

Rethinking the Digital Divide: Towards a Path of Digital Effectiveness

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Abstract

The digital divide is a complex and dynamic phenomenon. Despite extensive studies on the digital divide and its impact, developing countries, in particular, are still searching for sustainable solutions to reduce the digital gap in order to leverage their investments in information and communication technologies (ICT) toward the attainment of greater economic and social benefits and increased global competitiveness. Research has shown that the earlier focus on this phenomenon targeted physical access and diffusion of ICT as an indicator of digital readiness to reap ICT benefits. However, there has been growing attention to the effectiveness of deployment and use. In this paper we set out to extend the analysis by providing another perspective, involving a digital effectiveness framework (DEF), which describes progressive levels of capabilities and associated benefits along a path toward digital effectiveness. The DEF is derived from the theoretical foundations and scholarly work in knowledge management, diffusion of innovation, and institutionalism and includes constructs such as knowledge acquisition, access, adoption, exploitation and innovation. The implications for research are discussed.

1. Introduction

A Digital Planet Report has predicted that spending on information and communications technologies (ICT) is estimated to reach US\$4 trillion by 2009[45]. This is largely because economies have continued to make significant investments in ICT as a competitive necessity, in order to help meet the demands of globalisation. However, while developing countries have increased expenditures on ICT the expected corresponding increase in national income is not evident as they continue to lag behind more developed ones [13]. Additionally, some of these countries have not experienced real technology-

induced growth despite consistently high ratings on the Network Readiness Index. This can be seen in the relatively slow growth rate of their industries, and the lag in development of new technologies and expertise.

More importantly, high ICT expenditures have not necessarily moved these developing countries closer to larger countries in translating ICT acquisition and use into economic gains. Instead, as seen in the CIA Factbook [7] several of these developing countries have also increased their national debt over the last decade with little, and in some cases no, increase in national income. This has accentuated the focus on the phenomenon that has been termed the digital divide, the distance between those who have access to, and use ICT and those who do not. In the quest for solutions, regional governments have been involved in the discourse on digital opportunities aimed at improving access among the technological disadvantaged [18] and bridging the digital gap. Similarly, researchers have sought insights to inform corrective prescriptions. However, these efforts have concentrated primarily on access to ICT and the strategies for expanding digital capabilities [10] [16] [23] [30] [36] [42].

Hsieh and Kiel [23], in our view, correctly assert that digital inequality is an important issue faced by developing economies; however, analysis beyond access and use is certainly needed [14]. As developing countries and organisations struggle to keep pace with the competitive pressures of globalisation, it is becoming apparent that mere physical access to ICT solves only a small part of the puzzle. Considerations of digital effectiveness in maximizing the benefits of ICT acquisitions without fixation on the difference in technical capabilities of more developed countries and the creation of an environment that fosters innovation and knowledge sharing are also quite important. Yet very little research has addressed these issues.

A few researchers [16] [21] [23] have begun to reconceptualize the digital divide phenomenon as the current characterization provides a poor framework for analysis or policy development [44]. Some have provided analyses and measurements that promote improved understanding of the phenomenon [5] including the consideration of knowledge-based approaches [39]. We have continued on this path through the investigation of the notion of digital effectiveness – *establishing the ability to maximize the capabilities of available technologies within the particular environmental context to obtain positive economic returns on the adoption and use of the ICT*. Digital effectiveness is analogous to Hymes' [24] Internet competence, the capacity to respond pragmatically and intuitively to challenges and opportunities in a manner that exploits the Internet's potential.

The paper proposes a digital effectiveness framework (DEF), which represents a synthesis of the literature on the digital divide, technology adoption in economies, and knowledge management. It draws on established theories used in information systems (IS) such as institutional theory, diffusion of innovation, and knowledge management to recommend a five-step approach which includes acquisition of knowledge on the availability and usefulness of technologies relevant to the economies or organisations, creation of access opportunities, adoption and use, creation of new products and/or services from these ICT, and effectively harnessing potential and capability through a sharing and collaborative environment.

