



The Role of ICT Laws and National Culture in Determining ICT Diffusion and Well-Being: A Cross-Country Examination

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Abstract

ICT-induced legal and regulatory challenges, including security and privacy risks, are on the rise. Despite that, there is a dearth of research emphasizing the role of ICT laws and understanding its effect on the level of ICT diffusion and the well-being of a country. Drawing on Dror's law and social change framework, and grounding the discussion on the literature on ICT diffusion, the perspective of perceived risk, Hofstede's typology of national culture, and the technological determinism theory, this study (1) explores the effect of maturity of ICT laws in a country on ICT diffusion among its citizens and businesses; (2) understands how this relationship is contingent on the national cultural dimensions; and (3) explicates the role of ICT diffusion in promoting the well-being. The research model is examined using publicly available data from 83 countries, and the findings suggest that sound ICT laws are necessary for achieving a greater diffusion of ICTs and improving well-being.

Keywords Maturity of ICT laws · Security and privacy issues · National culture · ICT diffusion · Well-being

1 Introduction

Information and communication technology (ICT), which refers to “a diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information” (Charoensukmongkol and Moqbel 2012, p. 63), is a double-edged sword (Liang and Xue 2009). It is evident that ICTs have dramatically improved real-time communication worldwide and proved their potential to improve human, organizational, and governmental performance (Lee and Fedorowicz 2018). Nevertheless, they have brought about a host of legal and regulatory challenges, ranging from the validity of electronic contracts and the associated security risks to concerns over protecting the privacy and intellectual property rights online to cybercrime (Liang and Xue 2009; UN-

Report 2007). ICT may not be used at its full potential unless these issues are adequately addressed, and its diffusion would be limited (Larosiliere et al. 2017; UNCTAD 2015). Confirming this, a study conducted in the United States by the agencies, namely, National Cyber Security Alliance (NCSA) and TrustArc, revealed that 74% of the Internet users who were concerned about privacy online limited their online activity, and 28% of them stopped an online transaction (NCSAT 2016). It is thus crucial to address ICT-led legal and regulatory challenges for improving the level of ICT diffusion, conceptualized as the degree to which ICTs spread to general use within and across economies (Keller 2004).

Prior research has identified several potential determinants of ICT diffusion. Our review finds that these factors can be broadly classified into (1) socio-related factors, such as user behavior and organizational characteristics (e.g., Abukhzam and Lee 2010); (2) technology-related factors, such as ICT infrastructure and information technology (IT) knowledge (e.g., Lee et al. 2016); and (3) environmental factors, such as economic environment and regulatory settings (e.g., Brown and Thompson 2011). While these factors are important for driving ICT diffusion, with the increasing concerns of ICT-induced security and privacy risks, it becomes imperative to investigate how ICT-related regulatory environment (i.e., ICT laws) could play a role in influencing ICT diffusion, given that ICT laws—the regulations pertaining to the use of ICTs—have the potential to address these issues (Bhattacharjee and Shrivastava 2018).

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Nevertheless, the existing research except for a handful of studies (e.g., Larosiliere et al. 2017; Qu and Pinsonneault 2011) lacks from developing such an interesting understanding that is theoretically profound. This study, therefore, strives to explore the impact of the maturity of ICT laws on ICT diffusion among citizens and businesses and contributes to the information systems (IS) literature by investigating an underexplored but important environmental aspect that can flourish ICT diffusion. Having said this, we also acknowledge the role of the government, citizens, and businesses—the three key stakeholders on which the economic future of a country depends (Xiao et al. 2013). Specifically, ICT law formulation is executed by the government taking into consideration the interests of citizens and businesses, whose ICT use could be affected by ICT laws. In summary, this study encompasses three key stakeholders, each of which has a great role to play for the advancement of a nation by stimulating its ICT diffusion.

In light of the above, recent global studies indicate that the maturity of ICT laws, defined as the degree to which ICT laws are developed in a country, varies significantly across countries, and so does the level of ICT diffusion (GITR 2016; UNCTAD 2015). For instance, Luxembourg and Singapore perform much better than Lebanon and Ethiopia concerning the maturity of ICT laws. Likewise, in terms of ICT diffusion, businesses in Japan and the United Kingdom hold higher ranks than their counterparts in Malawi and Nepal. And, citizens in Denmark and Norway are found to use ICTs, especially the Internet, to a greater degree as compared to those in Tanzania and Zambia (GITR 2016). Motivated by this variability of the level of the maturity of ICT laws and the degree of ICT diffusion across countries,¹ the key purpose of this study is to investigate their relationship at the *macro* (i.e., cross-country) level and present a global dynamics of the phenomenon. Accordingly, one of the key research questions (RQs) that we address in this study is as follows:

RQ1: *What is the relationship between the maturity of ICT laws in a country and the diffusion of ICTs among its citizens and businesses?*

Further, we acknowledge that in a macro-level study like ours, cultural influence may be observed on the phenomenon, since a country's culture may exert a significant influence on the way the country conducts (Straub 1994). Consistent with this, prior research has argued that national cultural values account for the significant variations in ICT diffusion among countries (Maitland and Bauer 2001; Krishnan and AISudary 2016; Veiga et al. 2001; Zhao 2011). Therefore, it is logical to expect that though the maturity of ICT laws in a country will impact its ICT diffusion, the degree of such influence will vary depending

on the cultural values rooted in that country. Hence, the second question that the current study strives to address is as follows:

RQ2: *How do the national cultural dimensions affect the relationship between the maturity of ICT laws in a country and ICT diffusion among its citizens and businesses?*

In recent times, IS researchers have called for extending the scope of IS research beyond business and management by considering the societal impacts of ICT (e.g., Lee and Fedorowicz 2018). This study heeds to such calls by focusing on the impact of ICTs on the well-being of a country. In particular, we strive to understand how ICT diffusion among citizens and businesses affects a country's well-being, which refers to both positive and negative evaluations that citizens make about their lives (Ganju et al. 2016). We further explore how ICT laws may shape the well-being of a country by influencing its ICT diffusion. In essence, the third question that this study addresses is as follows:

RQ3: *How does the level of ICT diffusion among citizens and businesses contribute to the well-being of a country?*

In an attempt to answer the RQs mentioned above, we draw on Dror's (1970) framework of law and societal change and build a conceptual framework (see Fig. 1) to provide an overview of our phenomenon. In particular, to address the first question, we draw on the ICT diffusion literature (e.g., Larosiliere et al. 2017; Oliveira and Dhillon 2015) and the perspective of perceived risk (Featherman and Pavlou 2003), and contend that the level of maturity of ICT laws in a country will determine the level of ICT diffusion among citizens and businesses by affecting their perceived risk in association with the use of ICTs (Zhu et al. 2017). To answer the second question, we draw on Hofstede's (1980) typology of national culture and investigate the influence of the cultural dimensions of power distance, masculinity, and uncertainty avoidance on the relation of maturity of ICT laws in a country with its ICT diffusion. We express these cultural dimensions as a broad set of contingencies (Smith et al. 2011) and underscore how they will moderate the relationships mentioned above. Further, to address the third question, we draw on the technological determinism theory (Chandler 1996) to illustrate the role of ICT diffusion in influencing the level of well-being of a country. It is interesting to remark that such an application of multiple theoretical perspectives is not uncommon in IS literature. For instance, in their study, Khan and Krishnan (2019) followed a multi-theoretic approach involving five different theories, namely, the agency theory, the rent-seeking theory, the theory of X-inefficiency, the control theory, and the perspective of trust in institutions for understanding the impact of

¹ These countries also vary in terms of their socio-economic status. We thank Reviewer #3 for this thought.

corruption on e-government maturity. In another study, a multi-theory based model was developed and validated by drawing on three theories, namely, the protection motivation theory, the theory of reasoned action, and the cognitive evaluation theory, to explain employees’ adherence to information security policies (Siponen et al. 2014).

We use publicly available archival data of 83 countries to test the proposed relationships, the results of which offer support for our hypotheses. The study makes several crucial contributions to the knowledge base of IS security and ICT diffusion. First, this is one of the first few studies to identify the significance of an underexplored environmental determinant, ICT laws, in mitigating the perceived risks induced by ICTs and influencing the ICT diffusion among citizens and businesses. Second, drawing on Hofstede’s typology of national culture, the current study investigates how the relationship between the maturity of ICT laws in a country and its ICT diffusion is contingent on the cultural dimensions of power distance, masculinity, and uncertainty avoidance. Third, this study provides useful insights into the societal impact of ICTs by explaining how the maturity of ICT laws contributes to the well-being of a country through enhancing ICT diffusion among citizens and businesses.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature and develops the study hypotheses and the research model (see Fig. 2) based on the conceptual framework (see Fig. 1). Section 3 describes the research design, while Section 4 deals with empirical analyses and presents the

results. In Section 5, we discuss the theoretical and practical implications of our study and highlight future research directions. The final section draws concluding remarks.

2 Theory and Hypotheses

To address the aforementioned RQs, we logically derive our hypotheses by grounding our discussion on the (1) literature on ICT diffusion (e.g., Larosiliere et al. 2017; Oliveira and Dhillon 2015); (2) perspective of perceived risk (Featherman and Pavlou 2003); (3) typology of national culture (Hofstede 1980); and (4) theory of technological determinism (Chandler 1996). Our conceptual framework, shown in Fig. 1, incorporates the above perspectives from the viewpoint of Dror (1970) and offers an integrated understanding of the phenomenon. Dror’s (1970) framework considers the use of law as an effective policy instrument for directing societal change. However, being a subsystem of society, the legal system may not always have direct impacts on societal change, and other social policy instruments such as technological changes need to be considered to realize the effect of the law on societal change. In sum, Dror’s (1970) framework regards law as an essential tool for bringing societal change and suggests exploring other intermediary variables through which this change can be realized. Accordingly, we argue that the maturity of ICT laws (i.e., law) in a country will lead to the well-

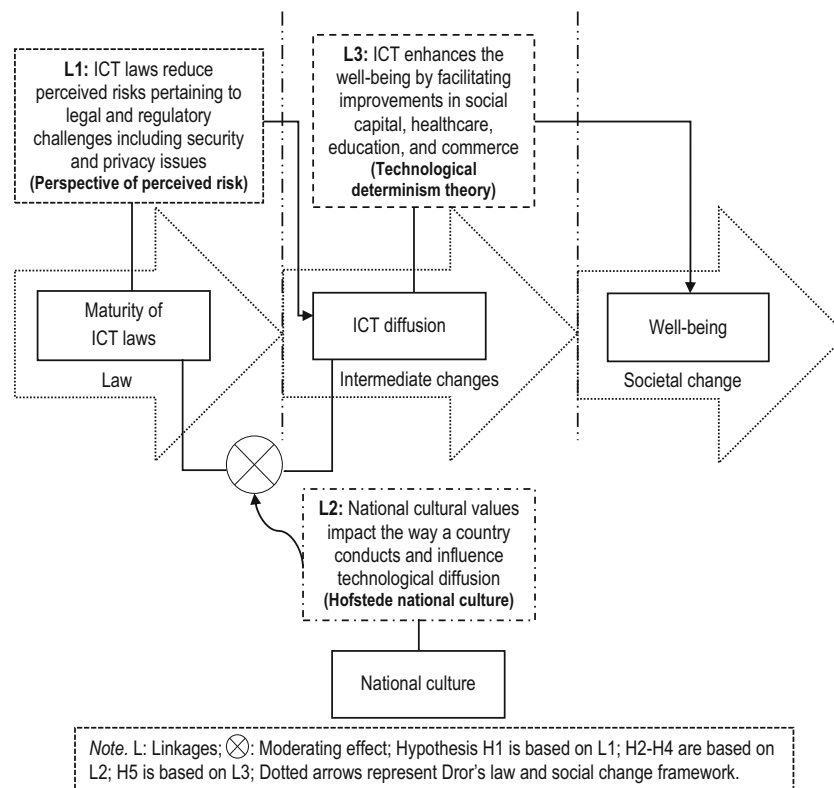


Fig. 1 Conceptual framework

being (i.e., societal change) by affecting ICT diffusion (i.e., intermediate changes) among its citizens and businesses. Our framework depicts the theoretical linkages between the key study variables—maturity of ICT laws, ICT diffusion, national culture, and well-being—leading to the development of our hypotheses. Specifically, while hypothesis H1, which is based on the linkage **L1**, explains the effect of maturity of ICT laws on ICT diffusion, hypotheses H2–H4 (based on **L2**) explicate the cultural influence on the phenomenon, and H5 (based on **L3**) elaborates the role of ICT diffusion in determining the well-being. In the following sections, by drawing on our conceptual framework as a theoretical lens, we extend our discussion on hypothesis development.

2.1 ICT Laws and ICT Diffusion

The technology diffusion research is characterized by two metaphors (Attewell 1992). The dominant representation suggests that diffusion is a process whereby potential users are communicated about the availability of new technologies and are persuaded to adopt and use these technologies (Rogers 1983). The other metaphor takes an economic standpoint to perceive diffusion in terms of cost and benefit; the higher the price, the slower diffusion will take place (Attewell 1992). ICT diffusion refers to the extent to which ICTs spread to general use within and across economies (Keller 2004). The existing literature has investigated ICT diffusion from several theoretical lenses. Some of the predominant theories and models include Technology Acceptance Model (TAM; Davis 1989), Theory of Planned Behavior (TPB; Ajzen 1991), the diffusion of innovation theory (DoI; Rogers 1995), Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al. 2003), the Technology-Organization-Environment framework (TOE; Tornatzky and Fleischer 1990), and the institutional theory (DiMaggio and Powell 1983), among others. As argued by Xiao et al. (2013), the potential determinants of ICT diffusion can broadly be classified into (1) socio-related factors (e.g., Martins et al. 2014); (2) technology-related factors (e.g., Larosiliere et al. 2017); and (3) environmental factors (e.g., Brown and Thompson 2011). Table 1 shows the classification and lists some of the potential determinants of ICT diffusion.

In this study, we take an interest in external environmental elements, specifically technology-oriented environmental factors that can impact ICT diffusion across countries. While several socio-centric, technology-centric, and environment-centric factors are investigated as shown in Table 1, little is known about the significance of technology-oriented environmental factors such as ICT-related regulatory environment in the context of ICT diffusion. With the increasing concerns of ICT-induced legal and regulatory challenges, and data security and privacy issues, we believe that such factors would have a more important role to play, which is worth investigating.

Table 1 Classification of determinants of ICT diffusion

Classification	Potential determinants	Exemplary research
Socio-related factors	User behavior, top management perception, organizational characteristics	Abukhzam and Lee (2010); Choudrie et al. (2018); Gorla et al. (2017); Martins et al. (2014)
Technology-related factors	ICT infrastructure, IT resources, IT knowledge, IT skills	Bygstad and Aanby (2010); Lee et al. (2016); Larosiliere et al. (2017); Krishnan and Lymm (2016)
Environmental factors	Policy and standards, regulation, economic and cultural environment, competitive pressure	Erumban and Jong (2006); Abukhzam and Lee (2010); Oliveira and Dhillon (2015); Xu et al. (2017)

Environmental factors refer to the conditions and settings of the environment within which entities operate (Tornatzky and Fleischer 1990), and are considered to play a substantial role in the technological diffusion (Larosiliere et al. 2017). Prior research has explored different environmental conditions in diverse domains. For instance, environmental turbulences and mimetic pressure were found to be the main drivers of ICT innovation for the financial services companies (Wolf et al. 2012). At the country level, the quality of the environment in terms of (a) government support and (b) the presence of a sound institutional environment appeared to be the key enabler for electronic business (e-business) development (Srivastava and Teo 2010).

