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# The Status Quo of IS Conference Publications on Theorising eHealth in Developing Countries

*Research-in-Progress*

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## Abstract

*The purpose of this systematic review is to consolidate existing evidence on electronic health (eHealth) initiatives examined in developing countries to better inform future practice and research. More specifically, this paper examines the status quo of theorising eHealth in developing countries across a range of top Information Systems (IS) conference publications over a fifteen year period (2000–2015). While some work has been done on examining the application of theory within the eHealth domain, the associated context in which this work is performed is often over looked. Examining the papers from a theoretical and contextual perspective reveal that IS researchers' primary attention is generalisable theory (in the form of explanation) with some consideration given to the interaction with the healthcare context. IS researchers should leverage the lessons learned from other IS sub domains and move beyond generalisable theories to further enrich the understanding of eHealth in developing countries.*

**Keywords:** eHealth, Developing countries, Theorising, Systematic Review

## Introduction

The concept of the 'digital divide' between resource-rich and resource-poor regions of the globe is not a new phenomenon. The concept first began to receive attention by academics in the 1990s (Heeks 2010). Since the emergence of the 'digital divide' the concept has been examined from various angles. A comprehensive appraisal on the topic of the digital divide can be reviewed at Dewan et al., (2005), Avgerou (2008) and Banker et al., (2011). A simplistic definition delineates that the digital divide emphasises "the separation between those who have access to digital information and communications technology (ICT) and those who do not" (Dewan and Riggins 2005 p. 298). Helbig et al., (2009) argues that the digital divide literature yields several defining characteristics including (1) an access digital divide, (2) multi-dimensional digital divide (economic and skill related), and an emergent (3) multi-perspective digital divide (varying stakeholders). Despite various definitions of digital divide, the issue remains that differences between developed and developing countries, from the perspective of

Information Technology (IT) diffusion, exist. While developing countries have witnessed the growth of ICT, primarily mobile IT, this growth is for personal as opposed to professional use (Leach and Makalima 2006). Although arguments are put forward and empirical evidence has shown that the 'digital divide' is closing (Mechael 2009; Skaletsky et al. 2016), the issue still remains that a gap exists between ICT diffusion and implementation in developing and developing countries (Veit and Huntgeburth 2014). To reduce the digital divide many new ICT initiatives are being deployed in developing countries across many industries such as Agriculture and Rural Development, Economy and Growth, Education, Financial Sector, Social Protection, and Labour and Trade (Duncombe 2014). One sector which is argued to be experiencing numerous benefits from the introduction of ICT is that of Health (Blaya et al. 2010). The establishment of the Millennium Development Goals (MDG) in 2000 has witnessed a surplus of ICT initiatives in developing countries within the health domain (United Nations 2015). The emergence of additional ICT initiatives is expected to continue growing over the forthcoming years due to the emergence of Sustainable Development Goals (SDG) (Misra 2012).

The key component of the proposed SDG is 'sustainability'. Successful electronic Health ICT initiatives (referred herein as eHealth) are reportedly in abundance, but the health sector in developing countries has yet to reach a level of scalability and sustainability (Chib et al. 2015). It is undoubtedly a sector which suffers from a case of 'eHealth Pilotitis'. According to Franz-Vasdeki et al., (2015 p. 35) "the term 'pilotitis' has been coined in response to frequently expressed dissatisfaction from donors and governments about isolated mHealth interventions that are successful in one context, but not 'rolled out' due to a variety of technical, practical, economic and often institutional and political barriers". That is, eHealth technologies have not being sustained or scaled beyond the pilot study stage. Yet, in saying this pilot studies are imperative for understanding if a wider scale project can be implemented (Chib et al. 2015).

As IS researchers we often strive to develop/test theory to solve a research problem and enhance research (Gregor 2006). While the proliferation of theory has created considerable diversity (Furneaux et al. 2007), are IS researchers playing a role in maintaining 'eHealth Pilotisis' in developing countries? Although theorising within eHealth research was briefly explored by Cockcroft (2015), there is a need to understand this phenomenon further to shape future research and practice (Scott et al. 2015). That is, what has theorising achieved for eHealth research in a developing world context? Using Gregor's (2006) taxonomy for IS theories, the aim of this paper is to investigate the status quo of top IS conference publications on theorising eHealth in developing countries over a 15 year period.