We believe that digital effectiveness is an alternative perspective that augments and extends current digital divide research. The framework is intended to assist researchers by providing a novel lens for viewing digital capabilities along an effectiveness continuum, linking capabilities to associated benefits and prescribing a path from knowledge to innovation. The framework will also help practitioners, inclusive of governments and organisational decision makers to create and adopt policies to assist in attaining digital effectiveness.

In the rest of the paper, we discuss the theoretical underpinnings of the framework and explain the steps; propose a research model, which provides the basis for several research propositions, then conclude with remarks on the theoretical and practical implications of this research.

2. Background

The framework we propose in this paper is an alternative approach to analyzing the multi-dimensional factors that bear on the issues facing developing economies as they attempt to leverage the capabilities of ICT for sustainable economic and social benefits and maintain competitiveness in the face of rapid globalization. To our knowledge, no previous study has combined perspectives from the digital divide, diffusion of innovation, and knowledge management literature, as we have, to prescribe a continuum of increasing effectiveness that developing countries can follow to reduce the digital gap and realize increasing benefits from their ICT investments. Instead of investigations primarily focused on the impact of ICT diffusion, studies on the effectiveness of the technology use, the translation to tangible improvements and effective knowledge sharing would help to uncover additional insights. It has become apparent that research is needed to discover the links between the digital divide and economic management and success. The DEF begins this quest based on the synthesis of the theoretical pillars of several research streams.

2.1. The digital divide phenomenon

The digital divide has often been defined as the difference in the availability of, and access to digital technology across various social groups. However, over time, a more rigorous characterization of this phenomenon has evolved, with researchers proffering extensions to its originally conceived connotation and significance (e.g., [5] [14]). Researchers have also highlighted several problems with the traditional view of the digital divide. For example, Cisler [9] argues, that there is not a binary division of information "haves and have-nots", but rather a progression based on different degrees of access to information technology and Barzilai-Nahon [5] asserted that the measurements have been primarily "*single factor and monotopical*". These challenges and other inadequate portrayal of the phenomenon cannot lead to useful roadmaps for using ICT to promote development because as Warschauer [43] asserted, there is an overemphasis on the importance of the physical presence of computers and connectivity to the exclusion of other factors that are more conducive to meaningful usage. Such challenges provide a conundrum for policy makers in their efforts to reduce perceived technological gaps.

Empirical evidence has suggested that various governments have been challenged, and continue to struggle, to find, strategies for reducing both the external (between countries) and the internal (within countries) digital divide as is evident by the increased digital opportunities initiatives. Dewan & Riggins [14] contend that much of the research on the digital divide focuses on “first order effects” regarding who has access to the technology, but only a limited number addresses the “second order effects” of inequality in the ability to use the technology among those who do have access. The diffusion of ICT is a mere starting point; using the technologies to transform organizational capabilities toward the attainment of tangible economic benefits will only emerge from appropriate deployment within the particular area *of need* and the maximization of their capabilities through effective use. Traditional wisdom suggests that access to and use of technology do not in themselves provide sustained benefits but rather the capability to transform adopted technology into tangible economic benefits provides the key for transformation. Over time, developing countries must find ways to shift from being predominant consumers of digital technologies into the realm of the creators and innovators.

Extensive investigations have been conducted into various aspects of ICT access and use. There has been discourse on the impact of technological investments on health and education [32]; analysis across gender and ethnic lines and the effectiveness of community centers in promoting ICT to the urban poor [28] [29]; and access to free software and the opportunities for developing countries as an important issue faced by communities [25] [41]. Another well discussed issue is the need to stem the cycle of path dependency, which requires commitment and effort on the part of governments.

Policy makers and governments have also adopted initiatives and explored mechanisms for leveraging digital opportunities. The G8 Head of States created the Digital Opportunity Task Force (DOT Force) as a cooperative effort to identify opportunities in which the digital revolution can benefit people around the world, particularly the poorest and most marginalized groups [19]. Their main objectives were to enhance global understanding and consensus on the challenges and opportunities of ICT, and the role that these technologies can play in fostering sustainable, participatory development, better

governance, wealth creation, and empowerment of local communities and vulnerable groups.