In this study, environmental conditions indicate ICT-related regulatory environment characterized by ICT laws, which refer to the regulations pertaining to the use of ICTs (Bhattacharjee and Shrivastava 2018; UN-Report 2007) such as mobile applications, websites, transactional online media, and other technologies involving electronic commerce (e-commerce). These laws shape the use of ICTs by addressing the concerns over e-commerce and by ensuring consumer protection, data authentication (digital signature), and data privacy. Therefore, ICT laws are stated to protect and regulate harmful behavior during electronic communication, and facilitate secured electronic transactions through IT standards, cryptography, digital signatures, and digital certificates (Bhattacharjee and Shrivastava 2018). These laws also set guidelines for collecting, storing, and sharing electronic information (Bhattacharjee and Shrivastava 2018). Prior research has shown the relevance of ICT laws to the adoption and use of ICTs in different contexts. In their study, Boyer-Wright and Kottemann (2008) found the ICT-related legal environment as

a significant factor for the adoption of online government services. In another study, Qu and Pinsonneault (2011) demonstrated that when established laws facilitated companies, IT outsourcing increased. Further, in the context of social network diffusion, Larosiliere et al. (2017) found that people were more likely to use virtual social networks within a sound ICT-related regulatory landscape.

Consistent with these arguments and drawing on the perspective of perceived risk by Featherman and Pavlou (2003), we postulate two mechanisms explaining how the maturity of ICT laws in a country can influence the diffusion of ICTs. First, as mentioned before, the use of ICTs involves various information security issues, including privacy, data protection, or other related issues that may lead to reduced ICT use (Larosiliere et al. 2017; Schaupp and Carter 2010). For instance, one of the serious concerns lies with the management of the consumers' data. The collection of personal data is almost inevitable during e-commerce transactions, and such consumer information may be used not only by the companies to deliver personalized service but also by the advertisers to reach the target segment (Lee et al. 2011). Nonetheless, not every consumer welcomes personalized service at the cost of the disclosed profile information. In fact, such risks pertaining to consumer data protection may have a negative impact on ICT usage intention of citizens, as it was witnessed that location-based online promotion service providers, such as Groupon.com, have lost certain customer segments who were concerned of their online footprints being tracked and therefore closed their accounts (Zhu et al. 2017). Citizens thus could experience serious security and privacy concerns and develop an increasing sense of antipathy towards using ICTs, especially the Internet (Li 2014; Ozturk et al. 2017), which may not only impact their usage intention but also reduce their trust on some Internet merchants (Kim et al. 2008), thereby affecting the overall diffusion of ICTs among citizens. As ICT laws deal with various information security issues, in a country where ICT laws are sophisticated and matured, citizens are expected to have minimal concerns about such issues (Larosiliere et al. 2017), thereby decreasing their perceived risk in relation to the use of technologies and e-services (Zhu et al. 2017). The literature on perceived risk and ICT use suggests that ICT usage is largely affected by users' perception of ICT-induced security and privacy risks (Arpaci et al. 2015; Im et al. 2008; Martins et al. 2014), and the ICT usage can be enhanced by mitigating such risks. According to Featherman and Pavlou (2003), perceived risk is defined as "the potential for loss in the pursuit of a desired outcome of using an e-service" (p. 454), which essentially entails risks concerning ICT use. And, in their study, performance risks such as security and privacy risks were noted as the most salient concerns that could inhibit the use of the Internet-based services (Featherman and Pavlou 2003). It is thus expected, as specified in the linkage L1 of Fig. 1, that the level of

maturity of ICT laws in a country will determine the extent of ICT diffusion among citizens.

Second, in the presence of well-developed ICT laws, businesses are expected to experience less uncertainty about the formation and validation of electronic contracts (i.e., e-commerce contracts), since a legal framework related to e-commerce is critical to deal with issues such as security, commercial trust, the legal validity of contracts, and dispute settlement (Martin et al. 2019; Tekleberhan 2012; UNCTAD 2015). To elaborate, most organizations now conduct businesses online, and all the legal agreements formed between them and their partners, suppliers, and clients are treated as electronic contracts (Nepal and Zic 2008). Although such contracts enable better flexibility for conducting business, they involve huge risks and uncertainties (UNCTAD 2015). One of the most prominent issues in electronic contracts is the authenticity and validity of the electronic signature. As opposed to the traditional way where it is possible to personally witness the process of signing a contract, in case of electronic contracting, there is a higher chance of fraudulent activities (e.g., impersonation of the contracting parties) due to the lesser clarity on the validity and enforceability of electronic signature, and the possibility of bending the laws. Indeed, perception of such risks owing to the lower maturity of ICT laws can affect the ICT use by businesses in a country (per the linkage L1 of Fig. 1), and may even discourage them from extensively using ICTs for business transactions (Boyer-Wright and Kottemann 2008; UN-Report 2007). Taken together, we hypothesize:

H1: *The maturity of ICT laws in a country is positively associated with the diffusion of ICTs among its citizens (H1a) and businesses (H1b).*

2.2 National Culture

The concept of culture is introduced in various ways in the literature (Sørnes et al. 2004). Perhaps, the most commonly held view is that the cultural environment shapes the values shared by the members of society. In this study, we draw on Hofstede's (1980) cultural dimensions typology, arguably the most widely used theory of national culture in the literature (Myers and Tan 2002). According to Hofstede, national culture is "the collective programming of the mind which distinguishes the members of one human group from another" (1980, p. 260). He identified four dimensions of national culture, namely: (1) power distance (large vs. small); (2) individualism vs. collectivism; (3) masculinity vs. femininity; and (4) uncertainty avoidance (strong vs. weak) (Hofstede 1980). Later, long- vs. short-term orientation was included as a fifth dimension (Hofstede 1991).

The notion of national culture has been used to explain various cross-country phenomena across disciplines. In IS literature, prior research attributed the significant variations in IT adoption, diffusion, and implementation between countries to national culture (Krishnan and AlSudiary 2016; Veiga et al. 2001; Zhao 2011). In particular, the research linking IT and culture can broadly be classified into six themes: (1) culture and IT development; (2) culture, IT adoption and diffusion; (3) culture, IT use and outcomes; (4) culture, IT management and strategy; (5) the influence of IT on culture; and (6) IT culture (Leidner and Kayworth 2006). While there is a need to develop an understanding on all the above themes, only a few studies have focused on the influence of culture on IT diffusion (e.g., Qu et al. 2011; Srite and Karahanna 2006), and our review finds that most of them are limited to a particular region or a group of countries (Dotan and Zaphiris 2010; Shareef et al. 2016; Straub 1994). For example, the effect of the cultural dimension of uncertainty avoidance on the firm-level IT diffusion was compared in a study conducted in Japan and the United States (Straub 1994). Another cross-cultural analysis of Flickr users was performed, taking into account only five countries—Iran, Israel, Peru, Taiwan, and the United Kingdom (Dotan and Zaphiris 2010). While we acknowledge the useful insights these studies impart, we also emphasize developing a combined understanding of the cross-cultural ICT diffusion among citizens and businesses. Interestingly, the interplay between national culture and technology diffusion is complicated but required (Venkatesh and Zhang 2010). Thus, motivated by the lack and the need for macro-level cross-cultural investigations, this research examines the moderating effects of national cultural dimensions on the relationship of maturity of ICT laws in a country with ICT diffusion among its citizens and businesses.

In particular, we focused our efforts on the national cultural dimensions of power distance, masculinity vs. femininity, and uncertainty avoidance in our research model. The other two dimensions were not considered for the following reasons. The aspect of individualism-collectivism was found to be highly correlated with power distance in a host of cross-cultural research (Hofstede et al. 2010). For instance, in a cross-cultural study (Cho et al. 2009) based on Australia, India, North Korea, Singapore, and the United States, individualism-collectivism demonstrated a very high correlation with power distance ($r = -0.836$). Another study by Waarts and van Everdingen (2005) dropped the dimension of individualism-collectivism due to the multicollinearity concern. Further, studies involving 29 European countries found that the ICT adoption by businesses did not differ in terms of individualism-collectivism in those countries (e.g., Kollmann et al. 2009; Qu et al. 2011); however, the adoption was contingent on other cultural dimensions, precisely power

distance. Concerning the dimension of long- vs. short-term orientation, prior research suggests that the focus of this dimension is on Asian value systems (Srite and Karahanna 2006), whereas this study aims to capture a global perspective. Further, this dimension has been subject to criticism with respect to philosophical flaws and methodological issues, among others (Chen and Zahedi 2016; Feng 2003), thereby making the investigation of the three cultural dimensions, namely, (1) power distance, (2) masculinity vs. femininity, and (3) uncertainty avoidance more relevant in our study context.

2.2.1 Power Distance

Power distance is defined as the extent to which a society expects and accepts that power is distributed unequally among individuals, institutions, and organizations (Hofstede 2001). That is, in large power distance cultures, people expect and desire to have inequalities, hierarchical orders, and differential social statuses. In contrast, people in small power distance societies are more likely to demand power equalization (Hofstede 1984). Prior research on ICT diffusion has indicated that the degree of ICT diffusion is higher in small power distance countries as compared to large power distance countries. For instance, in their study, Gong et al. (2007) observed that Internet access and usage were increased in small power distance countries. Similar findings were noticed in other cross-cultural research (e.g., Im et al. 2011). In addition, ICTs can discourage social inequalities and enhance social capital by offering platforms for users to communicate and exert their rights (Ellison et al. 2007; Khan and Krishnan 2018), due to which citizens in small power distance cultures are expected to use ICTs to a greater extent than those in large power distance cultures. Therefore, it is logical to presume that despite a higher level of maturity of ICT laws, the diffusion of ICTs among citizens will be higher in small power distance countries than that in large power distance countries.

Further, organizations in countries with large power distance are usually characterized by authority, centralized decision structures, the use of formal rules, and restrained sharing of information (Hofstede 2001), which leads to a lower degree of innovation diffusion (Zmud 1982). That is, organizations in countries with large power distance tend to maintain the status quo and are hesitant to implement changes and innovations in fear of deranging the existing power structure (Leung et al. 2005; Qu et al. 2011). Prior research thus found that businesses in large power distance countries were slow to adopt technology such as open-source software (e.g., Qu et al. 2011). Taken together, we contend that even though the maturity of ICT laws increases ICT diffusion, in large power distance

countries, businesses are less likely to use ICTs (due to a higher level of centralization and formalization) than their counterparts in countries with small power distance. Hence, in line with the linkage **L2** shown in Fig. 1, we hypothesize:

H2: *Power distance moderates the relationship of the maturity of ICT laws in a country with the level of ICT diffusion among its citizens (H2a) and businesses (H2b), such that the effects of the maturity of ICT laws on the level of ICT diffusion among citizens (H2a) and businesses (H2b) would be less in large power distance cultures than in small power distance cultures.*

2.2.2 Masculinity

The cultural dimension of masculinity vs. femininity refers to the extent to which national culture is characterized by masculine relative to feminine values (Hofstede 2001). Masculine cultures are characterized by values such as assertiveness, ambition, competition, and performance, whereas feminine cultures are characterized by nurturance, equality, and social relationships. Societies that are characterized by feminine culture are expected to be rich in human capital and have more educated people than masculine societies (Khalil 2011). Further, it is observed that societal information dissemination capacity is positively correlated with gender egalitarianism values and practices (Khalil and Seleim 2010), indicating that individuals in feminine cultures require more information and are likely to adopt and use ICTs since these technologies provide access to information and facilitate information sharing and communication among individuals and groups (Bagchi et al. 2004; Khalil 2011). Confirming this, Sun and Wang (2012) found that masculinity is negatively related to the diffusion of virtual social networks in a country. Other studies also showed that feminine cultures tend to be effective in using computer-mediated tools and technologies than their counterparts (Thelwall 2008; Thelwall et al. 2010). Consistent with this, we expect that the positive effect of the maturity of ICT laws on the diffusion of ICTs among citizens will be higher in feminine cultures than that in masculine cultures.

As stated above, human capital is likely to be more developed in feminine cultures than in masculine cultures (Khalil 2011). It is one of the major factors that enhance the efficacy of businesses to use technological innovation and positively influence their ICT use (Liu 2008), indicating that businesses in feminine cultures are more likely to use ICTs. Further, the degree of ICT diffusion appears to be higher in feminine cultures when technology is used for enabling communication (Erumban and Jong 2006). Given that ICTs facilitate real-time

communication with business partners, consumers, and end-users, businesses in feminine cultures are expected to use ICT more. In sum, driven by the increased human capital and the propensity to establish communication with other stakeholders, businesses in feminine cultures are expected to use ICTs to a greater extent than their counterparts in masculine cultures. Therefore, the positive effect of the maturity of ICT laws on the diffusion of ICTs among businesses will be higher in feminine cultures than that in masculine cultures. Taken together, consistent with the linkage **L2** of Fig. 1, we hypothesize:

H3: *Masculinity moderates the relationship of the maturity of ICT laws in a country with the level of ICT diffusion among its citizens (H3a) and businesses (H3b), such that the effects of the maturity of ICT laws on ICT diffusion among citizens (H3a) and businesses (H3b) would be less in masculine cultures than in feminine cultures.*

2.2.3 Uncertainty Avoidance

Uncertainty avoidance is defined as “the degree to which members of a society feel uncomfortable with uncertainty and ambiguity” (Hofstede 1984, p. 83). To elaborate, while strong uncertainty avoidance cultures are less comfortable in unstructured situations characterized by ambiguity and uncertainty, weak uncertainty avoidance cultures are more comfortable with ambiguity, chaos, and novelty (Hofstede 2001). Furthermore, individuals in strong uncertainty avoidance cultures tend to take familiar risks and avoid the risk induced by the unknown and unstructured situations, whereas individuals in weak uncertainty avoidance cultures tend to take unknown risks (Hofstede 1991, 2001). Researchers argue that the inclination of members of a culture to avoid uncertainty and ambiguity affects the diffusion of ICTs (Hofstede et al. 2010; Straub 1994) such that countries with strong uncertainty avoidance would experience a slow rate of ICT diffusion (Khalil 2011). For instance, Lim (2004) found countries with weak uncertainty avoidance cultures to have higher Internet shopping rates as compared to others. Consistent with this logic, we argue that ICTs encompass numerous mobile applications, e-commerce, multimedia, transactional online media, and continuously evolving technological features that create inherent risks, including privacy and security issues for citizens to use ICTs for communicating and sharing of information (Larosiliere et al. 2017). As a result, despite the higher level of maturity of ICT laws, citizens in strong uncertainty avoidance cultures are expected to be more hesitant to use ICTs than those in weak uncertainty avoidance cultures,

leading to a lower diffusion of ICTs among citizens in strong uncertainty avoidance cultures.