The remainder of this paper is structured as follows: The next section describes IS theory and its relationship within the healthcare domain. The methodology employed for this study, namely; systematic review is subsequently described. The preliminary findings, from profiling the 38 papers which were included as part of the analysis, is presented. The findings are discussed and paper concludes with future recommendations for research and practice.

## IS theory and eHealth

In 1962, Kuhn argued that the acquisition of theory is one indicator of maturity of a field of knowledge as it demonstrates that the given domain has moved beyond initial exploration and has established a firm understanding of its concepts, principles and relations (Kuhn 1962). Lim et al., (2009) presents prior IS research analysing the IS field's development across a range of issues. Gregor (2006) further highlights that IS research is built from the use of theories, many of which are drawn from other disciplines. Many IS researchers who utilise the term *theory* within their work often neglect to explicitly define that term within the context of their study, although a vast array of definitions exist (Gregor, 2006). According to Truex et al., (2006 p.800) theory acts as *"a lens through which we [researcher] focus"* our research. Therefore, a theory is defined in the context of this study as: "*a set of interrelated concepts, definitions, and propositions that present a systematic view of events or situations by specifying relations among variables, in order to explain and predict the events or situation"*. Theory can be substantive or formal. Substantive theory *"builds generalizations on observations of a substantive .....area such as patients care," while "formal theory, on the other hand, is built for a formal or conceptual area.....on the comparative analysis of different kinds of substantive cases and is developed for a formal or conceptual area" (Glor 2008 p.2)*. That is, substantive theory can be used to develop formal theory. According to Gregor (2006), there are five types of theory (Table 1). Although different in nature, these five theories have commonality across them; research projects always commence with a problem or question of

interest which use theory as a lens to provide greater clarity to the area/field under consideration. Furthermore, they all have a means of advancing the state of knowledge in a given field.

**Table 1. A Taxonomy of Theory Types in Information Systems Research (Gregor 2006)**

| Theory Type | Distinguishing Attributes |
|---|---|
| 1. Analysis | Says what is.<br>The theory does not extend beyond analysis and description. No causal relationships among phenomena are specified and no predictions are made. |
| 2. Explanation | Says what is, how, why, when, and where.<br>The theory provides explanations but does not aim to predict with any precision. There are no testable propositions. |
| 3. Prediction | Says what is and what will be.<br>The theory provides predictions and has testable propositions but does not have well-developed justificatory causal explanations. |
| 4. Explanation and Prediction | Says what is, how, why, when, where, and what will be.<br>Provides predictions and has both testable propositions and causal explanations. |
| 5. Design and Action | Says how to do something.<br>The theory gives explicit prescriptions (e.g., methods, techniques, principles of form and function) for constructing an artifact. |

**Table 1. A Taxonomy of Theory Types in Information Systems Research (Gregor 2006)**

The IS discipline constitutes a vast area of research with numerous publications surrounding the phenomenon of theory. Theories operate at different levels of scale or abstraction and are utilised by IS researchers to derive strong theoretical contributions (Lim et al. 2009). However, when theorising it is imperative to understand the role that context plays in IS research (Orlikowski and Iacono 2001). Contextualism is concerned with the event in its setting (Pettigrew 1985). First, many authors have characterised the unique differences between healthcare and other industries (e.g. manufacturing, financial, aerospace) which utilise IS (Chiasson and Davidson 2004; Kay 2007; Menon et al. 2000; Rigby et al. 2000). Second, the developing world context in which Health IS are often deployed is remarkably different from their developed world counterparts (Escobar 2011). Airhihenbuwa et al. (2014 p. 2) argues that the status of "wealth distribution, early childhood care, education, globalization, commercialization, urbanization, employment conditions, food security, environment, water and sanitation, family patterns, and sociocultural values" differentiate developing from developed countries.

Realising the importance context plays in IS research, Chiasson and Davidson (2004) classified IS theory within Health IS research. They identified four IS theory and context relationship types in their review of Health Information Technology (HIT) related research. Eight years later, Romanow et al. (2012) built upon Chiasson and Davidson's (2004) work. Table 2 presents an overview of these author's perceptions of theory in health-related research.