There is little doubt that focus on the digital divide has intensified over the last decade, particularly in relation to the critical social and economic issues that face countries that are deemed digital “have nots”. In this regard, most of the literature has focused primarily on strategies for exploiting digital opportunities within and across developing countries, (e.g., [13] [16]). Interestingly, most of the literature is about the eastern hemisphere with little emphasis on developing countries in the Caribbean, for example. This gap provides an exciting opportunity for future research. Caribbean nations have initiated various measures to increase their economic influence on the global community through economic and social partnerships; however, as is the case in other developing countries, these initiatives have not yet begun to manifest any narrowing of the digital divide.

It has been shown that ICT penetration and use is positively associated with national income [13]. It goes without saying, therefore that the digital divide is unlikely to narrow. Our objective in this paper therefore is to provide the case for a shift in focus from narrowing the divide to establishing a framework for maximizing digital effectiveness at any level of diffusion and access.

2.2. Towards digital effectiveness

Research into the digital divide is maturing and has produced more useful insights into what it means and signifies. For example, we have evolved beyond the notions of the digital divide as a bipolar division between the haves and the have-nots and the connected and the disconnected as it is described by Warschauer [44] to Cisler’s [9] connectivity continuum. This paper seeks to expand this focus by associating beneficial outcomes at various levels of the continuum that results from effectively harnessing the capabilities at that level as a fulcrum for advancing to progressively higher levels, without particular reference to a country’s relative position. This expands on Warschauer’s [43] recommendation that to effectively use ICT to access, adapt and create knowledge is an iterative relationship among physical, digital, human and social resources. Therefore, it is prudent for economies to not only focus on the digital resources but to resolve how all can be combined for long term benefits.

Digital effectiveness suggests stages of exploitation of the capabilities of digital assets that are deployed appropriately for maximum benefit. We appeal to several theories and IS concepts to help explain how countries can respond effectively to challenges and opportunities to exploit the available and affordable technologies. First we refer to Diffusion of Innovation (DOI) theory which depicts how innovation permeates through a particular social system over time [33] [34]. The diffusion of technology, concerning who has access, and how ICT is harnessed is a concern for developing countries and countries as a whole. We augment this view with the institutional perspective that suggests that coercive, normative and mimetic mechanisms influence the decisions of institutions [17]. We then borrow concepts from knowledge management. Knowledge is generally regarded as a critical asset which must be carefully managed for effective returns. There has been an increasing focus on leveraging organizational (and by extension national) knowledge for potential competitive positioning. Below we further elaborate on these concepts which are synthesized to support the development of our proposed framework, DEF.

2.2.1. Diffusion of innovation

Within the current environment, countries are faced with internal and external competitive pressures that invariably influence the adoption and diffusion of technology across sectors. Several interlinked factors such as per capita GDP, technology costs, size of urban population, average education level, and the importance of the trade sector can impact a country's ICT infrastructure [13]. Guillén & Suárez [20] assert that the divide is attributable to factors such as the economic, regulatory and sociopolitical characteristics of countries and their evolution over time. This is especially true for developing countries as they struggle to meet competing resource demands and other political, economic, and social policy choices. Thus, developing countries face an uphill battle to fund technology acquisitions for achieving improved capabilities.

The level of ICT diffusion is an important measure of the reduction of the digital distance between developed and developing countries and represents the starting point of the effective use of technology. Empirical evidence suggests that adoption of technology impact the rate of diffusion and will create advancement. However, there are several critical antecedents such as

technical compatibility, technical complexity, and relative advantage (perceived need). Dewan, Ganley et al [13] contend that ICT spending is highly correlated with levels of development and ICT investments are associated with higher output in developed countries; however, this level of investments is not (yet) productive in developing countries.

Dewan & Riggins[15] proposed a direction for digital divide research that included areas of ICT innovation, ICT access and ICT use which they called the ICT Adoption Cycle. This represents the preliminary levels of our framework, DEF, where innovation is implicit in the model's cyclical approach. Access and use of technology are the foundations upon which technology can produce tangible benefits. Beyond access and use are technology innovation and transformation which can translate into future benefits.