Similarly, concerning organizational communication behavior, uncertainty and ambiguity are conceived as principal factors in predicting media use (Straub 1994). ICT tends to thrive in a culture characterized by low uncertainty avoidance (Hasan and Ditsa 1999), where managers and decision-makers are inclined to take a risk (Khalil 2011). Hence, despite the potential of sound ICT laws to minimize the legal and regulatory concerns of ICT use, it is expected that businesses in strong uncertainty avoidance cultures will be more sluggish in the usage of ICTs than those in weak uncertainty avoidance cultures. Taken together, consistent with the linkage **L2** of Fig. 1, we hypothesize:

H4: *Uncertainty avoidance moderates the relationship of the maturity of ICT laws in a country with the level of ICT diffusion among its citizens (H4a) and businesses (H4b), such that the effects of the maturity of ICT laws on ICT diffusion among citizens (H4a) and businesses (H4b) would be less in strong uncertainty avoidance cultures than in weak uncertainty avoidance cultures.*

2.3 ICT Diffusion and Well-Being

ICTs have long been known to have a profound impact on the productivity of nations. For the period 1985–1993, Dewan and Kraemer (2000) observed an increase in productivity in terms of gross domestic product (GDP) with an increase in ICTs in the developed nations. Later, Dedrick et al. (2014) showed that for the period 1994–2007, there was a corresponding increase in productivity with increasing investments in ICTs in both developing and developed countries. Nevertheless, with the advent of new technologies and their increasing affordability in the more recent period, the effects of ICT usage are not limited to the changes in national productivity, such as GDP. In other words, ICTs offer several uses for citizens and businesses in a country and mark their widespread impact across all aspects of citizens' life and organizational settings (Lee and Fedorowicz 2018), and this could further enhance the well-being of the country, which is beyond GDP. This argument is also consistent with the technological determinism theory that considers technology to bring societal transformation at all levels, namely, individual, social, and institutional (Chandler 1996; Dafoe 2015). In line with prior studies (e.g., Ganju et al. 2016), we conceptualize a country's well-being in terms of (1) social capital and social equality, (2) health, (3) education, and (4) commerce; and, by drawing on the technological determinism theory, we contend, as described in the ensuing paragraphs, that ICT diffusion

among citizens and businesses in a country contributes to its well-being by enhancing the aforementioned aspects of well-being.

Firstly, ICT enhances the level of well-being of citizens by enabling them to develop social capital. For instance, social networking platforms such as Facebook increases the social capital by allowing people at a distance to be connected (Ellison et al. 2007). Besides, the Internet empowers people to voice their demands and rights, and participate actively in local and global governance, leading to decreased social inequality. In sum, the potential of ICTs to enable individuals to raise their voice and feel connected with communities adds to their self-esteem and social capital, which in turn enhance the overall well-being of a country. Secondly, ICT contributes to healthcare by (1) enabling citizens to easily access a number of medical services (e.g., doctor appointment) online; (2) increasing awareness and health literacy by transferring health information to individuals including people at a disadvantage; and (3) extending access to the medical information to the health practitioners (Deloitte 2014; O' Connor and O'Reilly 2018). According to the Deloitte (2014) report, in India, rural villages having access to the Internet had witnessed 14% lower child mortality rates than villages without the Internet. Similarly, other studies (e.g., Kaplan 2006; Simon et al. 2004) found that the use of ICTs could enhance people's health, thereby contributing to well-being. Thirdly, ICTs can positively impact education by facilitating the transfer of knowledge, learning tools, and educational resources to communities having limited access to education. For instance, an online interactive medium such as massive open online courses (MOOCs) facilitates access to learning materials (Cooper and Sahami 2013). Similarly, GenLink offers an online platform whereby the children from marginalized communities in India could access education by being taught by elderly teachers from urban areas (Parthiban et al. 2020). And finally, the use of ICTs by citizens in a country has made commercial transactions more efficient and encouraged businesses to directly transact with them, eliminating the need of middle-men and improving the overall quality of commerce.

Not only the ICT usage by citizens but its usage by businesses also contributes to the well-being. Firstly, businesses, through ICT use, raise the level of social capital by helping people build trust in certain brands and organizations and improving customer relationships. During e-commerce transactions, customers tend to rely on user feedback to make decisions and share their experience with others (Turban et al. 2017), thereby developing social capital. Secondly, many businesses provide health-based online applications to help citizens access information and make better decisions for health management. For instance, IBM, using its artificial intelligence system,

Watson, helps doctors diagnose tumors from people’s electronic health records (EHR) at an accuracy of 90% (WEF 2017). Further, due to the increased availability of information through EHRs, pharmaceutical companies are in a better position to generate lifesaving drugs (WEF 2017), thereby improving healthcare. Thirdly, the use of ICTs for providing distant educational and training programs is on the rise. That is, businesses are increasingly investing in Internet-based education services to provide affordable and flexible educational courses for the betterment of society. For example, by leveraging ICT, businesses such as Coursera and edX, in partnership with top educational institutions such as Stanford University and Yale University, among others, have enabled the access to high-quality education open to all for transforming citizens’ lives through it (Coursera 2019; EdX 2019). And finally, ICT brings positive impacts on citizens’ lives by changing the nature of commerce and commercial transactions. For instance, the use of ICTs by businesses for B2C e-commerce transactions has eased the purchase activities for citizens and allowed them to make an informed decision by comparing price and retrieving user feedback (Kohli and Jaworski 1990). Besides, the business usage of ICT led to the creation of 140 million new jobs and improved the lives of millions of people, as reported by Deloitte (2014). Taken together, as specified in the linkage L3 of Fig. 1, we posit that ICT diffusion among citizens and businesses of a country influences its well-being by facilitating improvements in social capital, healthcare, education, and commerce. Hence, we hypothesize:

H5: *The diffusion of ICTs among citizens (H5a) and businesses (H5b) of a country is positively associated with its well-being.*

Our research model depicting the hypotheses is shown in Fig. 2. In the ensuing sections, we discuss its empirical validation and results.

3 Research Design

3.1 Data

We used publicly available archival data to test our hypotheses for two reasons. First, we regard that the collection of primary data for a large scale cross-country study is certainly restrained by the amount of time and resources consumed by such research (Krishnan et al. 2017). Second, archival data offers several advantages, namely: (1) easy reproducibility; (2) ability to generalize the outcomes from larger datasets (Kiecolt and Nathan 1985); and (3) robustness to the threat of common method bias (Woszczyńska and Whitman 2004). Hypotheses were tested by gathering data from 83 countries after omitting the missing values (see Appendix A for the list of the countries). We considered our sample size adequate, given that 50 is the minimum number required to avoid degrees of freedom and efficiency concerns, as argued by Hair et al. (2006). Further, consistent with the existing studies that recommend observing the lagged effect of the independent variable on the dependent ones (e.g., Das et al. 2017; Krishnan and Teo 2012; Robertson and Watson 2004), we kept a 1-year lag between the dependent and the intervening variables, and between the intervening and the independent variables. Hence, we collected data for the dependent variable for the year 2017, the intervening variables for 2016, and the independent variable for 2015.

The *dependent variable* in this study is the well-being of a country (see Appendix B for details), which represents citizens’ evaluations about their life. It was captured using a well-established metric of subjective well-being by the Gallup World Poll (GWP; WHR 2017). To measure the well-being, the GWP used the Cantril scale (Cantril 1965a, 1965b) and obtained the score by asking the respondents, “Please imagine a ladder, with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?” Thus, the scores for

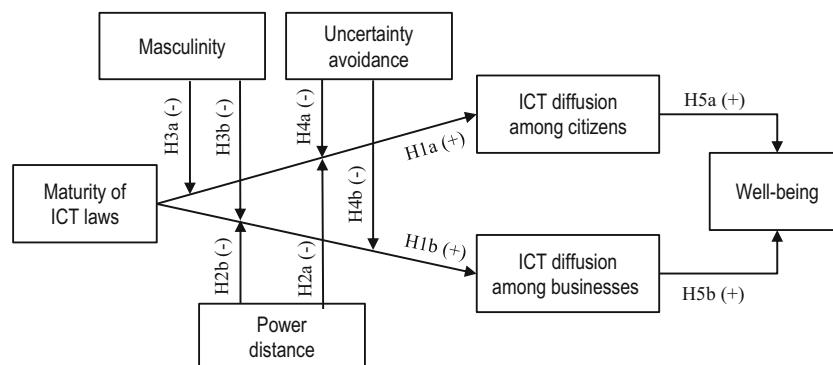


Fig. 2 Research Model

this scale ranged between “0” (worst possible life; low well-being) and “10” (best possible life; high well-being). This scale continuum was further assessed in terms of other important measures, such as daily affect, health problems, and daily experiences of the respondents to understand their perspectives based on which they responded to the above question (Gallup 2019). And finally, grounded on various empirical validations in the course of several iterations of research and professional judgment, it was found that the well-being scale represented different aspects of individuals’ life including health and education, among others (Gallup 2019).

The *intervening variables* in our research model are (1) ICT diffusion among citizens; and (2) ICT diffusion among businesses. ICT diffusion among citizens refers to the extent to which ICTs spread to general use by citizens in a country and was modeled as a formative construct with three indicators: (1) percentage of individuals using the Internet; (2) fixed (wired)-broadband Internet subscriptions per 100 inhabitants; and (3) active mobile-broadband subscriptions per 100 inhabitants. The indicators were sourced from the World Economic Forum’s (WEF) Global IT Report (GITR 2016). The second intervening variable, ICT diffusion among businesses, refers to the extent to which ICT use spreads through businesses in a country and was modeled as a formative construct with three indicators obtained from the WEF’s Global IT Report (GITR 2016). The three indicators represent the extent to which businesses in a country (1) adopt new technology; (2) use ICTs for transactions with other businesses; and (3) use ICTs for selling goods and services to consumers. And, they were anchored on a 1-to-7 scale with “1” representing “not at all” and “7” representing “to a great extent.”

The *independent variable* in this study is the maturity of ICT laws, and it indicates the level of sophistication of ICT laws in a country (Larosiliere et al. 2017). In other words, it is defined as the extent to which ICT laws are developed and refined in a country. And, the measure for the same was sourced from an executive opinion survey conducted by the WEF whereby respondents (i.e., business executives and country experts) were asked to assess the maturity of their countries’ ICT laws related to e-commerce, digital signatures, and consumer protection on a scale of “1” (not developed at all) to “7” (extremely well developed). The scores were obtained from the WEF’s Global IT Report (GITR 2015).

The cultural dimensions of power distance, masculinity, and uncertainty avoidance were used as the *moderating variables*. Power distance refers to the extent to which the less powerful members in a country accept that power is distributed unequally, while masculinity refers to the degree of the preference of society for achievement, assertiveness, success, and material rewards (Hofstede et al. 2010). And, uncertainty avoidance refers to the extent to which members of a society feel comfortable with ambiguity and uncertainty (Hofstede et al. 2010). The scores for all cultural variables were obtained from the country

comparisons available on the Hofstede Insights website (see www.hofstede-insights.com). Appendix C discusses the measurements of these dimensions in detail.

We employed five *control variables* in this study, namely: (1) macroeconomic conditions; (2) social support; (3) regional difference; (4) primary education; and (5) local competition. Most prior macro-level studies demonstrated the direct influence of financial indicators on the well-being of a country (e.g., Diener and Biswas-Diener 2002; Ganju et al. 2016). Accordingly, we used macroeconomic conditions to control for a country’s financial stability that was measured by the macroeconomic environment index obtained from the WEF’s Global Competitiveness Report (GCR 2015). This index was composed of five financial sub-indices, namely, government budget balance, gross national savings (as a percentage of GDP), inflation, government debt, and country credit rating. Apart from this financial indicator, we also controlled for social support, referred to as having someone to count on in times of trouble, which has been argued to impact the well-being (WHR 2018). It was measured by taking a national average of the binary responses (i.e., “0” or “1”) to the question, “If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?” (WHR 2015). Also, in line with past studies where the country-level difference across different regions was found to explain various cross-country phenomena (e.g., Krishnan et al. 2013), we controlled for the effect of regional difference on the well-being. Specifically, based on the World Bank’s regional classifications, we coded countries into seven groups (i.e., North America, Latin America and Caribbean, Europe and Central Asia, East Asia and Pacific, South Asia, Middle East and North Africa, and Sub-Saharan Africa). Primary education is required for individuals, including people associated with businesses, so that they can apply ICTs to the extent that can contribute to well-being. Hence, in line with Vicente and López (2006), we controlled for the effect of primary education on ICT diffusion among citizens and businesses. It was operationalized using the net enrolment rate in primary education, representing the number of children of official primary school age enrolled in primary school as a percentage of the total population of the same age group (UNESCO 2015). Further, the local competition that indicates the magnitude of local rivalry among businesses in a country is expected to drive businesses to adopt and use technologies for moving ahead in the competition. Therefore, per Gruber (2001), we controlled for the effect of local competition on ICT diffusion among businesses, which was operationalized using the indicator, intensity of local competition, obtained from the WEF’s Global Competitiveness Report (GCR 2015). It was measured by asking the respondents, “In your country, how intense is competition in the local markets?” and was anchored on a 1-to-7 scale with “1” representing “not intense at all” and “7” representing “extremely intense.”

3.2 Reliability and Validity

The key variables in our study were sourced from the World Poll and the Global IT Report published by the Gallup and the WEF, respectively. Both agencies have followed stringent procedures in ensuring the reliability and validity of the data. In the case of the Gallup, the data was collected from countries that included 99% of the adult population. The survey included more than 100 global questions as well as region-specific questions. To ensure the reliability of data, the survey asked the same questions every time, in the same way to all respondents in every country. Besides, all samples were probability-based and representative of the adult population in a country. A typical survey included around 1000 individuals, and the questions were translated into the major languages of the respective country. Face-to-face, as well as telephone interviews, were used to collect the survey data. The sampling frame represented the entire civilian, non-institutionalized, aged 15 and older population. To ensure the validity of data, the questions were vetted by a global network of researchers and political scientists, who were experts in question development and construction, and data collection. Further, statistical analyses were performed to assess the reliability of the data. Finally, the data set went through a stringent quality assurance process before it was released. The directors of survey research in each region of the world reviewed the data for consistency and stability, and if a problem was suspected, data was collected again.

