., Oh, Y., & Jambulingam, M. (2018). Elucidating social networking apps decisions: Performance expectancy, effort expectancy and social influence. *Nankai Business Review International*, *9*(2), 118–142. https://doi.org/10.1108/NBRI-01-2017-0003.

Cilliers, L., & Flowerday, S. V. (2013). Health information systems to improve health care: A telemedicine case study. *South African Journal of Information Management*, *15*(1), Article 541. https://doi.org/10.4102/sajim.v15i1.541.

Darrow, J. B., & Behrend, T. S. (2017). Person-environment fit is a formative construct. *Journal of Vocational Behavior*, *103*, 117–131. https://doi.org/10.1016/j.jvb.2017.08.007.

Datta, P. (2011). A preliminary study of ecommerce adoption in developing countries. *Information Systems Journal*, *21*(1), 3–32. https://doi.org/10.1111/j.1365-2575.2009.00344.x.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340. https://doi.org/10.2307/249008.

Delcourt, C., Gremler, D. D., van Riel, A. C. R., & van Birgelen, M. J. H. (2016). Employee emotional competence: Construct conceptualization and validation of a customer-based measure. *Journal of Service Research, 19*(1), 72–87. https://doi.org/10.1177/1094670515590776.

Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., & Kaiser, S. (2012). Guidelines for choosing between multi-item and single-item scales for construct measurement: A predictive validity perspective. *Journal of the Academy of Marketing Science, 40*(3), 434-449. https://doi.org/10.1007/s11747-011-0300-3.

Dickinger, A., & Stangl, B. (2013). Website performance and behavioral consequences: A formative measurement approach. *Journal of Business Research, 66*(6), 771–777. https://doi.org/10.1016/j.jbusres.2011.09.017.

Dwivedi, Y. K., Khoumbati, K., Williams, M. D., & Lal, B. (2007). Factors affecting consumers' behavioural intention to adopt broadband in Pakistan. *Transforming Government: People, Process and Policy*, *1*(3), 285–297. https://doi.org/10.1108/17506160710778112.

Eria, S. (2018). Diffusion of GIS in Uganda: The role of change agents, opinion leaders, champions, social network links and re-invention. *GeoJournal, 84*(6), 1567–1595. https://doi.org/10.1007/s10708-018-9938-4.

Fakhoury, R., & Baker, D. S. (2016). Governmental trust, active citizenship, and e-government acceptance in Lebanon. *Journal of Leadership, Accountability and Ethics*, *13*(2), 36–52. https://articlegateway.com/index.php/JLAE/article/view/1915/1815/.

Fan, J., Shao, M., Li, Y., & Huang, X. (2018). Understanding users' attitude toward mobile payment use: A comparative study between China and the USA. *Industrial Management & Data Systems*, *118*(3), 524–540. https://doi.org/10.1108/IMDS-06-2017-0268.

Farah, M. F., Hasni, M. J. S., & Abbas, A. K. (2018). Mobile-banking adoption: Empirical evidence from the banking sector in Pakistan. *International Journal of Bank Marketing*, *36*(7), 1386–1413. https://doi.org/10.1108/IJBM-10-2017-0215.

Fetscherin, M., & Lattemann, C. (2008). User acceptance of virtual worlds. *Journal of Electronic Commerce Research*, *9*(3), 231–242. Retrieved from http://www.jecr.org/sites/default/files/09_3_p05.pdf/.

Gao, L., & Bai, X. (2014). A unified perspective on the factors influencing consumer acceptance of internet of things technology. *Asia Pacific Journal of Marketing and Logistics*, *26*(2), 211–231. https://doi.org/10.1108/APJML-06-2013-0061.

Guillemette, M. G., Laroche, M., & Cadieux, J. (2014). Defining decision making process performance: Conceptualization and validation of an index. *Information & Management, 51(6)*, 618–626. https://doi.org/10.1016/j.im.2014.05.012.

Gupta, A., & Dogra, N. (2017). Tourist adoption of mapping apps: A UTAUT2 perspective of smart travellers. *Tourism and Hospitality Management*, *23*(2), 145–161. https://doi.org/10.20867/thm.23.2.6.

Haba, H., Hassan, Z., & Dastane, O. (2017). Factors leading to consumer perceived value of smartphones and its impact on purchase intention. *Global Business and Management Research: An International Journal*, *9*(1), 42–71. Retrieved from http://www.gbmrjournal.com/pdf/vol.%209%20no.%201/V9N1-4.pdf.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Thousand Oaks, CA: Sage.