Globalization and with it increased competitiveness have caused most developing countries to think beyond the mere acquisition of ICT infrastructure (adoption) and more towards the innovative capabilities of these ICT. Therefore, DOI theory is seen as a justifiable lens through which to view the diffusion of technology in economies as they grapple with advancement in technologies, and the provision of new processes or insights for effecting transformation. DOI can also be applied at various levels of analysis to explore how innovation permeates through a particular social system over time [33] [34], and suggests that relative advantage, compatibility, trialability, observability and complexity impact adoption. Moore and Benbasat [31] extended Roger's (1985) work by expanding upon the five factors impacting the adoption of innovations into eight factors (voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and trialability) that impact the adoption of IT. Empirical studies have further established that several of these factors impact the adoption of various technological innovations.

2.2.2. Institutionalism

Political, regulatory and technological factors have long been viewed as the underlying torrents that may influence a country's behavior towards ICT. Institutional theory depicts how groups, organizations or industries interact socially (which makes it applicable to countries) and how social structures become entrenched and influence behavior [16]. It is useful for

studying elements of diffusion, which may be due to pressures from government, companies and consumers. Researchers have long adopted the institutional perspective to help explain adoption of technologies at the institutional levels. According to the Theory of Planned Behavior (TPB), human action is guided by three considerations: behavioral beliefs, normative beliefs and control beliefs [1] [2]. This view has guided current adoption theories and forms important considerations for governments and decision makers as they create adoption initiatives. Additionally, empirical evidence supports the notion that normative, coercive and mimetic pressures such as environmental norms, competitive pressures and conformance to established practices have an impact on technology adoption [38].

Normative pressures are those taken for granted that may be morally or socially instituted [17]. Coercive pressures are defined as formal or informal pressures exerted by external forces upon which the institutions may dependent [17]. This relates to laws, sanctions that are a result of political influence and the problem of legitimacy [17] [35]. Mimetic pressures relates to standard responses to uncertainty [17] that may be culturally supported. These forces are significant underlying factors that may influence economies and their approach to technology adoption, use and exploitation.

2.2.3. Management of knowledge

Churchman [8], in distinguishing between knowledge and information, intimated that knowledge is information processed through a user's brain. Knowledge can be further described as new or modified insight or predictive understanding [26], a combination of context, information and experience [22], it can also be a prescription of knowing what to do [6], or how to act [27] in a given situation. The attainment of information and knowledge is the first step in a country's quest to make decisions on the technologies available, their uses and applications. Strategic insight will guide the process as they transcend the stages of digital effectiveness. From a management perspective, corporate or government leaders would therefore involve the coordinated effort to effectively and efficiently manage the use of technology, learning and knowledge. It is expected that developing countries, in particular, aspire to the acquisition of technological knowledge both to bridge the digital gap and in attaining technological competence. This may be

enhanced by a formal knowledge management approach to guide appropriate uses of ICT resources, and instill confidence in exploiting their capabilities.

There has been growing research interest in managing knowledge as any other significant organizational resource [4]. This can be extended to the country level (with equal validity) where the need to distil and propagate knowledge and knowledge-sharing are significant success factors for digital effectiveness. Learning, sharing and collaboration are essential component of the framework. It is expected that knowledge will be filtered through government teams down to various levels of the country to eventually establish effective knowledge communities - formal or semi-formal organised units that share the learning experience about the available technologies that would be useful in the country or organisational context.

According to Courtney [12], the management of "technology" and "context" are key ingredients of successful knowledge communities. These communities can be on varying levels such as organisational, regional and global. The author further contends that the qualities of effective knowledge communities should include a supportive culture for learning and sharing of knowledge. Taylor and Wright [37] echoed similar sentiments in their investigation of factors that influence readiness to share knowledge effectively. They found six important contributing factors: open leadership climate, vision of change, learning from failure, performance orientation, information quality and satisfaction with change processes. In this paper we posit that developing countries need to cultivate successful knowledge communities and foster a culture of effective knowledge sharing in order to assist in promoting the digital effectiveness required to move them on a path toward sustained economic benefits and global competitiveness.