Similarly, the WEF followed rigorous procedures while collecting and preparing the country-level data for ICT laws and ICT diffusion among citizens and businesses. The survey team followed detailed guidelines in the process of data collection to ensure that the sample was representative of the population. Further, to rule out the possibility of biases, a randomized sampling procedure was used. The survey was administered in various forms, including face-to-face or telephone interviews with business executives, mailed paper forms, and online

formats. After collecting the data, a series of tests were executed to confirm data reliability and validity. First, outliers in the data were removed to address the influence of extreme values in the dataset. Besides, surveys having at least 80% of the same responses and having below 50% completion rate were excluded to reduce the response bias. Second, tests were carried out to ensure that an individual survey conducted in a specific country represented the sample of that country. Third, individual responses were aggregated by computing a simple average at the country level, and then a test was run to identify excessive perception bias, if any. And, finally, tests were performed to detect any large swings—positive and negative—in the results to confirm the reliability and consistency of the data over time. Having said these, it is worthy to note that indicators such as ICT laws, well-being, and the macroeconomic environment from these reports have widely been used in prior studies (e.g., Bhattacharjee and Shrivastava 2018; Ganju et al. 2016; Larosiliere et al. 2017) published in top-tier IS journals such as Government Information Quarterly, Journal of the Association for Information Science and Technology, and MIS Quarterly, among others.

4 Analyses and Results

4.1 Descriptive Statistics and Correlations

Table 2 presents the descriptive statistics and correlations for all variables. It was observed that the maturity of ICT laws was positively correlated with ICT diffusion among citizens, and ICT diffusion among businesses, both of which were positively correlated with well-being. There was also a positive correlation between the maturity of ICT laws and well-being. Further, the cultural dimensions were found to be negatively correlated with the ICT diffusion variables. Before validating the hypothesized relationships, it was critical to assess the

Table 2 Descriptive statistics and correlations

	M	SD	MEC	REG	SOS	PED	LOC	ITL	IDC	IDB	PDI	MAS	UAI
MEC	4.86	1.02	–										
REG	2.69	1.74	<u>–0.04</u>	–									
SOS	0.84	0.11	<u>0.38</u>	–0.31	–								
PED	93.10	7.27	<u>0.19</u>	<u>–0.16</u>	0.37	–							
LOC	5.20	0.54	<u>0.33</u>	<u>0.03</u>	0.43	<u>0.15</u>	–						
ITL	4.21	0.85	0.51	–0.22	0.61	0.36	0.58	–					
IDC	45.60	23.66	0.47	–0.45	0.72	0.55	0.43	0.75	–				
IDB	4.92	0.67	0.51	–0.23	0.71	0.31	0.64	0.90	0.78	–			
PDI	62.20	21.07	–0.22	<u>0.20</u>	–0.44	–0.28	–0.28	–0.52	–0.57	–0.54	–		
MAS	47.20	19.16	<u>–0.11</u>	<u>0.10</u>	<u>–0.07</u>	<u>–0.19</u>	<u>0.10</u>	<u>–0.12</u>	<u>–0.05</u>	<u>–0.11</u>	<u>0.13</u>	–	
UAI	66.60	21.03	<u>–0.18</u>	–0.27	<u>0.08</u>	<u>0.04</u>	<u>–0.11</u>	<u>–0.08</u>	<u>0.09</u>	<u>–0.12</u>	<u>0.21</u>	<u>0.02</u>	–
WEB	5.89	1.07	<u>0.52</u>	–0.25	<u>0.69</u>	<u>0.28</u>	<u>0.40</u>	<u>0.68</u>	<u>0.80</u>	<u>0.76</u>	<u>–0.56</u>	<u>–0.07</u>	<u>0.08</u>

Note. N = 83; M: Mean; SD: Standard deviation; MEC: Macroeconomic conditions; REG: Region; SOS: Social support; PED: Primary education; LOC: Local competition; ITL: Maturity of ICT laws; IDC: ICT diffusion among citizens; IDB: ICT diffusion among businesses; PDI: Power distance; MAS: Masculinity; UAI: Uncertainty avoidance; WEB: Well-being; Correlations reported were significant at $p < 0.05$ (2-tailed) except the underlined.

possibility of multicollinearity. As per Wooldridge (2016), a high correlation indicates a linear relationship between two independent variables, but whether this will have an impact in correctly estimating the coefficients depends on standard errors of the estimators and total sample variation of the dependent variable. And, the most effective way to check this is to find the variance inflation factor (VIF), which indicates the effect of independent variables on the standard residual of a regression parameter (Hair et al. 2006). Our analysis showed the VIF values to range between 1.154 and 2.248, which was well within the acceptable range of < 4 as recommended by Fox (1991), indicating that our research model was not primarily affected by the multicollinearity concern.

4.2 Hypotheses Testing

We relied on structural equation modeling (SEM) in our analysis due to its ability to simultaneously analyze all paths in the

Table 3 Results of hypotheses testing

	IDC	IDB	WEB
Control variables			
MEC			.116
REG			.070
SOS			.156
PED	.303 ^{***}	-.013	
LOC		.231 ^{**}	
Independent variables			
ITL	.542 ^{***}	.730 ^{***}	
Intervening variables			
IDC			.478 ^{**}
IDB			.235 [*]
Moderating variables			
PDI	-.168 [*]	-.018	
MAS	.186 [*]	-.024	
UAI	.252 ^{***}	.035	
Moderation effects			
ITL * PDI	-.168 [*]	-.186 ^{**}	
ITL * MAS	-.199 ^{**}	-.014	
ITL * UAI	-.131 [*]	-.046	
Adjusted R-square	.772	.852	.691

Note. N = 83; Standardised path coefficients were reported; MEC: Macroeconomic conditions; REG: Regional difference; SOS: Social support; PED: Primary education; LOC: Local competition; ITL: Maturity of ICT laws; IDC: ICT diffusion among citizens; IDB: ICT diffusion among businesses; PDI: Power distance; MAS: Masculinity; UAI: Uncertainty avoidance; WEB: Well-being; * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ (2-tailed).

model (Chin 1998). Notably, we used partial least squares (PLS) instead of covariance-based SEM (CB-SEM) techniques for the following reasons. First, unlike CB-SEM, PLS-SEM does not place strict restrictions on the assumptions regarding the minimum sample size and the distribution of data (Hair et al. 2011). Second, PLS-SEM is robust against skewness issues and omissions of regressors (Cassel et al. 1999). And third, as the research linking maturity of ICT laws, national culture, ICT diffusion among citizens and businesses, and well-being is in an exploratory stage, PLS-SEM appears to be more suitable for data analysis (Hair et al. 2011).

Table 3 summarizes the results of the path analysis. The model was effective in explaining the variance in ICT diffusion among citizens (with Adjusted $R^2 = 0.772$), ICT diffusion among businesses (with Adjusted $R^2 = 0.852$), and well-being (with Adjusted $R^2 = 0.691$). As shown in the table, the maturity of ICT laws was positively and significantly related to the variables of ICT diffusion among citizens ($\beta = 0.542$, $p < 0.001$) and businesses ($\beta = 0.730$, $p < 0.001$); hence, hypotheses H1a and H1b were supported. It thus can be expected that sound ICT laws in a country will lead to a greater diffusion of ICTs among its citizens and businesses.

Further, as shown in the table, the moderation effect of power distance and the maturity of ICT laws was negative and statistically significant on ICT diffusion among citizens ($\beta = -0.168$, $p < 0.05$) and on ICT diffusion among businesses ($\beta = -0.186$, $p < 0.01$), indicating possible support for H2a and H2b respectively. Similarly, the moderation effect of masculinity and the maturity of ICT laws was negative and statistically significant on ICT diffusion among citizens ($\beta = -0.197$, $p < 0.05$), indicating possible support for H3a. However, this interaction was not significant for ICT diffusion among businesses ($\beta = -.014$, $p > 0.05$), thus failing to support H3b. Finally, the moderation effect of uncertainty avoidance and the maturity of ICT laws was negative and significant on ICT diffusion among citizens ($\beta = -0.131$, $p < 0.05$), indicating possible support for H4a. However, this interaction was not significant for ICT diffusion among businesses ($\beta = -.046$, $p > 0.05$), thus failing to support H4b.

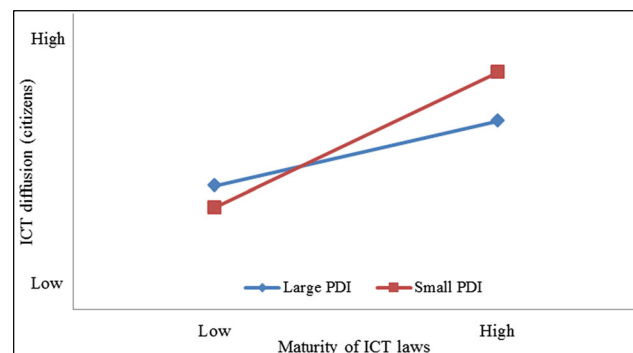


Fig. 3 Moderating effect of power distance on the maturity of ICT laws and ICT diffusion among citizens

To further dig into the nature of moderation, we plotted the significant effects as recommended by Cohen et al. (2003), and conducted simple slope analyses as advocated by Aiken and West (1991). Figure 3 shows the interaction of power distance on the relationship between the maturity of ICT laws and ICT diffusion among citizens. As shown, the positive relationship between the maturity of ICT laws and ICT diffusion among citizens was more prominent at small levels of power distance. Further, it can be observed from the figure that there was a negligible difference in ICT diffusion among citizens between small and large levels of power distance when the maturity of ICT laws was low, but there was a substantial difference when the maturity of ICT laws was high. Corroborating this, a simple slope analysis revealed that the relationship of the maturity of ICT laws with ICT diffusion among citizens was positive and stronger when power distance was small (slope = 16.06, $t = 157.34$, $p < 0.001$) in comparison to when it was large (slope = 7.73, $t = 2.75$, $p < 0.01$). Taken together, the results from Table 3 and Fig. 3 established support for hypothesis H2a.

Figure 4 shows the moderation effect of masculinity on the maturity of ICT laws and ICT diffusion among citizens. As depicted in the plot, there was a positive relationship between the maturity of ICT laws and ICT diffusion among citizens at both high and low levels of masculinity. It is also evident from the plot that there was a negligible difference in ICT diffusion measures between low and high values of masculinity dimension when the maturity of ICT laws was high, but the difference was substantial when the maturity of ICT laws was low. Further, it can be noticed that the slope of the line showing the positive relationship between the maturity of ICT laws and ICT diffusion among citizens became flatter at the high value of masculinity in comparison to the line at the low value of masculinity, indicating the negative moderation effect. This was confirmed through a simple slope analysis, which revealed that the relationship of maturity of ICT laws with ICT diffusion among citizens was positive and stronger when masculinity was low (slope = 16.41, $t = 165.76$, $p < 0.001$) in comparison to when it was high (slope = 7.40, $t = 2.61$,

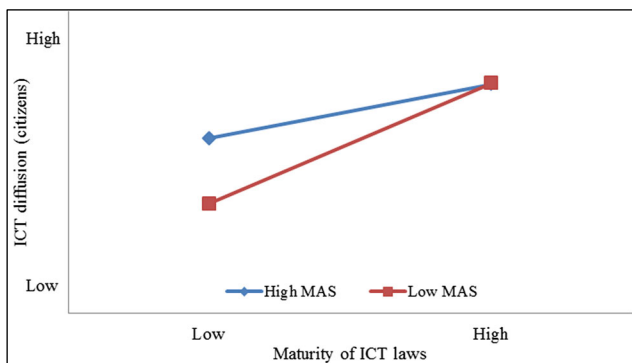


Fig. 4 Moderating effect of masculinity on maturity of ICT laws and ICT diffusion among citizens

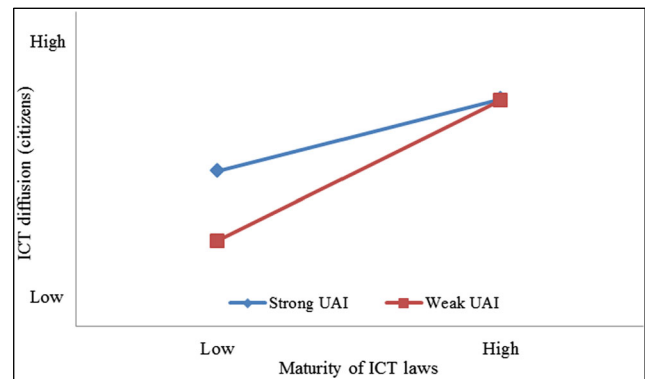


Fig. 5 Moderating effect of uncertainty avoidance on maturity of ICT laws and ICT diffusion among citizens

$p < 0.01$). Taken together, the results from Table 3 and Fig. 4 established support for hypothesis H3a.

Figure 5 shows the moderation effect of uncertainty avoidance on the maturity of ICT laws and ICT diffusion among citizens. As shown, there was a positive relationship between the maturity of ICT laws and ICT diffusion among citizens at both strong and weak levels of uncertainty avoidance. Further, it is noticed from the plot that there was only a small difference in ICT diffusion measures between weak and strong levels of uncertainty avoidance when the maturity of ICT laws was high, but the difference was considerable when the maturity of ICT laws was low. It is also observed that the line showing the positive relationship between the maturity of ICT laws and ICT diffusion among citizens became flatter at strong values of uncertainty avoidance in comparison to the line at weak values of uncertainty avoidance, indicating the negative moderation effect. Corroborating this, a simple slope analysis showed that the relationship of the maturity of ICT laws with ICT diffusion among citizens was positive and stronger when uncertainty avoidance was weak (slope = 15.77, $t = 192.07$, $p < 0.001$) in comparison to when it was strong (slope = 8.05, $t = 2.75$, $p < 0.01$). Taken together, the results from Table 3 and Fig. 5 provided support for hypothesis H4a.

Figure 6 shows the interaction of power distance on the relationship between the maturity of ICT laws and ICT diffusion

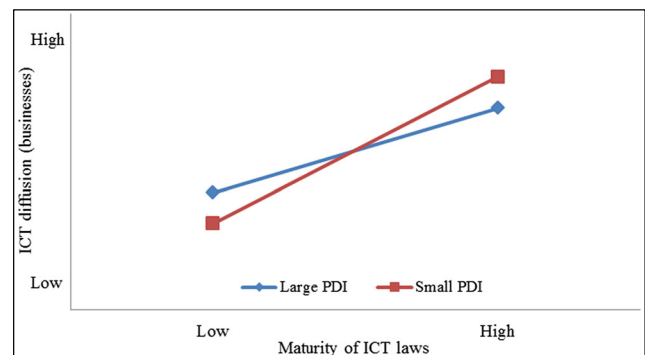


Fig. 6 Moderating effect of power distance on maturity of ICT laws and ICT diffusion among businesses

Table 4 Summary of hypotheses testing

Hypotheses	Relationships	Results
1a	ITL → IDC	Supported
1b	ITL → IDB	Supported
2a	ITL * PDI → IDC	Supported
2b	ITL * PDI → IDB	Supported
3a	ITL * MAS → IDC	Supported
3b	ITL * MAS → IDB	Not supported
4a	ITL * UAI → IDC	Supported
4b	ITL * UAI → IDB	Not supported

Note. ITL: Maturity of ICT laws; IDC: ICT diffusion among citizens; IDB: ICT diffusion among businesses; PDI: Power distance; MAS: Masculinity; UAI: Uncertainty avoidance.

among businesses. As shown, there was a positive relationship between the maturity of ICT laws and ICT diffusion among businesses at both large and small levels of power distance. Further, lines in the plot indicate that there was a substantial difference in ICT diffusion measures between large and small levels of power distance both at the high and low levels of maturity of ICT laws. It is also observed that the line showing the positive relationship between the maturity of ICT laws and ICT diffusion among businesses became flatter at large levels of power distance in comparison to the line pertaining to small power distance, indicating the negative moderation effect. Confirming this, a simple slope analysis revealed that the relationship of maturity of ICT laws with ICT diffusion among businesses was positive and stronger when power distance was small (slope = 0.73, $t = 324.39$, $p < 0.001$) in comparison to when it was large (slope = 0.42, $t = 6.06$, $p < 0.001$). Taken together, the results from Table 3 and Fig. 6 indicated support for hypothesis H2b.