Hobololo, T. S., & Mawela, T. (2017). Exploring the use of mobile phones for public participation in the Buffalo City Metropolitan Municipality. *Agris On-Line Papers in Economics and Informatics*, *9*(1), 57–68. https://doi.org/10.7160/aol.2017.090105.

Holzmann, P., Schwarz, E. J., & Audretsch, D. B. (2020). Understanding the determinants of novel technology adoption among teachers: The case of 3D printing. *The Journal of Technology Transfer*, *45*(1), 259–275. https://doi.org/10.1007/s10961-018-9693-1.

Hossain, M. A. (2016). Assessing m-Health success in Bangladesh: An empirical investigation using IS success models. *Journal of Enterprise Information Management*, *29*(5), 774–796. https://doi.org/10.1108/JEIM-02-2014-0013.

Hossain, M. M., & Jamil, M. R. (2015). Consumer acceptance of more-than-voice (MTV) services: Evidence from the bottom of pyramid in Bangladesh. *The Journal of Developing Areas*, *49*(5), 25–39. https://doi.org/10.1353/jda.2015.0066.

Hsieh, J. P. A., Rai, A., & Keil, M. (2008). Understanding digital inequality: Comparing continued use behavioral models of the socio-economically advantaged and disadvantaged. *MIS Quarterly*, *32*(1) 97–126. https://doi.org/10.2307/25148830.

Hult, G. T. M., Hair, J. F., Proksch, D., Sarstedt, M., Pinkwart, A., & Ringle, C. M. (2018). Addressing endogeneity in international marketing applications of partial least squares structural equation modeling. *Journal of International Marketing*, *26*(3), 1–21. https://doi.org/10.1509/jim.17.0151.

Ilorah, A. I., Ditsa, G. E., & Mokwena, S. N. (2017). Readiness assessment framework for implementation of mobile e-Healthcare in rural South Africa. *International Journal of Health and Economic Development*, *3*(1), 1–32. Retrieved from https://www.proquest.com/docview/1895141183.

Inmor, S. (2016, April). The adoption of Facebook for educational purposes in Thailand. In I. Vrankic & D. Tomic (Eds.), *Economic and social development: Book of proceedings* (pp. 121–130). Barcelona, Spain: Varazdin Development and Entrepreneurship Agency. Retrieved from https://www.esd-conference.com/?page=past-conferences.

Iyer, J., & Srivastava, R. K. (2018). Exploring the factors associated with employees' intention to use e-government services in India. *The Journal of Applied Business and Economics*, *20*(5), 73–83. https://doi.org/10.33423/jabe.v20i5.362.

Khasawneh, M. H. A. (2015). A mobile banking adoption model in the Jordanian market: An integration of TAM with perceived risks and perceived benefits. *Journal of Internet Banking and Commerce*, *20*(3), 1–35. https://doi.org/10.4172/1204-5357.1000128.

Kim, S. (2011). Testing a revised measure of public service motivation: Reflective versus formative specification. *Journal of Public Administration Research and Theory, 21*(3), 521–546. https://doi.org/10.1093/jopart/muq048.

Kumar, R., Sachan, A., Mukherjee, A., & Kumar, R. (2018). Factors influencing e-government adoption in India: A qualitative approach. *Digital Policy, Regulation and Governance*, *20*(5), 413–433. https://doi.org/10.1108/DPRG-02-2018-0007.

Kyle, G., & Jun, J. (2015). An alternate conceptualization of the leisure constraints measurement model. *Journal of Leisure Research, 47*(3), 337–357. https://doi.org/10.1080/00222216.2015.11950364.

Liew, E. J. Y., Vaithilingam, S., & Nair, M. (2014). Facebook and socio-economic benefits in the developing world. *Behaviour & Information Technology*, *33*(4), 345–360. https://doi.org/10.1080/0144929X.2013.810775.

Liu, X., Fu, Y., Chao, R. F., & Li, J. (2019). A formative measurement approach for exploring how to form service quality in hot spring resorts. *Tourism and Hospitality Research, 19*(1), 27–39. https://doi.org/10.1177/1467358416683767.

Lu, J., Liu, C., Yu, C. S., & Wang, K. (2008). Determinants of accepting wireless mobile data services in China. *Information & Management, 45*(1), 52–64. https://doi.org/10.1016/j.im.2007.11.002.