While Chiasson and Davidson (2004) and Romanow et al. (2012) identified papers related to each classification presented in Table 1, they argue that more work in this area is required. This argument is further advocated by Cockcroft (2015) and Scott et al. (2015). To enhance the current understanding of theory, it is proposed in this paper to merge the perspectives of Gregor (2006) with Chiasson and Davidson (2004) and Romanow et al. (2012). Aforementioned, theory represents different things to different people (as demonstrated in Gregor, 2006). Therefore, the category labelled as "Healthcare only" (Chiasson and Davidson 2004) and/or "Atheoretical" (Romanow et al. 2012) could be questioned as the IS in a healthcare context may "not extend beyond analysis and description. No causal relationships among phenomena are specified and no predictions are made" (expressed as theory type 'analysis' by Gregor 2006 p.620). Yet, this is perceived to be theory driven (Gregor 2006). Therefore, researchers should not only examine theory but also understand the context in which theory is examined.

| Table 2. IS Theory and context relationship in Health-related papers | |
|---|---|
| **Chiasson and Davidson 2004** | **Romanow et al., 2012** |
| *IS only:* Authors primary attention is generalizable theory without consideration of interaction with the healthcare context. | *Minimal HIT Context:* Focus of the paper is on testing or refining existing IS theories without regard for the healthcare context. |
| *IS-healthcare:* Authors primary attention is generalizable theory with some consideration given to the interaction with the healthcare context. | *Moderate HIT Context:* Focus of the paper is on testing or refining existing IS theories with some regard for the healthcare context. |
| *Healthcare-IS:* Authors examine phenomena in healthcare context, using theory to explain phenomena, possibly extending or building theory in this context. | *High HIT Context:* Papers that directly incorporate healthcare contextual influences to inform the analysis of the empirical results and to extend IS theory or concepts. |
| *Healthcare only:* Authors primary attention is describing IS or IT in a healthcare context with little consideration to theory | *Atheoretical:* Papers that describe an IS or IT in a healthcare context without consideration of theory. |

**Table 2. IS Theory and context relationship in Health-related papers**

The next section outlines the methodology employed as part of this study.

# Methodology

A systematic review of ICIS, ECIS, AMCIS and PACIS publications were performed by the researchers. The purpose of conducting this review was to examine the status quo of theorising eHealth in developing countries at popular IS conferences. Such an approach was performed to ensure that rigor was achieved (Webster and Watson, 2002; Levy and Ellis, 2006). Figure 1 graphically depicts the process in which this systematic review was conducted. A search of articles in the AIS e-library was conducted, focusing solely on publications during 2000-2015. ICIS, ECIS, AMCIS and PACIS were selected. While the authors acknowledge that ICT4D (Information and Communication Technology 4 Development) related conferences and various journal outlets were omitted from the review process, the four conferences selected were considered as the top conferences within the Information Systems domain (Rosemann and Recker 2009) and an excellent starting point for this research-in-progress paper. The fifteen year timespan was selected as this is the time period of the Millennium Development Goals (United Nations 2015). Search terms included 'Developing countries' and 'health' in an effort to yield the highest return of relevant academic papers. Noteworthy, the word 'theory' was not searched because the constitution and formation of 'theory' in IS research is fluid (Gregor 2006).

The search yielded a total of 396 studies but 85 studies remained after removal of duplicates and articles based on title and abstract review. On full study assessment another 45 papers were removed from the process as they were panel paper articles failed to meet the inclusion criteria. For this review the inclusion criteria included 1) research published by ICIS, ECIS, AMCIS and PACIS; 2) between 01/01/2000 and 31/12/2015; 3) published in English; 4) in a developing world context; 5) focused on eHealth; 6) vis-à-vis quantitative, qualitative, mixed methods or design science approach(es). Exclusion criteria included articles which 1) were published before 2000; 2) non-English; 3) research that only referred to 'developing countries' or another associated key term in passing; 3) research that only referred to 'eHealth' or another associated key term in passing; 4) panel papers, research-in-progress papers, and literature reviews. The authors ultimately assessed the remaining 38 studies to ensure that they adhered to the inclusion criteria. All the authors were responsible for reviewing the various papers across different conferences. Before this was done, the authors were completely clear and in agreement about the detailed procedure, as recommended by Okoli and Schabram (2010).