Table 3 further indicates that ICT diffusion among citizens and businesses had a positive and significant relationship with the well-being of a country, and hence, hypotheses H5a ($\beta = 0.478$, $p < 0.01$) and H5b ($\beta = 0.235$, $p < 0.05$) were supported. It thus can be expected that a higher diffusion of ICTs among citizens and businesses in a country will lead to a higher level of well-being. Regarding the control variables, as shown in the table, primary education was found to have a significant relationship

with ICT diffusion among citizens, whereas local competition was found to have a significant association with ICT diffusion among businesses. Macroeconomic conditions, regional difference, and social support did not show any significant relationships. Table 4 summarizes the results of our hypotheses.

4.3 Post Hoc Analysis

Although not formally hypothesized, we conducted post hoc analysis to understand the mediation effects of ICT diffusion on the relationship of the maturity of ICT laws in a country with its well-being. First, we tested a total effect model with the dependent, independent, and control variables, without the presence of ICT diffusion variables. The maturity of ICT laws in a country was found to be significantly and positively associated with its well-being, with a total effect size of 0.314 ($p < 0.001$). We further tested the direct effect of the maturity of ICT laws on well-being, as shown in Fig. 7, and found their relationship to be insignificant ($\beta = -0.179$, $p > 0.05$). The paths from maturity of ICT laws to ICT diffusion among citizens ($\beta = 0.637$, $p < 0.001$), and from ICT diffusion among citizens to the well-being ($\beta = 0.501$, $p < 0.001$) were all significant. And, the paths from maturity of ICT laws to ICT diffusion among businesses ($\beta = 0.801$, $p < 0.001$), and from ICT diffusion among businesses to the well-being ($\beta = 0.384$, $p < 0.05$) were also significant. The effect of maturity of ICT laws in a country on its well-being was thus found to be mediated by ICT diffusion among citizens and businesses.

To compute the indirect effect size and to assess if the indirect effects were meaningful, we used bootstrap confidence intervals. The bootstrapping-based analysis is a non-parametric test, which involves repeated random sampling with replacement from the dataset and computing the indirect effects of mediators in each resample. Based on the computation over thousands of resamples, an empirical approximation of the sampling distribution of the indirect effects is provided, and confidence intervals are generated for the indirect effects. This method, as compared to the traditional mediation-analysis methods (e.g., Sobel test), does not make assumptions about the shape of the sampling distribution; and methodologists (e.g., Hayes 2018; Preacher and Hayes 2008; Shrout and Bolger 2002) therefore recommend that we generate bootstrap

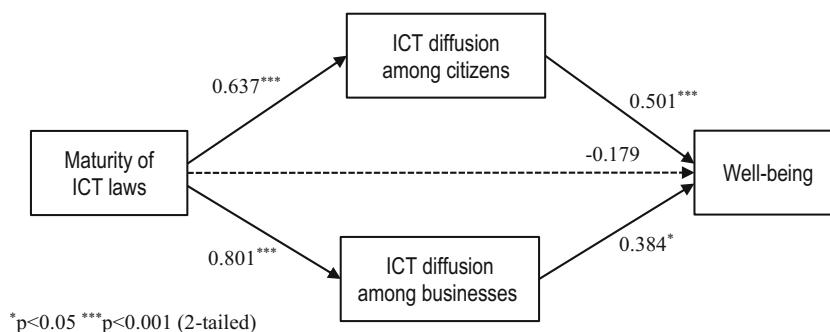


Fig. 7 Analysis after adding a direct link from independent to dependent variable (modified model)

confidence intervals for understanding the mediation effects. We calculated bias-corrected and accelerated confidence intervals across 5000 bootstrap resamples and found that the indirect effect size for the path between the maturity of ICT laws, ICT diffusion among citizens, and well-being (i.e., ITL→IDC→WEB) was 0.319, and it was significant as the 95% bootstrap confidence interval (0.131 to 0.510) did not contain zero. Similarly, the indirect effect size for the path between the maturity of ICT laws, ICT diffusion among businesses, and well-being (i.e., ITL→IDB→WEB) was found to be 0.308, and it was significant having the 95% bootstrap confidence interval within the range between 0.015 and 0.574.

As our original research model (see Fig. 2) did not have the direct linkage between the independent and dependent variables, we further compared the original model (excluding cultural dimensions) with the modified model after adding a direct link from maturity of ICT laws to well-being (see Fig. 7), in terms of R² change for the dependent variable, well-being. For R² comparison, we used Cohen’s (1988) formula for computing the effect size f² as

$$f^2 = (R^2_{\text{included}} - R^2_{\text{excluded}}) / (1 - R^2_{\text{included}})$$

The value of f² indicates whether the effect of a particular independent variable on a dependent variable is substantive. For the modified model, the value of R² for well-being was found to be increased from 0.708 to 0.713 with f² = 0.02, suggesting that the modified model does not have significantly better predictive power than the original model (Chin 1998).

We employed the same set of control variables, as discussed earlier, and observed that macroeconomic conditions, regional difference, and social support did not have any significant association with well-being. And, primary education was found to be significantly related to ICT diffusion among citizens, while its association with ICT diffusion among businesses was not significant. Finally, the local competition was found to be significantly associated with ICT diffusion among businesses. In summary, our post hoc analysis indicated that the indirect effect of maturity of ICT laws in a country on its well-being was significantly mediated by ICT diffusion among citizens and businesses. While this analysis was carried out by excluding the national cultural variables for keeping our focus on the mediation effects only, we found the results to hold after including the cultural variables (see Appendix D for details).

4.4 Robustness Test

To give readers confidence and comfort in the interpretations and contributions of the study, we validated the robustness of our findings by estimating the hypothesized relationships through Hayes’ (2018) regression-based moderation and mediation analysis implemented in PROCESS.² This alternative

approach was chosen for the following reasons. First, both PROCESS and PLS-SEM use ordinary least squares (OLS) to compute path estimates, yet there is a critical difference between them. PROCESS facilitates a regression-based analysis that is known to assign equal weights to all indicators of a composite construct (Goodhue et al. 2012), while PLS-SEM iterates through a process to optimize indicator weights for the construct (Peng and Lai 2012). Therefore, component-based SEM (e.g., PLS-SEM) is better suited for estimating formative models because of its ability to address the statistical identification problems (Chin 1998; Petter et al. 2007). In contrast, PROCESS is a useful tool for performing an observed variable path analysis (Hayes 2018). In our research model, as noted earlier, the variables of *ICT diffusion among citizens* and *ICT diffusion among businesses* were modeled as formative constructs. Although PLS-SEM is preferable to a regression-based analysis for estimating such models (Petter et al. 2007), the validation of findings using a competing approach such as PROCESS confirms the robustness. Second, PROCESS is widely acknowledged to implement modern and

Table 5 Results of the robustness test

	IDC	IDB	WEB
Control variables			
MEC			.111
REG			.025
SOS			.177
PED	.303***	-.004	
LOC		.238***	
Independent variables			
ITL	.539***	.722***	
Intervening variables			
IDC			.416**
IDB			.257*
Moderating variables			
PDI	-.084	-.002	
MAS	.171*	-.022	
UAI	.195**	.043	
Moderation effects			
ITL * PDI	-.189*	-.193**	
ITL * MAS	-.164*	-.014	
ITL * UAI ^a	-.179**	-.065	
R-square	.730	.865	.696

Note. N = 83; ^aUsed as a control variable in the PROCESS macro; Standardised path coefficients were reported; MEC: Macroeconomic conditions; REG: Regional difference; SOS: Social support; PED: Primary education; LOC: Local competition; ITL: Maturity of ICT laws; IDC: ICT diffusion among citizens; IDB: ICT diffusion among businesses; PDI: Power distance; MAS: Masculinity; UAI: Uncertainty avoidance; WEB: Well-being; * p < 0.05 ** p < 0.01 *** p < 0.001 (2-tailed).

² We thank the Coordinating Editor for the suggestion.

computer-intensive methods of inference, especially for determining the indirect effects and for analyzing the conditional process models (Hayes 2018). Having said these, it is essential to note that PROCESS allows estimating only two moderators (Hayes 2018) while our research model contains three moderators, making it infeasible to assess all the hypothesized relationships through PROCESS simultaneously. Despite the advantages of PLS-SEM, it is recommended that we perform alternative analyses to ensure the robustness of the PLS-SEM outcomes (Peng and Lai 2012). Therefore, in line with prior studies (e.g., Giovanis et al. 2015; Gong 2018; Klein and Rai 2009) that carried out regression analyses in PROCESS and other tools in addition to SEM analysis, we compared our results of PLS-SEM shown in Table 3 with the PROCESS outcomes presented in Table 5.

Given the limitation in the number of moderators to be used in PROCESS, we followed a different approach for estimating three moderation effects in a single analysis. That is, as only two variables can be specified as moderators in PROCESS (Hayes 2018), we defined two cultural variables (power distance and masculinity) as moderators and controlled for the product of the maturity of ICT laws and the third cultural variable (uncertainty avoidance). The underlying mechanism in PROCESS is that it includes the product of two antecedent variables (say, X and W) in the model to perform the moderation tests of W on the effect of X on Y (i.e., dependent variable) (Hayes 2018). Hence, we computed the product of the maturity of ICT laws and uncertainty avoidance and specified this product term and the moderator—uncertainty avoidance as control variables so that the final model could analyze all three moderation effects simultaneously. In essence, two moderation effects (i.e., the maturity of ICT laws x power distance, and the maturity of ICT laws x masculinity) were estimated through specifying power distance and masculinity as two moderators in the PROCESS macro, and the remaining moderation effect (i.e., the maturity of ICT laws x uncertainty avoidance) was estimated by including its product term as a control variable that could explain variance in the dependent variable. This approach enabled us to overcome the limitation of PROCESS and examine the three moderation effects through a single statistical model. As shown in Table 5, the results were found to be similar to that of the PLS-SEM

results. That is, the maturity of ICT laws was positively associated with ICT diffusion among citizens and ICT diffusion among businesses, which in turn were found to be positively related to well-being. Alike our initial observation, the moderation effect of power distance and the maturity of ICT laws was found to be negative and statistically significant on ICT diffusion among citizens and ICT diffusion among businesses. Similarly, (a) the moderation effect of masculinity and the maturity of ICT laws, and (b) the moderation effect of uncertainty avoidance and the maturity of ICT laws were negative and statistically significant on ICT diffusion among citizens, and these effects were found to be negative but insignificant on ICT diffusion among businesses. In summary, our results of hypotheses testing (see Tables 3 and 4) were observed to hold while performing the data analysis in PROCESS, thereby affirming the robustness of our findings.

Our post-hoc analysis, as in Section 4.3, was about mediation tests. To further confirm the robustness of the mediation results, we obtained the total effect, direct effect, and indirect effects from PROCESS outputs that are summarized in Table 6. Similar to the results of our initial mediation analysis, we found support for the mediation effects of ICT diffusion among citizens and ICT diffusion among businesses. That is, the maturity of ICT laws was observed to be significantly and positively related to well-being, with a total effect size of 0.314. The indirect effect size for the path ITL→IDC→WEB was found to be 0.261, and it was significant as the 95% bootstrap confidence interval (0.099 to 0.500) did not include zero. The indirect effect for the path ITL→IDB→WEB was also found to be significant (confidence interval to range between 0.004 and 0.604) with the effect size of 0.271. Taken together, we found the mediation results to be robust as both our initial results and PROCESS outcomes led us to draw similar conclusions.

5 Discussion

This study explored, at a cross-country level, (1) the influence of the maturity of ICT laws and the national cultural dimensions on ICT diffusion among citizens and businesses; and (2) the effect of ICT diffusion on the well-being. Our results

Table 6 Robustness test of mediation effects

Path	Total effect	Direct effect	Indirect effect
ITL → IDC → WEB	0.314 (0.122 to 0.506) ^a	−0.094 (−0.427 to 0.175)	0.261 (0.099 to 0.500) ^a
ITL → IDB → WEB			0.271 (0.004 to 0.604) ^a

Note. N = 83; 95% bootstrap percentile confidence intervals were reported in parentheses and generated using 5000 bootstrap resamples; ITL: Maturity of ICT laws; IDC: ICT diffusion among citizens; IDB: ICT diffusion among businesses; WEB: Well-being. ^a95% confidence intervals that did not include a zero.

suggested that the maturity of ICT laws in a country was positively associated with ICT diffusion among its citizens and businesses, and this relationship was contingent on the national cultural dimensions, but at varying degrees. To elaborate, all three cultural dimensions (i.e., power distance, masculinity, and uncertainty avoidance) were found to negatively moderate the relationship between the maturity of ICT laws and ICT diffusion among citizens. Nevertheless, only power distance found support as a moderator for ICT diffusion among businesses. That is, the effect of the maturity of ICT laws on the ICT diffusion among citizens was higher in countries characterized by small power distance, low masculinity, and weak uncertainty avoidance cultures. And, in the case of businesses, sound ICT laws resulted in greater diffusion of ICTs in countries with small power distance cultures than their counterparts. Further, our post hoc analysis confirmed that the maturity of ICT laws led to the well-being of a country by increasing ICT diffusion among its citizens and businesses.

The lack of support for the moderation effect of masculinity for businesses (i.e., H3b) may lie in the multi-purpose nature of ICTs. It has been argued that if ICTs are used primarily for facilitating communication, the degree of diffusion is expected to be higher in feminine cultures. If ICTs are used mostly for gaining competitive advantage, a higher degree of diffusion will be observed in masculine cultures (Erumban and Jong 2006). The Hofstede cultural dimension of masculinity vs. femininity includes both perspectives—(1) equality and social relationships (feminine values), which can be argued to increase ICT diffusion if organizations gain from increased human capital and wish to focus on building a social relationship (e.g., customer relationship) through communication; and (2) assertiveness, competition, and achievement (masculine values), which have significant relevance for organizations and can be stated to increase the ICT use when the purpose is to improve work goals, performance, and attain competitive advantage. In sum, depending on the purpose of using ICTs, for some countries, both masculine and feminine cultures may witness a higher level of ICT diffusion among organizations with an increase in the level of maturity of ICT laws. Having said this, it was refreshing to observe that the link of the moderation effect pertaining to H3b was in the expected direction (i.e., negative), thereby satisfying our line of argument to a considerable extent. We believe that this negative moderation effect may get more prominent for a set of countries, which is subject to further exploration.