Lobschat, L., Zinnbauer, M. A., Pallas, F., & Joachimsthaler, E. (2013). Why social currency becomes a key driver of a firm's brand equity - Insights from the automotive industry. *Long Range Planning, 46*(1-2), 125–148. https://doi.org/10.1016/j.lrp.2012.11.004.

Luftman, J., Lyytinen, K., & Zvi, T. (2017). Enhancing the measurement of information technology (IT) business alignment and its influence on company performance. *Journal of Information Technology, 32*(1), 26–46. https://doi.org/10.1057/jit.2015.23.

Lwoga, E. T., & Questier, F. (2014). Faculty adoption and usage behaviour of open access scholarly communication in health science universities. *New Library World*, *115*(3/4), 116–139. https://doi.org/10.1108/nlw-01-2014-0006.

Madan, K., & Yadav, R. (2016). Behavioural intention to adopt mobile wallet: A developing country perspective. *Journal of Indian Business Research*, *8*(3), 227–244. https://doi.org/10.1108/JIBR-10-2015-0112.

Maduku, D. K. (2015). An empirical investigation of students' behavioural intention to use e-books. *Management Dynamics: Journal of the Southern African Institute for Management Scientists*, *24*(3), 2–20. Retrieved from https://journals.co.za/doi/pdf/10.10520/EJC179374.

Makanyeza, C. (2017). Determinants of consumers' intention to adopt mobile banking services in Zimbabwe. *International Journal of Bank Marketing*, *35*(6), 997–1017. https://doi.org/10.1108/IJBM-07-2016-0099.

Makanyeza, C., & Mutambayashata, S. (2018). Consumers' acceptance and use of plastic money in Harare, Zimbabwe: Application of the unified theory of acceptance and use of technology 2. *International Journal of Bank Marketing*, *36*(2), 379–392. https://doi.org/10.1108/IJBM-03-2017-0044.

Maldonado, U. P. T., Khan, G. F., Moon, J., & Rho, J. J. (2011). E-learning motivation and educational portal acceptance in developing countries. *Online Information Review*, *35*(1), 66–85. https://doi.org/10.1108/14684521111113597.

Mansoori, K. A. A., Sarabdeen, J., & Tchantchane, A. L. (2018). Investigating Emirati citizens' adoption of e-government services in Abu Dhabi using modified UTAUT model. *Information Technology and People*, *31*(2), 455–481. https://doi.org/10.1108/ITP-12-2016-0290.

Masrek, M. N., Karim, N. S. A., & Hussein, R. (2008). The effect of organizational and individual characteristics on corporate intranet utilizations. *Information Management and Computer Security*, *16*(2), 89–112. https://doi.org/10.1108/09685220810879591.

Mbrokoh, A. S. (2016). Exploring the factors that influence the adoption of internet banking in Ghana. *Journal of Internet Banking and Commerce*, *21*(2), 1–20. Retrieved from https://www.icommercecentral.com/open-access/exploring-the-factors-that-influence-the-adoption-of-internet-banking-in-ghana.pdf.

Mikalef, P., Pappas, I. O., & Giannakos, M. (2016). An integrative adoption model of video-based learning. *The International Journal of Information and Learning Technology*, *33*(4), 219–235. https://doi.org/10.1108/IJILT-01-2016-0007.

Moghavvemi, S., Mohd Salleh, N. A., Zhao, W., & Mattila, M. (2012). The entrepreneur's perception on information technology innovation adoption: An empirical analysis of the role of precipitating events on usage behavior. *Innovation*, *14*(2), 231–246. https://doi.org/10.5172/impp.2012.14.2.231.

Mohammadi, H. (2015). A study of mobile banking usage in Iran. *International Journal of Bank Marketing*, *33*(6), 733–759. https://doi.org/10.1108/IJBM-08-2014-0114.

Mortimer, G., Neale, L., Hasan, S. F. E., & Dunphy, B. (2015). Investigating the factors influencing the adoption of m-banking: A cross cultural study. *International Journal of Bank Marketing*, *33*(4), 545–570. https://doi.org/10.1108/IJBM-07-2014-0100.

Mosweu, O., Bwalya, K., & Mutshewa, A. (2016). Examining factors affecting the adoption and usage of document workflow management system (DWMS) using the UTAUT model: Case of Botswana. *Records Management Journal*, *26*(1), 38–67. https://doi.org/10.1108/RMJ-03-2015-0012.

Mustafa, K., & Waheed, A. (2016). Impact of alternative factors on usage of telco-led branchless banking services: Empirical evidence from Pakistan. *Journal of Internet Banking and Commerce*, *21*(3), 1–19. Retrieved from https://www.icommercecentral.com/open-access/impact-of-alternative-factors-on-usage-of-telcoled-branchless-banking-servicesempirical-evidence-from-pakistan.pdf.