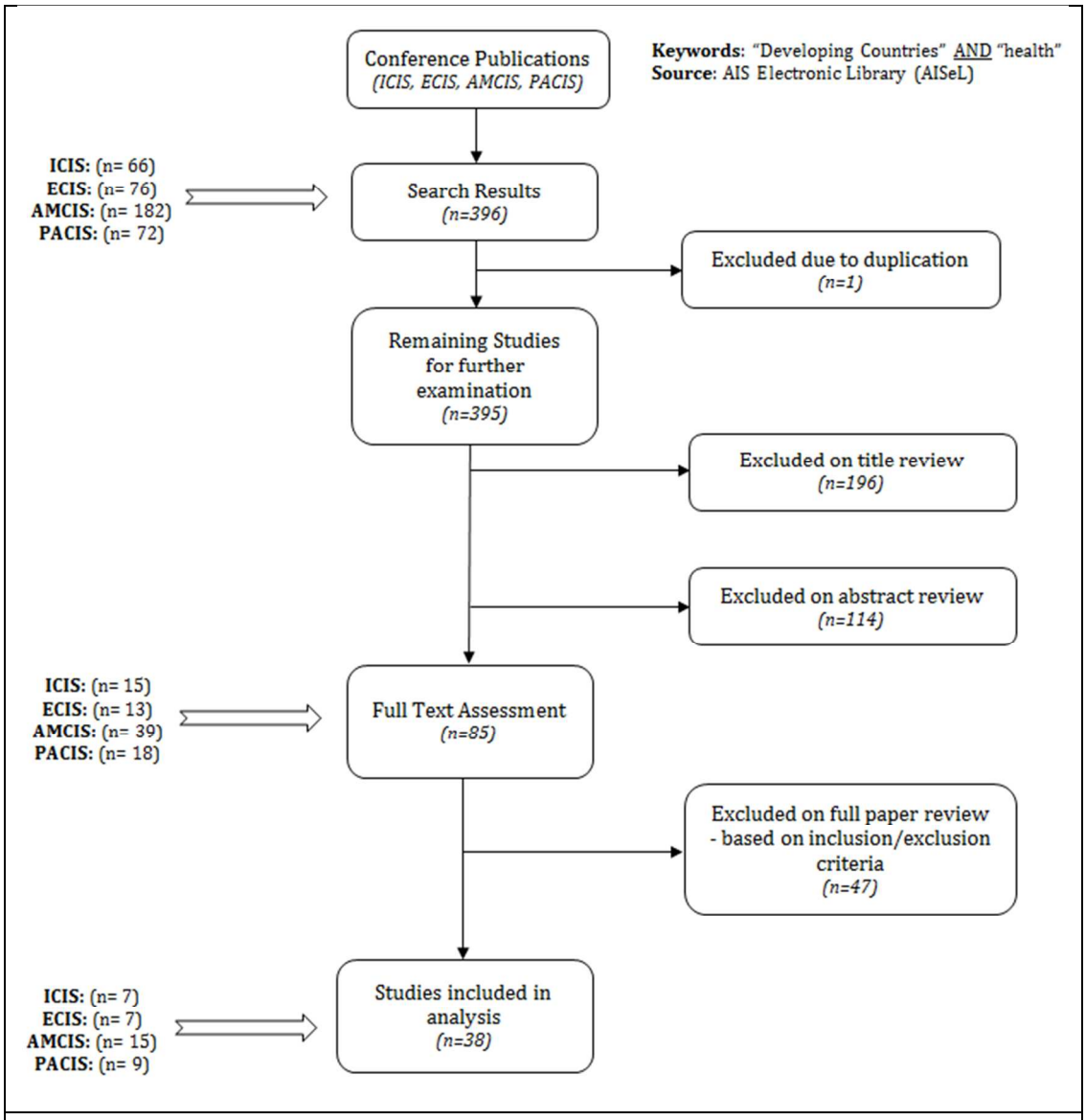


**Figure 1. Systematic Review Process**

Once the papers were finalised for inclusion in the analysis each paper was subsequently categorised using the following criteria: Year, conference publication, objective, level of analysis, location of study, healthcare domain, methodology, technology examined, frameworks/models/theories used (including listing of variables) and key outcomes. Next, the authors closely examined the objective, methodology, frameworks/models/theories used (including listing of variables) and key outcomes from each of the 38 papers categorising them under the 4 types of theory (aligning to Gregor's definitions of Explanation, Prediction, Explanation and Prediction, and Design and Action). See Table 4. Building from this, the author(s) examined the contextual landscape of each study (i.e. using the location of the study, healthcare domain, and the technology type) to categorise them according to Romanow et al. (2012) perspective. The findings from this analysis are reported in the next section.