Besides, the moderation effect of uncertainty avoidance on the relationship between the maturity of ICT laws and ICT diffusion (i.e., H3c) was found insignificant. While ICT laws are useful for businesses to reduce various uncertainties (e.g., issues regarding consumer data protection and electronic signature validation) that may negatively affect their ICT use,

there exist certain software solutions (e.g., BigID software) that also deal with such issues and help companies to comply with ICT laws. In other words, sound ICT laws are necessary for addressing ICT-induced legal and regulatory challenges, including information security issues; in addition to that, ICT itself, in the form of software and applications, can be beneficial to address some of these issues and to comply with the laws. Thus, for some countries having strong uncertainty avoidance cultures, businesses may be found to use ICTs more to avoid the ICT-induced risks. Nevertheless, such instances could be dependent on the efficacy of businesses and the availability of capable IT software; else, complexity and lack of expertise regarding the use of such software could induce more uncertainties and result in reduced ICT use. Perhaps, this could be the reason why our results found the link of the moderation effect pertaining to H3c to be in the desired direction (i.e., negative), which is again refreshing and needs further examination.

5.1 Implications

Our study offers several implications for research and practice. First, drawing on the literature on ICT diffusion and the perspective of perceived risk, this study underscores the importance of an underexplored environmental factor, namely, ICT-related regulatory environment characterized by ICT laws. As emerging technologies such as the Internet of Things and artificial intelligence are flourishing, the frequency and the scale of information security issues continue to rise, and so do user concerns. Prior research dealing with information security issues in connection with ICT use suggested that perceived security risk could largely affect users' attitudes towards using ICTs (Arpaci et al. 2015; Im et al. 2008; Martins et al. 2014), thereby affecting the diffusion of ICTs. Given that ICT laws define the regulatory landscape of a country that addresses various legal and regulatory challenges regarding ICT use, our research is instrumental in identifying ICT laws as a potential determinant that can deal with such risks and make an environment conducive for ICT diffusion. The study thus extends the literature on information security and technology diffusion by developing an understanding of how the maturity of ICT laws in a country can be helpful to improve ICT diffusion among its citizens and businesses.

Second, by drawing on Hofstede's typology of national culture and the literature on ICT diffusion, the current study derives theoretical linkages among maturity of ICT laws, national culture, and ICT diffusion. In particular, we regard cultural dimensions as contingencies and examine how the relationship between the maturity of ICT laws and ICT diffusion varies across different cultures characterized by power distance, masculinity, and uncertainty avoidance. We posit that not every cultural dimension will have a uniform effect on the "ICT laws—ICT diffusion" relationship; it may differ

depending on the stakeholder. To elaborate, while power distance is found to moderate the aforementioned relationship for citizens and businesses such that the positive impact of maturity of ICT laws on ICT diffusion among these two stakeholders would be enhanced in small power distance cultures and weakened in large power distance cultures, masculinity and uncertainty avoidance are noticed to negatively moderate the relationship for citizens only.

Third, the IS research calls for expanding our knowledge base and research horizons beyond business and management to embrace the societal impacts of ICT. The Bright ICT Initiative proposed by the Association for Information Systems (AIS) council, an establishment dedicated to IS research and educational domain, suggests that we refocus our research efforts towards investigating how technology development impacts society and communities (Lee and Fedorowicz 2018). Our study is one among the handful of investigations aimed at answering this call by focusing our attention to (1) ICT laws that would be very much useful in mitigating information security and privacy challenges, and facilitating ICT diffusion; and (2) a country's well-being that could be improved by enhancing ICT diffusion among citizens and businesses. Specifically, drawing on the technological determinism theory and ICT diffusion literature, this study recognizes the substantial role of ICT diffusion among citizens and businesses in improving the level of the overall well-being of a country. Furthermore, drawing on Dror's (1970) framework of law and social change, our study provides an initial theoretical basis and empirical evidence of the mechanism of how ICT laws will be able to exert societal impact (i.e., well-being) by increasing the degree of ICT diffusion among citizens and businesses.

Fourth, we acknowledge the government, citizens, and businesses as the key stakeholders, on which the economic future of a country largely depends. Given the dearth of macro-level studies simultaneously examining the roles of different stakeholders in influencing the overall level of ICT diffusion in a country, this study is one among the first few studies to offer a macro perspective by jointly estimating ICT diffusion among citizens and businesses in a single study, and by understanding the role of government while exploring the effect of maturity of ICT laws on the diffusion. Taken together, this study underscores the relationships among ICT laws, national culture, ICT diffusion, and well-being in a country, and we believe that our theoretically driven empirical research will be instrumental in inspiring future research on this phenomenon.

From a practical standpoint, our study first indicates that ICT laws are useful for enhancing ICT diffusion among citizens and businesses. These laws help define the legal structure and standards for gathering, sharing, and storing digital information (Bhattacharjee and Shrivastava 2018), and enable citizens and businesses to electronically communicate and

transact with other parties by minimizing legal and regulatory issues (UN-Report 2007). For instance, IT Act 2000 of India states, "Where any law provides that information or any other matter shall be in writing or in the typewritten or printed form, then, notwithstanding anything contained in such law, such requirement shall be deemed to have been satisfied if such information or matter is—(a) rendered or made available in an electronic form; and (b) accessible so as to be usable for a subsequent reference" (MEITY 2019, p. 5). It essentially provides legal recognition of electronic records that would encourage businesses to engage in electronic contracts, which will not only help e-commerce to thrive in a country but also lead to a greater level of ICT diffusion in that country. Hence, a country must invest in building sound ICT laws and regulations to facilitate its law enforcement that would further enable increased diffusion of ICTs among citizens and businesses.

Second, the moderating effects of national cultural dimensions would help policymakers understand the significance of cultural values in explaining the differences in the "ICT laws—ICT diffusion" relationship across countries. We suggest that policymakers in a country have to be mindful of the potential effect of cultural values. Although it is difficult to change the cultural traits, this must not discourage a country from taking steps towards developing its ICT laws, since our analyses found maturity of ICT laws to be positively associated with ICT diffusion for most cultures. The only issue lies in the variation of the degree to which the maturity of ICT laws results in increased ICT diffusion; for some cultures, it is very high, and for others, it is marginal.

Third, while we acknowledge that technological inventions are necessary for mitigating some of the regulatory challenges and security risks posed by ICTs, technology alone cannot be the solution. We emphasize building the ICT-related regulatory environment to raise the level of ICT diffusion. A country not only needs to develop and reform ICT laws but also has to ensure that the laws benefit the users without creating further problems. That is, policymakers have to focus on improving ICT laws that will be able to standardize various ICT-related dealings and enhance the ICT diffusion by mitigating the perceived risk of users. For instance, recently, the European Union (EU) proposed the General Data Protection Regulation (GDPR) to update their conflicting laws and regulations pertaining to online privacy, and this GDPR is expected to benefit European consumers by giving them control of their privacy (Casey 2019). In sum, with the growing concerns of digital security and privacy challenges, the refinement of ICT laws has become essential in guiding businesses in dealing with these challenges. This is further endorsed by the Digital Enterprise Report (DER 2019) published by Okta, Inc., a publicly-traded identity and access management company based in San Francisco, in which over half of the technology decision-makers at large organizations suggested that the

legislative movement in terms of sophisticated laws would make security compliance easier. However, sometimes piecemeal law reform may lead to more issues than it solves (UN-Report 2007), making it important to devise the approach of developing ICT laws within the broader context of a country's ICT diffusion. Further, as sophisticated laws could be intricate, the government may consider educating and making ICT users aware of the effectiveness and application of ICT laws for creating an encouraging environment for ICT use.

Fourth, this study further draws the attention of policymakers to the influence of ICT diffusion among citizens and businesses on the well-being of a country, thereby indicating the need for taking measures to improve technological diffusion. And, as stated earlier, one such measure is to work on the development of ICT laws to increase its level of maturity, which can positively impact ICT diffusion. This research, as shown in the conceptual framework (see Fig. 1), suggests that for a country to raise the level of its well-being, it has to focus on the maturity of ICT laws, which can be conceived as a tool and policy instrument for bringing societal change by enhancing ICT diffusion among its citizens and businesses.

5.2 Limitations and Future Research Directions

The study findings have to be interpreted in consideration of two limitations. First, this study uses secondary data compiled from multiple third-party sources to incorporate the infeasibility of collecting primary data for undertaking a large scale cross-country analysis. Nevertheless, as these reputable sources use stringent guidelines for their data collection, the choice of secondary sources is perceived to be reasonable for conducting such a study. Second, we used data from countries that are common to all the primary sources, and countries such as Algeria, North Korea, Oman, and others were excluded from the sample. As a result, data from 83 countries were examined, which appears to be adequate considering that 50 is the minimum number necessary to avert the concerns over degrees of freedom and efficiency (Hair et al. 2006).

Future studies may focus on various directions. First, the primary purpose of this study was to realize the role of ICT-related regulatory environment in influencing ICT diffusion, and as an initial step towards serving this purpose, we focused on exploring the direct effect of the maturity of ICT laws on ICT diffusion. While we found the positive direct relationship between them, there could be intervening variables (e.g., administrative process efficiency) explaining how the maturity of ICT laws could result in increased ICT diffusion. Future research may uncover such mediating variables. Second, we used national cultural dimensions as the moderators and realized their roles in connection with ICT laws. However, our analyses could not fully explain the hypothesized moderation

effects pertaining to masculinity and uncertainty avoidance for businesses, which can be explored as part of the future research by considering a comparative analysis of two or more countries that are placed almost at the extreme ends of masculinity and uncertainty avoidance dimensions. Third, future research may identify and study other contingencies that could affect the “ICT laws—ICT diffusion” relationship to offer exciting insights into the phenomenon. For instance, governance mechanisms such as government effectiveness, political stability, and control of corruption (Kaufmann et al. 1999) could act as contingencies, since poor governance may hinder the maturity of ICT laws and hence influence the “ICT laws—ICT diffusion” relationship. Fourth, while this study has primarily focused on the diffusion of ICTs among citizens and businesses, future research may understand the significant role played by the public sectors in improving the well-being.³ Nevertheless, it is essential to note that the effect of ICT use by the public sectors on the well-being of a country will be more pronounced when its citizens and businesses use ICTs for harnessing the benefits of online public services. It thus may be expected that the diffusion of ICTs among citizens and businesses will have a more direct impact on the well-being of a country than ICT diffusion among the public sectors, given that citizens and businesses are usually the end-users of online public services. Future studies may validate these possibilities. Finally, following Lee and Fedorowicz (2018), we call for more research directing their focus on the societal impacts of ICT. Specifically, it will be worthwhile to examine, in the purview of the Bright ICT Initiative, how technological development in dealing with ICT security and privacy issues may make significant contributions to society.

6 Concluding Remarks

Despite the growing concerns of ICT-induced security and privacy risks, limited research is carried out to understand the role of ICT-related regulatory environment in shaping the ICT diffusion across countries. This study, as an initial step towards building such an understanding, underlines the importance of maturity of ICT laws in a country and develops a conceptual framework by drawing on Dror's framework of law and social change as an overarching framework, and by grounding on the literature on ICT diffusion, the perspective of perceived risk, Hofstede's typology of national culture, and the technological determinism theory. Anchoring on our conceptual framework as a theoretical lens, the current study proposes a research model to (1) investigate the impact of maturity of ICT laws in a country on ICT diffusion among its citizens and businesses; (2) examine the moderating effects of national cultural dimensions on the aforementioned relationships; and (3) understand the role of ICT diffusion in promoting the level of well-being of a country. The model is empirically validated using publicly accessible archival data, and the findings suggest that the level

³ We thank Reviewer #2 for this thought.

of maturity of ICT laws in a country positively impacts the level of its ICT diffusion; nevertheless, the degree of this impact is dependent on the cultural values of power distance, masculinity, and uncertainty avoidance. This study also emphasizes that the maturity of ICT laws significantly contributes to the well-being of a country by increasing ICT diffusion among its citizens and businesses. In summary, we firmly believe that this research uncovers an exciting phenomenon, and our theoretical explanations and empirical validations will enrich the IS literature and stimulate further research.

Appendix A

List of countries

Albania, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Germany, Ghana, Greece, Guatemala, Honduras, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Jordan, Kenya, Kuwait, Latvia, Lebanon, Lithuania, Luxembourg, Malawi, Malta, Mexico, Morocco, Mozambique, Nepal, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Vietnam, and Zambia; $N = 83$.

Appendix B

Overview of the well-being construct

Essence of well-being

The notion of well-being was introduced in Nicomachean and Eudemean ethics by philosophers such as Aristotle (2000). He and other Greek philosophers hold the view that it is the attainment of *eudemonia* or well-being that drives human endeavor (Ganju et al. 2016). Thereafter, several philosophers discussed well-being and built theories (e.g., maximization of subjective well-being) around it (Diener et al. 1998). While the idea of attaining well-being started in the field of philosophy, it has received increasing attention in the psychology and economics works of literature in recent decades. For instance, economists of the neoclassical school of thought posit that the pursuit of utility is central to people's endeavors (Ganju et al. 2016). In contrast, IS research has paid limited attention to understand well-being in connection to the use of ICTs. Given that well-being is a societal aspect, we believe that it

is worthwhile and exciting to explore how it can be achieved by harnessing the benefits of ICTs.

It is interesting to remark that the term well-being is closely associated with the term happiness. In fact, in global reports such as the World Happiness Report (WHR 2018), happiness and well-being have been used interchangeably. In theory, well-being represents both positive and negative evaluations that people make about their lives (Diener 2006), and it refers to a range of phenomena including individuals' emotional responses, domain satisfactions, and overall evaluations of life satisfaction (Diener et al. 1999). While these are different aspects, they exhibit high correlation and are often interpreted under the umbrella term of well-being (Ganju et al. 2016). In contrast, happiness usually refers to positive feelings that people experience, and it may have different meanings to different people. For instance, it may refer to global judgments about life satisfaction and causes that make people happy, if they are leading a good life, and most studies thus prefer to use the term well-being instead of happiness (Ganju et al. 2016). Nevertheless, alike global reports, well-being is colloquially referred to as happiness in the literature (Diener 2006).

Measures of well-being

Multiple scales exist to measure the construct of well-being. While studies have used different scales based on their preference, it is argued that these scales have yielded almost similar results (Ganju et al. 2016). That is, there is a high correlation between the outcomes generated by these different scales. In generic, two types of scales have been used predominantly in literature. They include (1) a single-item scale such as the Cantril scale; and (2) multi-item scale such as the satisfaction with life scale.

This study uses the Cantril scale (Cantril 1965a, 1965b) that measures the level of well-being by asking respondents to imagine a ladder of which one end represents "the best possible life for you," and the other end represents "the worst possible life for you." Respondents are then asked to identify where on the ladder they stand at that time. Typically, this scale uses 11 steps that are numbered from "0" (worst possible life) to "10" (best possible life), but occasionally the ladder is found to have nine or ten steps. The single-item scale was developed by Henry Cantril and has been accepted widely for the results being "theoretically convincing and politically interesting" (Glatzer and Gulyas 2014, p. 510).