Nagy, M. S. (2002). Using a single-item approach to measure facet job satisfaction. *Journal of Occupational and Organizational Psychology, 75*(1), 77–86. https://doi.org/10.1348/096317902167658.

Namahoot, K. S., & Laohavichien, T. (2018). Assessing the intentions to use internet banking: The role of perceived risk and trust as mediating factors. *International Journal of Bank Marketing*, *36*(2), 256–276. https://doi.org/10.1108/IJBM-11-2016-0159.

Narattharaksa, K., Speece, M., Newton, C., & Bulyalert, D. (2016). Key success factors behind electronic medical record adoption in Thailand. *Journal of Health Organization and Management*, *30*(6), 985–1008. https://doi.org/10.1108/JHOM-10-2014-0180.

Nawi, N. B. C., Mamun, A. A., Nasir, N. A. B. M., Shokery, N. M. B. A. H., Raston, N. B. A., & Fazal, S. A. (2017). Acceptance and usage of social media as a platform among student entrepreneurs. *Journal of Small Business and Enterprise Development*, *24*(2), 375–393. https://doi.org/10.1108/JSBED-09-2016-0136.

Nel, J., Raleting, T., & Boshoff, C. (2012). Exploiting the technology cluster effect to enhance the adoption of WIG mobile banking among low-income earners. *Management Dynamics: Journal of the Southern African Institute for Management Scientists*, *21*(1), 30–44. Retrieved from https://journals.co.za/doi/abs/10.10520/EJC119179.

Niehaves, B., & Plattfaut, R. (2014). Internet adoption by the elderly: Employing IS technology acceptance theories for understanding the age-related digital divide. *European Journal of Information Systems*, *23*(6), 708–726. https://doi.org/10.1057/ejis.2013.19.

Nwagwu, W., & Akeem, A. (2013). Contexts of utilization of ICT by medical practitioners in private hospitals in Osun State Nigeria. *World Journal of Science, Technology and Sustainable Development*, *10*(3), 229–246. https://doi.org/10.1108/WJSTSD-01-2013-0004.

O'Connor, Y., Heavin, C., & O'Donoghue, J. (2016). First impressions are lasting impressions: Intention to participate in mobile health projects within developing countries. *Journal of Decision Systems*, *25*(2), 173–190. https://doi.org/10.1080/12460125.2016.1125647.

Offong, G. O., & Costello, J. (2017). Enterprise social media impact on human resource practices. *Evidence-Based HRM: A Global Forum for Empirical Scholarship, 5*(3), 328–343. https://doi.org/10.1108/EBHRM-06-2017-0031.

Olatubosun, O., Olusoga, F., & Shemi, A. P. (2014). Direct determinants of user acceptance and usage behavior of eLearning system in Nigerian tertiary institution of learning. *Journal of Information Technology and Economic Development*, *5*(2), 95–111. https://doi.org/10.9734/bjast/2015/18434.

Pee, L. G., Woon, I. M. Y., & Kankanhalli, A. (2008). Explaining non-work-related computing in the workplace: A comparison of alternative models. *Information & Management, 45(2)*, 120–130. https://doi.org/10.1016/j.im.2008.01.004.

Piabuo, S. M., Piendiah, N. E., Njamnshi, N. L., & Tieguhong, P. J. (2017). The impact of ICT on the efficiency of HRM in Cameroonian enterprises: Case of the mobile telephone industry. *Journal of Global Entrepreneurship Research*, *7*(1), 1–18. https://doi.org/10.1186/s40497-017-0063-5.

Qasim, H., & Abu-Shanab, E. (2016). Drivers of mobile payment acceptance: The impact of network externalities. *Information Systems Frontiers*, *18*(5), 1021–1034. https://doi.org/10.1007/s10796-015-9598-6.

Ramsey, J. B. (1969). Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society. Series B (Methodological), 31*(2), 350–371. https://doi.org/10.1111/j.2517-6161.1969.tb00796.x.

Rana, N. P., Dwivedi, Y. K., Lal, B., Williams, M. D., & Clement, M. (2017). Citizens' adoption of an electronic government system: Towards a unified view. *Information Systems Frontiers*, *19*(3), 549–568. https://doi.org/10.1007/s10796-015-9613-y.