## Findings

This section profiles the 38 papers analysed as part of this systematic review. Publication of eHealth papers examined in developing countries first emerged at IS conferences in 2004 (n=3). 2014 saw the

highest number of publications on this phenomenon (n=6), followed closely by 5 publications in both 2010 and 2012, respectively. Table 3 provides an overview of the publications per year.

| Table 3. Frequency of Publications | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Publications | 3 | 0 | 3 | 2 | 2 | 4 | 5 | 4 | 5 | 2 | 6 | 2 |

**Table 3. Frequency of Publications**

Using Gregor's (2006) classification of theory, Table 4 presents the frequency at which various theories were applied across eHealth papers in developing countries. It is evident from this table that the theory type of explanation is the most common theory applied within this domain.

| Table 4. Theory Type and Frequency of Occurrence | |
|---|---|
| **Theory Type** | **Frequency of Occurrence** |
| 1. Analysis | N/A – due to exclusion criteria (RIP, literature reviews) |
| 2. Explanation<br>3. (n=17) | Kimaro and Nhampossa (2004); Xue et al., (2004); van Belle (2006); Al-Jaghoub et al. (2007); Bernadi (2009); Nguyen (2010); Peng and Kurnia (2010); Maarop et al. (2011); Teoh and Wichramasinghe (2011); Thomas et al. (2012); Bernardi and Sarker (2013); Mengiste (2013); Banerjee and Bagha (2014); Rickenberg et al. (2014); Sahay and Walsham (2014); Xue et al. (2014); Mahapatra and Sahoo (2015); |
| 4. Prediction<br>5. (n=7) | Hsu et al. (2006); Illie et al. (2009); Tong and Teo (2009); Mukherjee et al. (2010); Akter et al. (2011a); Guo et al. (2012); Motamarri et al. (2012) |
| 6. Explanation and Prediction<br>7. (n=5) | Shivute et al. (2008); Akter et al. (2011b); Nguyen and Nguyen (2010); Bedeley et al. (2014); Dutta et al. (2015) |
| 8. Design and Action<br>9. (n=9) | Nhamposa (2004); Lungo et al. (2006); Awoyelu and Ikono (2007); Wouters et al. (2009); Nunes et al. (2012); Sanner et al. (2012); Haque et al. (2014); Nyella and Mndeme (2010); Staring and Titlestad (2008); |

**Table 4. Theory Type and Frequency of Occurrence**

To understand the contextual landscape in which the 38 papers identified for this study was examined the authors also identified a number of key variables including Objective, Location, Healthcare Domain, Methodology Employed, Technology Examined and Key Outcomes.

Various methodological approaches were employed throughout the various studies. Qualitative based case studies were the popular method of choice (n= 16), followed by quantitative surveys (n=8) and design science/action research (n=8). Mixed Method approaches (n=6) were also employed to examine eHealth in a developing world context. Healthcare services in a country were delivered at various institutions ranging from small and simple health care centres to large and technologically advanced hospitals (Braa et al. 2007). Research to date has explored eHealth at the national (n=15), provincial/regional (n=2), District/Hospital (n=8) and community/rural (n=4) levels of healthcare. 5 multi-level based papers were also identified with the remaining 4 not explicitly stating the level at which the study was explored.

Various eHealth technologies were examined in the papers reviewed. The dominant technology examined in the literature was Health Information Systems (n=16). Other technologies explored include teleconsultation/telemedicine (n=5), electronic medical records (n=5), disease management system (n=1), e-pharmacy (n=1) and 6 specific eHealth tools including electronic Edmonton Symptom Assessment System e-ESAS (mobile based), e-Mahtari: Mother and Child Tracking System (MCTS), Patient monitoring system using USSD technology via mobile phones, Nokia 9300 device demonstrating medical software, Electronic Medical Information (EMI) systems and UCEMEPA environment formed by three modules: Wireless Body Sensor Network (WBSN), Collective Monitoring Server (CMS) and Physical

Activity Information System (SIAF). The remaining four did not explicitly document a specific eHealth technology (i.e. eHealth was used in a generic sense). Table 5 categorises the papers based on Chiasson and Davidson (2004) and Romanow et al. (2012) descriptions, with Figure 2 graphically depicting the results.