3. Digital effectiveness framework

The DEF ([figure 1](#)) proposes a progressive path toward digital effectiveness through knowledge-based diffusion and "effective" use which are explicated through a five-step process that includes knowledge acquisition, access to the technologies, adoption, exploitation for beneficial results over time, and innovation and transformation of capabilities into new products, service or capabilities. We contend that for countries to maximize their returns on investments in digital assets, the management of

knowledge, learning, and collaboration should permeate all their processes. We further posit that countries will need to go several stages of development to fully harness the capabilities of available technologies. Likewise, different countries may be at various stages along the DEF continuum with respect to particular technologies. For example a country may be making advancement with mobile telephony while another is exploiting the capabilities of the Internet.

This viewpoint resonates with absorptive capacity, which explores the technological capacity that firms can absorb [11] and include dimensions of acquisition, assimilation, transformation and exploitation [46]. From a country analysis, it is argued that acquisition, access and adoption of technology are precursors to exploiting these technologies towards the development of innovative practices.

Knowledge management may be considered as the management of key processes for strategic alignment. Alavi and Leidner [3] conceive of four key knowledge processes; creation, storage/retrieval, transfer and application. These dimensions are important elements that support the implicit processes of learning, sharing and collaboration required for sustained development through technological utilization.

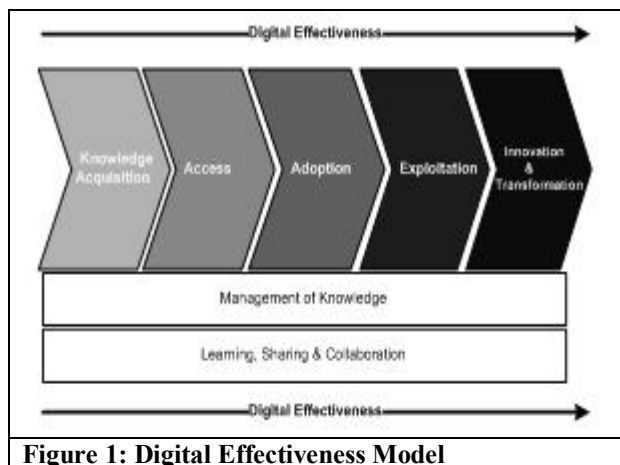


Figure 1: Digital Effectiveness Model

Knowledge acquisition refers to the attainment of information on the digital opportunities available for the particular economy. This first step sets the stage for movement along the effectiveness continuum as it is the precursor to implementation of any new ICT. Countries are made aware of emerging technologies and their usefulness through meetings and research.

Access is the most commonly cited research dimension of the digital effectiveness framework. This refers to groups within the economy having access to, and using available ICT at least at the basic level. Access to ICT generates the opportunity for economic development by paving the way for effective use.

Adoption infers a more pervasive commitment to the use of the ICT which implies an improved understanding of the technologies and the potential and capabilities associated with them. It is believed that a system is not adopted until there is confidence and consistency of use.

Exploitation follows from the adoption phase where the capabilities or potential offered by the integration of several ICT are exploited (i.e., optimally utilized) leading to innovation, the next stage of digital effectiveness. In other words, it is the competence and expertise in using the available ICT, in preparation for the creation of new ideas, products or services. Therefore, exploitation can be seen as an advanced stage of use and adoption.

Innovation is a new idea or insight that involves identifying and using opportunities to create new products and services. Transformation involves leveraging these creations into wide-scale radical but meaningful changes.

4. Digital effectiveness conceptual model

The proposed research model is derived from a synthesis of the main theories supporting the digital effectiveness framework, i.e. diffusion of innovation, institutional theory and knowledge management. Propositions, derived from the model, are put forward to support our expectations about digital effectiveness and provide the agenda for future research and discourse. We argue that technology adoption, institutionalism and management of ICT knowledge are critical components that influence the ability of countries to maximize their ICT capabilities to achieve positive social and economic benefits (see [figure 2](#)).