Rehman, M., Esichaikul, V., & Kamal, M. (2012). Factors influencing e-government adoption in Pakistan. *Transforming Government: People, Process and Policy*, *6*(3), 258–282. https://doi.org/10.1108/17506161211251263.

Roberts, N., Thatcher, J. B., & Grover, V. (2010). Advancing operations management theory using exploratory structure equation modelling techniques. *International Journal of Production Research, 48*(15), 4329–4353. https://doi.org/10.1080/00207540902991682.

Ruiz, D. M., Gremler, D. D., Washburn, J. H., & Carrión, G. C. (2008). Service value revisited: Specifying a higher-order, formative measure. *Journal of Business Research, 61(12)*, 1278–1291. https://doi.org/10.1016/j.jbusres.2008.01.015.

Sahu, G. P., & Gupta, M. P. (2007). Users' acceptance of e-government: A study of Indian central excise. *International Journal of Electronic Government Research*, *3*(3), 1–21. https://doi.org/10.4018/jegr.2007070101.

Sambasivan, M., Wemyss, P. G., & Rose, C. R. (2010). User acceptance of a G2B system: A case of electronic procurement system in Malaysia. *Internet Research*, *20*(2), 169–187. https://doi.org/10.1108/10662241011032236.

Sarstedt, M., Becker, J. M., Ringle, C. M., & Schwaiger, M. (2011). Uncovering and treating unobserved heterogeneity with FIMIX-PLS: Which model selection criterion provides an

appropriate number of segments? *Schmalenbach Business Review, 63*(1), 34–62. https://doi.org/10.1007/BF03396886.

Sarstedt, M., Ringle, C. M., Cheah, J. H., Ting, H., Moisescu, O. I., & Radomir, L. (2020). Structural model robustness checks in PLS-SEM. *Tourism Economics, 26*(4), 531–554. https://doi.org/10.1177%2F1354816618823921.

Saxena, S. (2018). Role of “perceived risks” in adopting mobile government (m-government) services in India. *Foresight*, *20*(2), 190–205. https://doi.org/10.1108/FS-08-2017-0040.

Seethamraju, R., Diatha, K. S., & Garg, S. (2018). Intention to use a mobile-based information technology solution for tuberculosis treatment monitoring - Applying a UTAUT model. *Information Systems Frontiers*, *20*(1), 163–181. https://doi.org/10.1007/s10796-017-9801-z.

Sharma, H., & Pillai, S. P. (2017). Social media technology management in College of Technology in Oman: An empirical analysis. *Journal of International Education in Business*, *10*(2), 147–163. https://doi.org/10.1108/JIEB-09-2016-0029.

Sivathanu, B. (2018). An empirical study of cloud-based e-Governance services adoption in India. *International Journal of Electronic Government Research, 14*(1), 86–107. https://doi.org/10.4018/IJEGR.2018010105.

Sugiharto, T., Suhendra, E. S., & Hermana, B. (2010). Information technology and business performance: A case study on small food processing firms. *Journal of Global Business Administration*, *2*(1), 84–95. Retrieved from http://repository.gunadarma.ac.id/1276/.

Suliantoro, H., Ghozali, I., & Wibowo, M. A. (2015). E-procurement adoption in government institution: Predicting social values effect on intention and usage behavior of e-procurement. *International Journal of Business and Society*, *16*(2), 167–184. https://doi.org/10.33736/ijbs.562.2015.

Sun, Y., Wang, N., Guo, X., & Peng, Z. (2013). Understanding the acceptance of mobile health services: A comparison and integration of alternative models. *Journal of Electronic*

Commerce Research, *14*(2), 183–200. Retrieved from http://ir.nsfc.gov.cn/paperDownload/1000006533286.pdf.

Tak, P., & Panwar, S. (2017). Using UTAUT 2 model to predict mobile app-based shopping: Evidences from India. *Journal of Indian Business Research*, *9*(3), 248–264. https://doi.org/10.1108/JIBR-11-2016-0132.

Tarhini, A., Masa'deh, R. E., Al-Busaidi, K. A., Mohammed, A. B., & Maqableh, M. (2017). Factors influencing students' adoption of e-learning: A structural equation modeling approach. *Journal of International Education in Business*, *10*(2), 164–182. https://doi.org/10.1108/JIEB-09-2016-0032.

Theodosiou, M., Katsikea, E., Samiee, S., & Makri, K. (2019). A comparison of formative versus reflective approaches for the measurement of electronic service quality. *Journal of Interactive Marketing, 47*, 53–67. https://doi.org/10.1016/j.intmar.2019.03.004.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, *15*(1), 125–143. https://doi.org/10.2307/249443.