**Table 5. Theorising eHealth in Developing Countries**

| **IS Theory and context** | **Theory Type** | **Authors** |
|---|---|---|
| *Minimal HIT* | N/A – due to exclusion criteria (RIP, literature reviews) | |
| *Moderate HIT (n=24)* | *1. Analysis* | N/A – due to exclusion criteria (RIP, literature reviews) |
| | *2. Explanation (n=12)* | Xue et al., (2004); van Belle (2006); Al-Jaghoub et al. (2007); Nguyen (2010); Teoh and Wichramasinghe (2011); Thomas et al. (2012); Bernardi and Sarker (2013); Mengiste (2013); Banerjee and Bagha (2014); Rickenberg et al. (2014); Xue et al. (2014); Mahapatra and Sahoo (2015). |
| | *3. Prediction (n=4)* | Illie et al. (2009); Mukherjee et al. (2010); Akter et al. (2011a); Guo et al. (2012). |
| | *4. Explanation & Prediction (n=4)* | Shivute et al. (2008); Nguyen and Nguyen (2010); Bedeley et al. (2014); Dutta et al. (2015) |
| | *5. Design & Action (n=4)* | Nhamposa (2004); Awoyelu and Ikono (2007); Nunes et al. (2012); Sanner et al. (2012). |
| *High HIT (n=14)* | *1. Analysis* | N/A – due to exclusion criteria (RIP, literature reviews) |
| | *2. Explanation (n=5)* | Kimaro and Nhampossa (2004); Bernadi (2009); Peng and Kurnia (2010); Maarop et al. (2011); Sahay and Walsham (2014). |
| | *3. Prediction (n=3)* | Hsu et al. (2006); Tong and Teo (2009); Motamarri et al. (2012). |
| | *4. Explanation & Prediction (n=1)* | Akter et al. (2011b). |
| | *5. Design & Action (n=5)* | Lungo et al. (2006); Wouters et al. (2009); Haque et al. (2014); Nyella and Mndeme (2010); Staring and Titlestad (2008). |
| *Athoeretical* | N/A – due to exclusion criteria (RIP, literature reviews) | |

**Table 5. Theorising eHealth in Developing Countries**

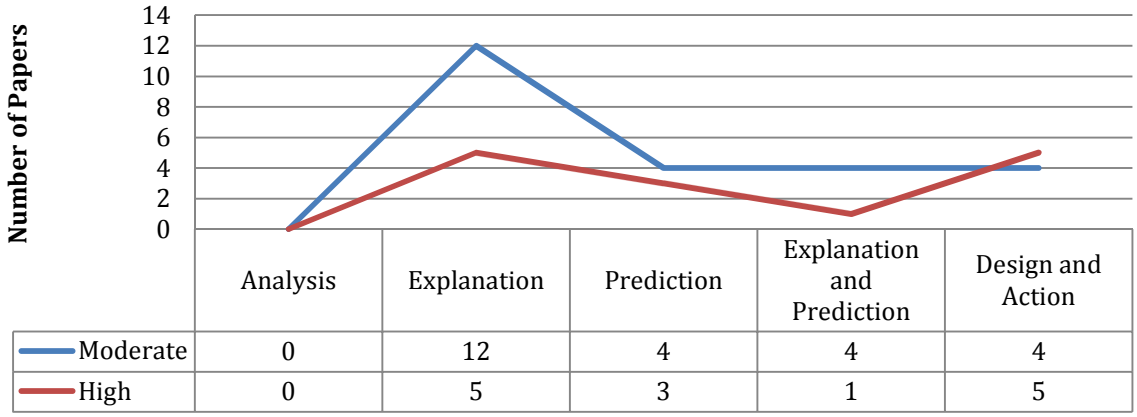


**Figure 2. Theorising eHealth in Developing Countries**

Another area of interest was the location in which research has been conducted. Figure 2 presents 26 developing countries in which research has been explored (Bangladesh (n=4), Botswana (n=1), Brazil (n=1), China (n=4), Cuba (n=1), Ethiopia (n=2), Ghana (n=1), India (n= 5), Jordan (n=1), Kenya (n=3), Malawi (n=2), Malaysia (n=3), Middle East (n=1), Mozambique (n=3), Myanmar (Burma) (n=1), Namibia (n=1), Nigeria (n=2), Singapore (n=1), Sierra Leone (n=1), South Africa (n=3), Taiwan (n=1), Tanzania (n=6), Tajikistan (n=1), Uganda (n=1), Vietnam (n=4), and Zambia (n=1)). Noteworthy, individual studies reviewed as part of this study explored eHealth across a number of developing countries.