The model suggests the following set of propositions that may be translated into research hypothesis in the follow-up studies we hope to conduct.

We assert that the acquisition of knowledge related to ICT may prove beneficial in the formative stages of achieving digital effectiveness. Being armed with the necessary tools and capabilities about available ICT and

most suitable based on environment contexts will allow countries to move along the digital effectiveness continuum.

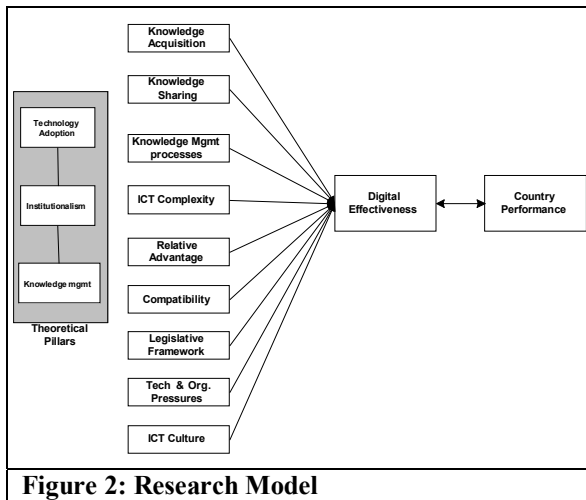


Figure 2: Research Model

P1: The rate of knowledge acquisition related to ICT positively influences the level of digital effectiveness of a country

The management of knowledge at any level is a key strategic effort. Delivering structured policies that foster and harness management of knowledge on how to effectively access, exploit technologies is critical for developing economies.

P2: The effective management of the knowledge processes positively influences the level of digital effectiveness of a country

The presence of a collaborative environment that fosters learning and sharing of ICT knowledge is likely to influence the growth of technology and effectiveness of use.

P3: The presence of knowledge sharing positively influences the level of digital effectiveness of a country

Empirical studies have found that technical compatibility, technical complexity, and relative advantage (perceived need) are important antecedents to the adoption of innovations[31] For our purpose, technical complexity is simplified to mean complexity of ICT within this context.

The degree to which an innovation is perceived as being difficult to use is used to define the level of complexity or perceived ease

of use[31]. Arguably, the learning curve for advanced technology may be too steep for developing economies to harness due to challenges such as funds and human capital.

P4: Perceived complexity of ICT negatively influences the level of digital effectiveness of a country

Relative advantage is the degree to which an innovation is perceived as being better than its precursor [31]. We assert that clearly advantageous technologies may be harnessed earlier than those perceived as less beneficial. One of the implications here is that special groups, such as academics and researchers, need to demystify these technologies to facilitate better understanding where a middle ground between panacea and aggravation is provided, and ultimately the potential benefits can be seen and derived by social groups, governments and policy makers.

P5: The relative advantage derived from available ICT positively influences the level of digital effectiveness of a country

Compatibility refers to the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters [31]. Similar arguments discussed above are also relevant.

P6: The compatibility of available ICT positively influences the level of digital effectiveness of a country

The institutional perspective considers factors such as legislature framework, national culture and technical and organizational influences that may originate from other countries. The competitive pressures from globalization is a simple example which can be seen as developing economies try to keep pace with technological developments from innovators and early adopters.

Legislative framework incorporates the regulatory structures that may influence behavior towards ICT. Having strong legislative support will likely enhance innovation and development through the provision of guidance and rules relating to issues such as intellectual property rights, copyright, electronic transactions and general information security

P7: Strong legislative framework positively influences the level of digital effectiveness of a country

Technical and organizational pressures are particularly concerned with the external mimetic and coercive pressures countries may face from other more technologically advanced countries and regions. With mounting competitive pressures, organizations and countries are forced to keep pace with emerging technologies or lose valuable footing, which may translate to reduced competitive advantage or loss of income.