Thornton, S. C., Henneberg, S. C., & Naudé, P. (2014). Conceptualizing and validating organizational networking as a second-order formative construct. *Industrial Marketing Management, 43*(6), 951–966. https://doi.org/10.1016/j.indmarman.2014.05.001.

Turan, A. H. (2012). Internet shopping behavior of Turkish customers: Comparison of two competing models. *Journal of Theoretical and Applied Electronic Commerce Research*, *7*(1), 77–93. https://doi.org/10.4067/S0718-18762012000100007.

Vaithilingam, S., Nair, M., & Liew, E. J. Y. (2012). *Mobile communication ecology and socioeconomic development of urban poor communities in a developing country* [Unpublished manuscript]. Monash University Malaysia.

van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly*, *28*(4), 695–704. https://doi.org/10.2307/25148660.

Van Slyke, C., Ilie, V., Lou, H., & Stafford, T. (2007). Perceived critical mass and the adoption of a communication technology. *European Journal of Information Systems*, *16*(3), 270–283. https://doi.org/10.1057/palgrave.ejis.3000680.

Venkatesh, V., Bala, H., & Sykes, T. A. (2010). Impacts of information and communication technology implementations on employees' jobs in service organizations in India: A multi-method longitudinal field study. *Production and Operations Management*, *19*(5), 591–613. https://doi.org/10.1111/j.1937-5956.2010.01148.x.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478. https://doi.org/10.2307/30036540.

Venkatesh, V., & Sykes, T. A. (2013). Digital divide initiative success in developing countries: A longitudinal field study in a village in India. *Information Systems Research*, *24*(2), 239–260. https://doi.org/10.1287/isre.1110.0409.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157–178. https://doi.org/10.2307/41410412.

Wang, Y., & Haggerty, N. (2011). Individual virtual competence and its influence on work outcomes. *Journal of Management Information Systems, 27*(4), 299–334. https://doi.org/10.2753/MIS0742-1222270410.

Widuri, R., O'Connell, B., & Yapa, P. W. S. (2016). Adopting generalized audit software: An Indonesian perspective. *Managerial Auditing Journal*, *31*(8/9), 821–847. https://doi.org/10.1108/MAJ-10-2015-1247.

Willems, J., Huybrechts, G., Jegers, M., Weijters, B., Vantilborgh, T., Bidee, J., & Pepermans, R. (2012). Nonprofit governance quality: Concept and measurement. *Journal of Social Service Research, 38*(4), 561–578. https://doi.org/10.1080/01488376.2012.703578.

Wu, J. H., & Wang, S. C. (2005). What drives mobile commerce? An empirical evaluation of the revised technology acceptance model. *Information & Management*, *42*(5), 719–729. https://doi.org/10.1016/j.im.2004.07.001.

Yang, T. M., & Wu, Y. J. (2016). Examining the socio-technical determinants influencing government agencies' open data publication: A study in Taiwan. *Government Information Quarterly, 33*(3), 378–392. https://doi.org/10.1016/j.giq.2016.05.003.

Yoganathan, D., & Kajanan, S. (2014). What drives fitness apps usage? An empirical evaluation. In B. Bergvall-Kåreborn, & P. A. Nielsen (Eds.), *Creating value for all through IT: Proceedings of Conference on Transfer and Diffusion of IT (TDIT) 2014*, *IFIP Advances in Information and Communication Technology (*Vol. 429, pp. 179–196). Berlin, Heidelberg: Springer. https://doi.org/10.1007/978-3-662-43459-8_12.

Yu, C. S. (2012). Factors affecting individuals to adopt mobile banking: Empirical evidence from the UTAUT model. *Journal of Electronic Commerce Research*, *13*(2), 104–121. Retrieved from http://www.jecr.org/sites/default/files/13_3_p01_0.pdf.

Yuen, Y. Y., Yeow, P. H., Lim, N., & Saylani, N. (2010). Internet banking adoption: Comparing developed and developing countries. *Journal of Computer Information Systems*, *51*(1), 52–61. Retrieved from https://www.tandfonline.com/toc/ucis20/current.

Zhang, Y., Chen, X., Liu, X., & Zhu, N. (2018). Exploring trust transfer between internet enterprises and their affiliated Internet-only banks: An adoption study of Internet-only banks in China. *Chinese Management Studies*, *12*(1), 56–78. https://doi.org/10.1108/CMS-06-2017-0148.