## Discussion and Conclusion

Are we as IS researchers focusing too much on testing or refining existing theories with some regard for the healthcare context as opposed to examining phenomena in healthcare context, using theory to explain phenomena, possibly extending or building theory in this context? Do we need to be more prescriptive to ensure that eHealth work moves from pilot phase to long term sustainable phase? This research-in-progress paper set out to establish the status quo of theorising eHealth in developing countries.

The findings reveal that IS researchers' primary attention is generalisable theory (in the form of explanation) with some consideration given to the interaction with the healthcare context. The attraction to the explanatory may be attributed to the perceived nascence or lack of maturity in eHealth or HIT research and practice (Franz-Vasdeki et al. 2015) coupled with the perceived contextual complexity and social diversity amid a proliferation of eHealth technologies (Chiasson et al. 2007). The observed abundance of explanatory papers may well be considered an indicator or the lack of research maturity of eHealth as an area of research.

There are other sub-areas of research where researchers can leverage the lessons learned and move beyond generalisable theories. The eHealth domain faces many challenges such as fragmentation of national health information systems, marginalization of IT-illiterate, poor infrastructure, limitations with current eHealth strategies, policies and legal frameworks in developing countries. Researchers could tackle these complex area of eHealth initiatives by leveraging a socio-technical approach in order bring greater theoretical clarity to the area of eHealth (Chib et al. 2015). As per the Chib paper, the area of eHealth needs to see greater convergence in order to begin to influence national and international policy. Contextual factors are very important when examining eHealth initiatives, especially in a developing world environment (Chiasson and Davidson 2004; Romanow et al. 2012). In order to achieve greater

convergence, contextual factors and the level with which eHealth research is conducted is important (i.e. individuals, organizations and society) to report.

This study reveals that the majority of work being conducted is at a national level. It is assumed that the attention paid to the national level is driven by MDG/SDG and policy makers however; the domain suffers from 'pilotisis'. Given the nascence and complexity of this area of research, accompanied by the issue of 'pilotisis', the authors argue that existing theory (predominantly explanatory-based) is not fit for purpose within the context of Health IS/eHealth research. Following Agarwal et al. (2010 p. 15) "although healthcare shares many characteristics with other industries, researchers should be cognizant of the unique attributes of this sector. The distinct nature of the health-care setting promises to help scholars generate new insights and theories". In order to address the problem of 'pilotisis' and building from the findings, the authors propose that that researchers now need to engage in and draw on substantive theorising to supplement the largely formal theorising found across different units of analysis (i.e. individuals, organizations and society). This is an opportunity to encourage the increasingly interdisciplinary eHealth research community to devise new theories to better address the opportunities and challenges of eHealth in developing countries. From a practical perspective, exploring new theories may provide richer insights into how eHealth initiatives in developing countries can be sustained and scaled-up thereby addressing the SDGs.

Certain provisions were employed by the researchers to ensure the integrity of the research study. A systematic approach was undertaken, documenting all the steps in the process to ensure rigour was achieved (Webster and Watson, 2002; Levy and Ellis, 2006). Although the research study achieved its objective, the results of this study should be interpreted in the context of its limitations. Only IS conferences were used as part of this systematic review. As a result, there is limited theorising that address the specific domain (ICT4D or other related health care and ICT policy) and local context of eHealth activities which may be strongly influenced by the sampling of the conferences review. Researchers interested in this domain should extend their search criteria beyond the four conferences listed here.

The next stage of this research is to draw a greater understanding between the perspectives of Gregor (2006) with Chiasson and Davidson (2004) and Romanow et al. (2012) in terms of theorising eHealth in developing countries by extending the scope of this review to additional conferences and top journals. A more thorough analysis will be conducted based on the literature reported as part of this study, especially reviewing other disciplines where eHealth is studied and theorised, such as conferences on Information and Communication for Development (ICT4D) with health tracks and conferences related to health care and ICT policy.

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