P8: Technical and organizational pressures positively influence the level of digital effectiveness of a country

We assert that a culture that promotes creativity and innovation in its use of ICT will be more likely to achieve high levels of digital effectiveness. Culture is seen as that *“complex whole which includes knowledge, beliefs, art, morals, law, customs and any other capabilities and habits acquired by members of society”*[40]. It is therefore essential that economies foster a culture that promotes technological development, effective management and sharing of this knowledge across social groups over time.

P9: National pro-ICT culture influences the level of digital effectiveness of a country

With progressive movement along the digital effectiveness continuum an improvement in the country’s social and economic performance is expected. This relationship is seen as symbiotic as digital effectiveness will positively influence country’s performance and vice-versa.

P10: The level of digital effectiveness positively influences country’s performance

The determination of the impact of the variables on digital effectiveness, or even digital effectiveness on a country’s performance is a difficult but not impossible task. The evaluation of how technologies are being used, harnessed and exploited across economies is one method. Anecdotally, different countries use technologies differently; Caribbean economies for example are primarily consumers of mobile technologies while emerging economies of Asia such as Hong

Kong and Singapore are constantly ahead of the curve in the development of innovative mobile technologies while being consumers. Therefore, one can look at the level of innovations associated with each technology or combination of technologies that are often apparent through patents and associated technological developments, and the management or harnessing of individual and collective capabilities across each country. The evidence of contribution to country’s performance will become more apparent as the country moves along the stages of digital effectiveness.

5. Future research directions

This research is in its nascent stage and the intent of the paper is to initiate debate and discourse on the DEF and the digital effectiveness model we derived and their applicability in diverse contexts. Despite several research efforts over several years, the digital divide continues to be an important research topic. However, alternative perspectives for framing research efforts and new insights are constantly sought.

This emerging research provides another connecting piece of the puzzle in the identification of important frameworks, models, and constructs to guide our own research and for contribution to the general research community in this cumulative effort. The next step therefore is to further expound on the dimensions of the framework, refine the research model, and further expand and explicate the propositions. We expect to conduct several empirical investigations of the propositions to offer additional insights in the cumulative examination of digital effectiveness in developing countries and particularly in the Caribbean region. This effort will provide much needed insights for ICT policy makers as they devise strategies for national development. Governments and organisations in developing countries need prescriptions to help them formulate policy and design approaches toward achieving the digital effectiveness necessary to compete globally and to address issues of social mobility internally.

6. Concluding remarks

From a global perspective, it is recognized that inequality in access to the Internet and other ICT can curtail the attainment of many of the objectives of globalization. Similarly, access to and the readiness to exploit available technology are important to policy makers as they devise

strategies for national development, particularly in developing countries. The continuing discourse on the digital divide therefore is both desirable and very important from the research and policy formulation perspectives. However, while the concentration on measures of diffusion and their contribution to digital readiness provides useful information about relative access of the “haves” and the “have nots,” this information still leaves developing countries without useful insights on how to maximize ICT use toward benefit realization.

It is evident that an approach that addresses how well a task is performed will achieve relatively more than another that measures only possession and elementary use of the tools. Hence, following on the suggestion of Dewan & Riggins [14], we have attempted to stimulate interest and further research on the perspectives of digital effectiveness to address the latter concern by introducing DEF, which incorporates elements from several IS concepts. The proposed DEF prescribes a progressive path toward the attainment of digital effectiveness, which may then help developing countries to maximize benefits from their ICT investments toward the realisation of economic goals and improved competitiveness in global markets, despite digital inequalities.

The steps of the DEF progresses through an effectiveness chain involving the awareness of emerging ICT; diffusion to provide general access to important technologies; adoption that signals commitment to effective use, exploiting the power of combinations of ICT to address significant problems; and the contribution to ICT-enabled innovations that can generate national and organizational transformation to heights of effectiveness and benefit realization.

Following from the DEF, we have also provided a research model to contribute another connecting piece of the cumulative research effort on the digital divide. We have identified several of important variables and constructs that we propose as antecedents as well as consequences of digital effectiveness and generate a set of propositions that we hope to investigate as the next step. The deployment and effective utilization of ICT to achieve social and economic benefits are important goals for all economies, yet they continue to be challenges for governments and institutional decision makers in developing countries.

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