The satisfaction with life scale is composed of five items, and it was proposed by Diener et al. (1985). This scale considers people's overall assessment of their level of satisfaction with their lives. Respondents are asked to record their responses on a 7-point scale ("1" representing "strongly disagree" and "7" representing "strongly agree") for five items: (1) In most ways my life is close to my ideal; (2) The conditionals of my life are excellent; (3) I am satisfied with my life;

(4) So far I have gotten the important things I want in my life; and (5) If I could live my life over, I would change almost nothing (Pavot et al. 1991).

Appendix C

Overview of the national cultural dimensions

The scores for national cultural dimensions were initially estimated by Geert Hofstede and his research team. He conducted a comprehensive study of a large body of survey data to understand how people's values in the workplace were influenced by culture (Hofstede et al. 2010). In particular, he studied employees working in the large multinational corporation, International Business Machines (IBM), in various countries around the world between 1967 and 1973 (see www.hofstede-insights.com). IBM employees were conceived to be the most represented sample as they were similar in all aspects except nationality due to which cultural differences were visible (Hofstede et al. 2010). While the data covered 50 countries and three regions around the world in the 1970s, subsequent studies carried out replications and extensions of the IBM study on different respondent groups including civil service managers, commercial airline pilots, consumers, bank employees, and elites in various other countries (Hofstede et al. 2010). The survey questionnaire employed for computing the scores for power distance, masculinity vs. femininity, and uncertainty avoidance is discussed in the ensuing section.

Power Distance

For calculating the power distance index, three survey items were used, and the mean scores on these questions were retrieved for each country. The formula involved “adding or subtracting the three scores after multiplying each by a fixed number, and finally adding another fixed number” (Hofstede et al. 2010, p. 56). The purpose was to (1) compute a weighted average by assigning equal weight to the three questions, and (2) get scores ranging from “0” (small-power-distance country) to “100” (large power-distance country). The three survey items (Hofstede et al. 2010, p. 56) were as follows:

- i To nonmanagerial employees: “How frequently, in your experience, does the following problem occur: employees being afraid to express disagreement with their managers?” (mean score on a 1–5 scale from “very frequently” to “very seldom”)
- ii To Subordinates: Their “*perception* of the boss’s actual decision-making style (percentage choosing the description of either an autocratic style or a paternalistic style, out of four possible styles plus a “none of these” alternative)”

- iii To Subordinates: Their “*preference* for their boss’s decision-making style (percentage preferring an autocratic or a paternalistic style, or, on the contrary, a style based on majority vote, but *not* a consultative style)”

Masculinity

For calculating masculinity index, the survey questions included a set of 14 work goals. Respondents “were asked: “Try to think of those factors that would be important to you in an ideal job; disregard the extent to which they are contained in your present job. How important is it to you to ...” followed by fourteen items, each to be scored on a scale from 1 (of utmost importance to me) to 5 (of very little or no importance)” (Hofstede et al. 2010, p. 92). For each country, a factor score was then computed through a factor analysis of 14 work goals. After that, scores were ranged from 0 (the most feminine country) to 100 (the most masculine country) by multiplying the factor scores by 20 and adding 50 (Hofstede et al. 2010, p. 92).

Uncertainty avoidance

Three survey questions (Hofstede et al. 2010, p. 190), as shown below, were used for computing the uncertainty avoidance index.

- i Job stress: “How often do you feel nervous or tense at work?” The measure was anchored on a 1-to-5 scale with “1” representing “I always feel this way” and “5” representing “I never feel this way”
- ii Rule orientation: “Company rules should not be broken—even when the employee thinks it is in the company’s best interest.” The measure was anchored on a 1-to-5 scale with “1” representing “I always feel this way” and “5” representing “I never feel this way”
- iii “How long do you think you will continue working for IBM?” The options were as follows: “(1) Two years at the most; (2) From two to five years; (3) More than five years (but I probably will leave before I retire); and (4) Until I retire”

Similar to the calculation of the power distance index, the value for the uncertainty avoidance index for each country was computed from the mean scores of the first and second of the survey questions and the percentage score for the third question. The mathematical formula used for calculating this index was the same as that of the power distance index and had a similar purpose of setting the range of scores between “0” (a country with the weakest uncertainty avoidance) and “100” (a country with the strongest uncertainty avoidance).

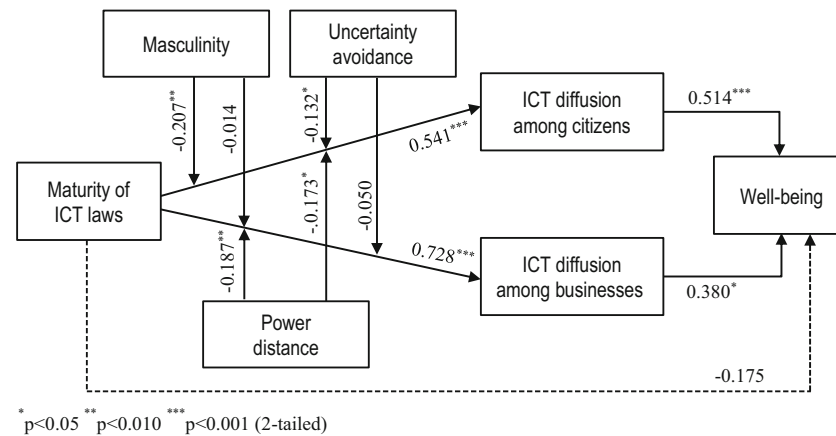


Fig. 8 Mediation analysis after including the national cultural dimensions

Appendix D

Figure 8 presents the results of mediation tests after including the national cultural variables. We found that the maturity of ICT laws in a country was significantly and positively associated with its well-being, with a total effect size of 0.314 ($p < 0.001$). Further, as shown in the figure, the direct effect of the maturity of ICT laws on well-being was not significant ($\beta = -0.175$, $p > 0.05$). The paths from maturity of ICT laws to ICT diffusion among citizens ($\beta = 0.541$, $p < 0.001$), and from ICT diffusion among citizens to the well-being ($\beta = 0.514$, $p < 0.001$) were all significant. And, the paths from maturity of ICT laws to ICT diffusion among businesses ($\beta = 0.728$, $p < 0.001$), and from ICT diffusion among businesses to the well-being ($\beta = 0.380$, $p < 0.05$) were also significant. Hence, the effect of maturity of ICT laws in a country on its well-being was observed to be mediated by ICT diffusion among citizens and businesses, even in the presence of national cultural variables.

References

- Abukhzam, M., & Lee, A. (2010). Factors affecting Bank staff attitude towards E-banking adoption in Libya. *The Electronic Journal of Information Systems in Developing Countries*, 42(2), 1–15.
- Aiken, L., & West, S. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks: Sage Publications.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Aristotle. (2000). *Nicomachean ethics* (Roger Crisp, Trans. Cambridge: Cambridge University Press.
- Arpaci, I., Kilicer, K., & Bardakci, S. (2015). Effects of security and privacy concerns on educational use of cloud services. *Computers in Human Behavior*, 45, 93–98.
- Attewell, P. (1992). Technology diffusion and organizational learning: The case of business computing. *Organization Science*, 3(1), 1–19.
- Bagchi, K., Hart, P., & Peterson, M. (2004). National culture and information technology product adoption. *Journal of Global Information Technology Management*, 7(4), 29–46.
- Bhattacharjee, A., & Shrivastava, U. (2018). The effects of ICT use and ICT Laws on corruption: A general deterrence theory perspective. *Government Information Quarterly*, 35(4), 703–712.
- Boyer-Wright, K., & Kottemann, J. (2008). High-level factors affecting global availability of online government services. In *Proceedings of the 41st Hawaii international conference on system sciences* (pp. 199–205). Waikoloa: IEEE.
- Brown, D. H., & Thompson, S. (2011). Priorities, policies and practice of e-government in a developing country context: ICT infrastructure and diffusion in Jamaica. *European Journal of Information Systems*, 20(3), 329–342.
- Bygstad, B., & Aanby, H. P. (2010). ICT infrastructure for innovation: A case study of the enterprise service bus approach. *Information Systems Frontiers*, 12(3), 257–265.
- Cantril, H. (1965a). *Pattern of human concerns*. New Brunswick, NJ: Rutgers University Press.
- Cantril, H. (1965b). *Pattern of human concerns*, (1st ed.). Rutgers University Press: New Brunswick, New Jersey.
- Casey, K. (2019). Does customer data privacy actually matter? It Should. *Entrepreneur India*. <https://www.entrepreneur.com/article/332700>. Accessed 28 Nov 2019.
- Cassel, C., Hackl, P., & Westlund, A. H. (1999). Robustness of partial least-squares method for estimating latent variable quality structures. *Journal of Applied Statistics*, 26(4), 435–446.
- Chandler, D. (1996). Shaping and being shaped: The tone of technological determinism. *Computer Mediated Communication Magazine*, 1.
- Charoensukmongkol, P., & Moqbel, M. (2012). Does investment in ICT curb or create more corruption? A cross-country analysis. *Public Organization Review*, 14(1), 51–63.
- Chen, Y., & Zahedi, F. M. (2016). Individuals' internet security perceptions and behaviors: Polycontextual contrasts between the United States and China. *MIS Quarterly*, 40(1), 205–222.
- Chin, W. W. (1998). The partial least squares approach to structural equation modelling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). New Jersey: Lawrence Erlbaum Associates.
- Cho, H., Rivera-Sánchez, M., & Lim, S. S. (2009). A multinational study on online privacy: Global concerns and local responses. *New Media and Society*, 11(3), 395–416.
- Choudrie, J., Pheeraphuttrangkoon, S., & Davari, S. (2018). The digital divide and older adult population adoption, use and diffusion of

- mobile phones: A quantitative study. *Information Systems Frontiers*, 22, 673–695. <https://doi.org/10.1007/s10796-018-9875-2>.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale: Lawrence Erlbaum.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. New York: Routledge.
- Cooper, S., & Sahami, M. (2013). Reflections on Stanford’s MOOCs. *Communications of the ACM*, 56(2), 28–30.
- Coursera. (2019). Coursera website. <https://about.coursera.org/>. Accessed 4 Nov 2019.
- Dafoe, A. (2015). On technological determinism: A typology, scope conditions, and a mechanism. *Science, Technology, & Human Values*, 40(6), 1047–1076.
- Das, A., Singh, H., & Joseph, D. (2017). A longitudinal study of e-government maturity. *Information and Management*, 54, 415–426.
- Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13, 319–340.
- Dedrick, J., Kraemer, K. L., & Shih, E. (2014). Information technology and productivity in developed and developing countries. *Journal of Management Information Systems*, 30(1), 97–122.
- Deloitte. (2014). *Value of connectivity: Economic and societal benefits of expanding internet access*. London: Deloitte LLP https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/TechnologyMediaCommunications/2014_uk_tmt_value_of_connectivity_deloitte_ireland.pdf.
- DER. (2019). *The digital Enterprise report: How the world’s largest companies are evolving with technology*. San Francisco: Okta <https://www.okta.com/resources/whitepaper/the-digital-enterprise-report-how-the-worlds-largest-companies-are-evolving-with-technology/>.
- Dewan, S., & Kraemer, K. L. (2000). Information technology and productivity: Evidence from country-level data. *Management Science*, 46(4), 548–562.
- Diener, E. (2006). Guidelines for national indicators of subjective well-being and ill-being. *Applied Research in Quality of Life*, 1(2), 151–157.
- Diener, E., & Biswas-Diener, R. (2002). Will money increase subjective well-being? *Social Indicators Research*, 57(2), 119–169.
- Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, 49(1), 71–75.
- Diener, E., Sapta, J. J., & Suh, E. (1998). Subjective well-being is essential to well-being. *Psychological Inquiry*, 9(1), 33–37.
- Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin*, 125(2), 276–302.
- DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160.
- Dotan, A., & Zaphiris, P. (2010). A cross-cultural analysis of Flickr users from Peru, Israel, Iran, Taiwan and the United Kingdom. *International Journal of Web Based Communities*, 6(3), 284–302.
- Dror, Y. (1970). Law as a tool of directed social change: A framework for policy-making. *The American Behavioral Scientist*, 13(4), 553–559.
- EdX. (2019). EdX website. <https://www.edx.org/about-us>.
- Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook “friends”: Social capital and college students’ use of online social network sites. *Journal of Computer-Mediated Communication*, 12(4), 1143–1168.
- Erumban, A. A., & Jong, S. B. (2006). Cross-country differences in ICT adoption: A consequence of culture? *Journal of World Business*, 41(4), 302–314.
- Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: A perceived risk facets perspective. *International Journal of Human-Computer Studies*, 59(4), 451–474.
- Feng, T. (2003). A critique of Hofstede’s fifth national culture dimension. *International Journal of Cross Cultural Management*, 3(3), 347–368.
- Fox, J. (1991). *Regression diagnostics*. Newbury Park: Sage Publications.
- Gallup. (2019). Understanding how Gallup uses the Cantril scale. <https://news.gallup.com/poll/122453/Understanding-Gallup-Uses-Cantril-Scale.aspx>.
- Ganju, K. K., Pavlou, P. A., & Banker, R. D. (2016). Does information and communication technology lead to the well-being of nations? A country-level empirical investigation. *MIS Quarterly*, 40(2), 417–430.
- GCR. (2015). The global competitiveness report. World Economic Forum.
- Giovanis, A., Athanasopoulou, P., & Tsoukatos, E. (2015). The role of service fairness in the service quality–relationship quality–customer loyalty chain: An empirical study. *Journal of Service Theory and Practice*, 25, 744–776.
- GITR. (2015). The global information technology report. World Economic Forum.
- GITR. (2016). The global information technology report. World Economic Forum.
- Glatzer, W., & Gulyas, J. (2014). Cantril self-anchoring striving scale. In W. Glatzer & J. Gulyas (Eds.), *Encyclopedia of quality of life and well-being research* (pp. 509–511). Dordrecht: Springer.
- Gong, T. (2018). Customer brand engagement behavior in online brand communities. *Journal of Services Marketing*, 32, 286–299.
- Gong, W., Li, Z. G., & Stump, R. L. (2007). Global internet use and access: Cultural considerations. *Asia Pacific Journal of Marketing and Logistics*, 19(1), 57–74.
- Goodhue, D. L., William, L., & Thompson, R. (2012). Comparing PLS to Regression and LISREL: A response to Marcoulides, Chin, and Saunders. *MIS Quarterly*, 36(3), 703–716.
- Gorla, N., Chiravuri, A., & Chinta, R. (2017). Business-to-business e-commerce adoption: An empirical investigation of business factors. *Information Systems Frontiers*, 19(3), 645–667.
- Gruber, H. (2001). Competition and innovation: The diffusion of mobile telecommunications in central and Eastern Europe. *Information Economics and Policy*, 13(1), 19–34.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (2006). *Multivariate data analysis with readings*. NJ: Prentice Hall.
- 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.
- Hasan, H., & Ditsa, G. (1999). The impact of culture on the adoption of IT: An interpretive study. *Journal of Global Information Management*, 7(1), 5–15.
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). New York: Guilford Press.
- Hofstede, G. (1980). *Cultural consequences: International differences in work-related values*. Beverly Hills, CA: Sage Publications.
- Hofstede, G. (1984). Cultural dimensions in management and planning. *Asia Pacific Journal of Management*, 1(2), 81–99.
- Hofstede, G. (1991). *Cultures and organizations: Software of the mind*. New York: McGraw-Hill.
- Hofstede, G. (2001). *Culture’s consequences: Comparing values, behaviors, institutions, and organizations across nations*. Thousand Oaks: Sage Publications.
- Hofstede, G., Hofstede, G., & Minkov, M. (2010). *Cultures and organizations: Software of the mind*. New York: McGraw-Hill.
- Im, I., Kim, Y., & Han, H.-J. (2008). The effects of perceived risk and technology type on users’ acceptance of technologies. *Information and Management*, 45(1), 1–9.

- Im, I., Hong, S., & Kang, M. S. (2011). An international comparison of technology adoption: Testing the UTAUT model. *Information and Management*, 48(1), 1–8.
- Kaplan, W. A. (2006). Can the ubiquitous power of mobile phones be used to improve health outcomes in developing countries? *Globalization and Health*, 2(9), 9. <https://doi.org/10.1186/1744-8603-2-9>.
- Kaufmann, D., Kray, A., & Zoido-Lobato, P. (1999). *Governance matters (policy research working paper 2196)*. Washington, DC: The World Bank Development Research Group.
- Keller, W. (2004). International technology diffusion. *Journal of Economic Literature*, 42(3), 752–782.
- Khalil, O. (2011). E-government readiness: Does national culture matter? *Government Information Quarterly*, 28(3), 388–399.
- Khalil, O., & Seleim, A. (2010). National culture practices and societal information dissemination capacity. *Journal of Information and Knowledge Management*, 9(2), 1–18.
- Khan, A., & Krishnan, S. (2018). Social media enabled e-participation: Review and agenda for future research. *e-Service. Journal*, 10(2), 45–75.
- Khan, A., & Krishnan, S. (2019). Conceptualizing the impact of corruption in national institutions and national stakeholder service systems on e-government maturity. *International Journal of Information Management*, 46, 23–36.
- Kiecolt, K. J., & Nathan, L. E. (1985). *Secondary analysis of survey data*. Beverly Hills: Sage.
- Kim, D. J., Ferrin, D. L., & Rao, H. R. (2008). A trust-based consumer decision-making model in electronic commerce: The role of trust, perceived risk, and their antecedents. *Decision Support Systems*, 44(2), 544–564.
- Klein, R., & Rai, A. (2009). Interfirm strategic information flows in logistics supply chain relationships. *MIS Quarterly*, 33(4), 735–762.
- Kohli, A., & Jaworski, B. (1990). Market orientation: The construct, research propositions, and managerial implications. *Journal of Marketing*, 54(2), 1–18.
- Kollmann, T., Kuckertz, A., & Breugst, N. (2009). Organizational readiness and the adoption of electronic business: The moderating role of national culture in 29 European countries. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, 40(4), 117–131.
- Krishnan, S., & AlSudary, M. A. T. (2016). Cultural practices and virtual social networks diffusion: An international analysis using GLOBE scores. *Journal of Global Information Technology Management*, 19(3), 154–173.
- Krishnan, S., & Lymm, J. (2016). Determinants of virtual social networks diffusion: Insights from cross-country data. *Computers in Human Behavior*, 54, 691–700.
- Krishnan, S., & Teo, T. S. H. (2012). Moderating effects of governance on information infrastructure and e-government development. *Journal of the Association for Information Science and Technology*, 63(10), 1929–1946.
- Krishnan, S., Teo, T. S. H., & Lim, V. K. G. (2013). Examining the relationships among e-government maturity, corruption, economic prosperity and environmental degradation: A cross-country analysis. *Information and Management*, 50, 638–649.
- Krishnan, S., Teo, T. S. H., & Lymm, J. (2017). Determinants of electronic participation and electronic government maturity: Insights from cross-country data. *International Journal of Information Management*, 37(4), 297–312.
- Larosiliere, G. D., Carter, L. D., & Meske, C. (2017). How does the world connect? Exploring the global diffusion of social network sites. *Journal of the Association for Information Science and Technology*, 68(8), 1875–1885.
- Lee, J., & Fedorowicz, J. (2018). Identifying issues for the bright ICT initiative: A worldwide Delphi study of IS journal editors and scholars. *Communications of the Association for Information Systems*, 42, 301–333.
- Lee, D.-J., Ahn, J.-H., & Bang, Y. (2011). Managing consumer privacy concerns in personalization: A strategic analysis of privacy protection. *MIS Quarterly*, 35(2), 423–444.
- Lee, S., Nam, Y., Lee, S., & Son, H. (2016). Determinants of ICT innovations: A cross-country empirical study. *Technological Forecasting and Social Change*, 110, 71–77.
- Leidner, D., & Kayworth, T. (2006). A review of culture in information systems research: Towards a theory of information technology culture conflict. *MIS Quarterly*, 30(2), 357–399.
- Leung, K., Bhagat, R. S., Buchan, N. R., Erez, M., & Gibson, C. B. (2005). Culture and international business: Recent advances and their implications for future research. *Journal of International Business Studies*, 36(4), 357–378.
- Li, Y. (2014). The impact of disposition to privacy: Website reputation and website familiarity on information privacy concerns. *Decision Support Systems*, 57(2), 343–354.
- Liang, H., & Xue, Y. (2009). Avoidance of information technology threats: A theoretical perspective. *MIS Quarterly*, 33(1), 71–90.
- Liu, M. (2008). Determinants of e-commerce development: An empirical study by firms in Shaanxi, China. In *In 4th international conference on wireless communications, networking and mobile computing, Dalian, China, October, Vols 1–31* (pp. 9177–9180).
- Maitland, C., & Bauer, J. (2001). National level culture and global diffusion: The case of the internet. In C. Ess (Ed.), *Culture, technology, communication: Towards an intercultural Global Village* (pp. 87–128). Albany, NY: State University of New York Press.
- Martin, N., Matt, C., Niebel, C., & Blind, K. (2019). How data protection regulation affects startup innovation. *Information Systems Frontiers*, 21(6), 1307–1324.
- Martins, C., Oliveira, T., & Popović, A. (2014). Understanding the internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, 34(1), 1–13.
- MEITY. (2019). *The information technology act, 2000*. Government of India. <https://meity.gov.in/writereaddata/files/itbill2000.pdf> : Ministry of Electronics and Information Technology.
- Myers, M., & Tan, F. (2002). Beyond models of national culture in information systems research. *Journal of Global Information Management*, 10(1), 24–32.
- NCSAT. (2016). The TRUSTe/National Cyber Security Alliance U.S. consumer privacy index. <https://staysafeonline.org/press-release/americans-concerned-data-privacy/>.
- Nepal, S., & Zic, J. (2008). A conflict neighbouring negotiation algorithm for resource services in dynamic collaborations. In *In 2008 IEEE International Conference on Services Computing, IEEE, Vol. 2* (pp. 283–290).
- O’Connor, Y., & O’Reilly, P. (2018). Examining the infusion of mobile technology by healthcare practitioners in a hospital setting. *Information Systems Frontiers*, 20, 1297–1317.
- Oliveira, T. F., & Dhillon, G. (2015). From adoption to routinization of B2B e-commerce: Understanding patterns across Europe. *Journal of Global Information Management*, 23(1), 24–43.
- Ozturk, A. B., Nusair, K., Okumus, F., & Singh, D. (2017). Understanding mobile hotel booking loyalty: An integration of privacy calculus theory and trust-risk framework. *Information Systems Frontiers*, 19(4), 753–767.
- Parthiban, R., Qureshi, I., Bandyopadhyay, S., Bhatt, B., & Jaikumar, S. (2020). Leveraging ICT to overcome complementary institutional voids: Insights from institutional work by a social enterprise to help marginalized. *Information Systems Frontiers*, 22, 633–653. <https://doi.org/10.1007/s10796-020-09991-6>.
- Pavot, W., Diener, E., Colvin, C. R., & Sandvik, E. (1991). Further validation of the satisfaction with life scale: Evidence for the cross-

- method convergence of well-being measures. *Journal of Personality Assessment*, 57(1), 149–161.
- Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of Operations Management*, 30(6), 467–480.
- Petter, S., Straub, D., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS Quarterly*, 31(4), 623–656.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891.
- Qu, W., & Pinsonneault, A. (2011). Country environments and the adoption of IT outsourcing. *Journal of Global Information Management*, 19(1), 30–50.
- Qu, W. G., Yang, Z., & Wang, Z. (2011). Multi-level framework of open source software adoption. *Journal of Business Research*, 64(9), 997–1003.
- Robertson, C. J., & Watson, A. (2004). Corruption and change: The impact of foreign direct investment. *Strategic Management Journal*, 25(4), 385–396.
- Rogers, E. (1983). *Diffusion of innovations* (3rd ed.). New York: Free Press.
- Rogers, E. (1995). *Diffusion of innovations* (4th ed.). New York: Free Press.
- Schaupp, L. C., & Carter, L. (2010). The impact of trust, risk and optimism bias on E-file adoption. *Information Systems Frontiers*, 12(3), 299–309.
- Shareef, M. A., Kumar, V., Dwivedi, Y. K., & Kumar, U. (2016). Service delivery through mobile-government (mGov): Driving factors and cultural impacts. *Information Systems Frontiers*, 18, 315–332.
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and non-experimental studies: New procedures and recommendations. *Psychological Methods*, 7(4), 422–445.
- Simon, G. E., Ludman, E. J., Tutty, S., Operskalski, B., & Von Korff, M. (2004). Telephone psychotherapy and telephone care management for primary care patients starting antidepressant treatment: A randomized controlled trial. *Journal of the American Medical Association*, 292(8), 935–942.
- Siponen, M., Mahmood, M. A., & Pahlila, S. (2014). Employees' adherence to information security policies: An exploratory field study. *Information and Management*, 51(2), 217–224.
- Smith, P. B., Peterson, M. F., & Thomason, S. J. (2011). National culture as a moderator of the relationship between managers' use of guidance sources and how well work events are handled. *Journal of Cross-Cultural Psychology*, 42(6), 1101–1121.
- Sørnes, J.-O., Stephens, K. K., Sætre, A. S., & Browning, L. D. (2004). The reflexivity between ICTs and business culture: Applying Hofstede's theory to compare Norway and the United States. *Informing Science Journal*, 7, 1–30.
- Srite, M., & Karahanna, E. (2006). The role of espoused national cultural values in technology acceptance. *MIS Quarterly*, 30(3), 679–704.
- Srivastava, S., & Teo, T. S. H. (2010). E-government, e-business, and national economic performance. *Communications of the Association for Information Systems*, 26, 267–286.
- Straub, D. W. (1994). The effect of culture on IT diffusion: E-mail and FAX in Japan and the U.S. *Information Systems Research*, 5(1), 23–47.
- Sun, J., & Wang, Y. (2012). Global diffusion of virtual social networks: A pyramid model. In S. Hunsinger (Ed.), *Proceedings of the conference on information systems applied research* (pp. 1–7). Louisiana, USA: New Orleans.
- Tekleberhan, M. (2012). Ethiopia Working on E-Commerce Law. <https://www.2merkato.com/news/business-proclamations-and-regulations/893-ethiopia-working-on-e-commerce-law>.
- Thelwall, M. (2008). Social networks, gender and friending: An analysis of MySpace member profiles. *Journal of the American Society for Information Science and Technology*, 59(8), 1321–1330.
- Thelwall, M., Wilkinson, D., & Uppal, S. (2010). Data mining emotion in social network communication: Gender differences in MySpace. *Journal of the American Society for Information Science and Technology*, 61(1), 190–199.
- Tornatzky, L., & Fleischer, M. (1990). *The process of technology innovation*. Lexington, MA: Lexington Books.
- Turban, E., Whiteside, J., King, D., & Outland, J. (2017). *Introduction to electronic commerce and social commerce* (4th ed.). Switzerland: Springer.
- UNCTAD. (2015). *Cyberlaws and regulations for enhancing e-commerce: Case studies and lessons learned. United Nations conference on trade and development*. Geneva: United Nations.
- UNESCO. (2015). UNESCO Institute for Statistics. <http://data.uis.unesco.org/>.
- UN-Report. (2007). *Information and communication technology policy and legal issues for Central Asia*. New York and Geneva: United Nations.
- Veiga, J. F., Floyd, S., & Dechant, K. (2001). Towards modelling the effects of national culture on IT implementation. *Journal of Information Technology*, 16(3), 145–158.
- Venkatesh, V., & Zhang, X. (2010). Unified theory of acceptance and use of technology: US vs. China. *Journal of global information technology management*, 13(1), 5–27.
- Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.
- Vicente, M. R., & López, A. J. (2006). Patterns of ICT diffusion across the European Union. *Economics Letters*, 93(1), 45–51.
- Waarts, E., & van Everdingen, Y. (2005). The influence of national culture on the adoption status of innovations: An empirical study of firms across Europe. *European Management Journal*, 23(6), 601–610.
- WEF. (2017). How the internet is improving healthcare. World Economic Forum. <https://www.weforum.org/agenda/2017/01/technology-is-changing-the-way-we-view-our-health-this-is-how>.
- WHR. (2015). *World happiness report 2015*. New York: Sustainable Development Solutions Network.
- WHR. (2017). *World happiness report 2017*. New York: Sustainable Development Solutions Network.
- WHR. (2018). *World happiness report 2018*. New York: Sustainable Development Solutions Network.
- Wolf, M., Beck, R., & König, K. (2012). Environmental dynamics as driver of on-demand computing infrastructures—Empirical insights from the financial services industry in UK. In *In proceedings of the European conference on information systems (ECIS), article 242*. Barcelona: Spain.
- Wooldridge, J.M. (2016). *Introductory econometrics: A modern approach*. Nelson Education.
- Woszczyńska, A., & Whitman, M. (2004). The problem of common method variance in IS research. In A. Woszczyńska & M. Whitman (Eds.), *The handbook of information systems research* (pp. 66–77). Hershey: Idea Group Publishing.
- Xiao, X., Califf, C. B., Sarker, S., & Sarker, S. (2013). ICT innovation in emerging economies: A review of the existing literature and a framework for future research. *Journal of Information Technology*, 28, 264–278.
- Xu, W., Ou, P., & Fan, W. (2017). Antecedents of ERP assimilation and its impact on ERP value: A TOE-based model and empirical test. *Information Systems Frontiers*, 19, 13–30.
- Zhao, F. (2011). Impact of national culture on e-government development: A global study. *Internet Research*, 21(3), 362–380.
- Zhu, H., Ou, C. X. J., van den Heuvel, W. J. A. M., & Liu, H. (2017). Privacy calculus and its utility for personalization services in e-commerce: An analysis of consumer decision-making. *Information and Management*, 54, 427–437.

Zmud, R. W. (1982). Diffusion of modern software practices: Influence of centralization and formalization. *Management Science*, 28(12), 1421–1431.

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