Measuring the benefits of IS in small organizations in developing countries

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Abstract— **The role of information system (IS) in economic growth and competitiveness in developing countries has grown in prominence. In particular, its impact on small and medium enterprises (SMEs) has received much rhetoric as these enterprises are seen as vital engines of innovation. Despite the promised benefits and the substantial investment by developing countries, scant research exists on measuring the benefits of IS for SMEs in these countries. This paper reports a preliminary findings of a research seeks to develop a measurement model to measure the benefits of IS for SMEs in developing countries. Thirty case studies published in vender's websites for developing countries spanning Africa and the Middle East, were examined. The analyses yielded 566 pertinent benefits, which were synthesized into 45 measures across four dimensions. The model – after validation- will provide critical insights to policymakers and managers for assessing the benefits of IS for SMEs in developing countries.**

Keywords- IS Success, IS Impact, measurement models, information systems evaluation, SMEs, developing countries.

I. INTRODUCTION

Economic growth and innovation are prominent issues, particularly important in light of global economic uncertainty. Small and medium enterprises (SMEs) are universally acknowledged to have a significant role in contributing to innovation and growth. There is widespread agreement that the SME sector generates significant earnings to the national economies in both developed and developing countries, constitutes the majority of firms and also provides the main source of employment. The use of IS in SMEs is paramount as it can lead to benefits in terms of efficiency, effectiveness and innovation [1-3]. However, SMEs confront many barriers in successfully implementing IS including lack of skilled labour, lack of additional funding, cost of development and implementation [4]. While information systems (IS) are seen as paramount for competitiveness of SMEs, these enterprises face a digital divide from their larger counterparts, evidenced by significant differences in IS-related activities such as e-commerce and e-procurement [5, 6].

This gap between SMEs and their larger counterparts is even further magnified in developing countries mirroring the digital divide between developing and developed countries [7]. Questions arise over how IS can really bring about economic growth in developing countries [8]. Despite promises and rhetoric around the positive impact of IS on the social and economic wellbeing of citizens of developing countries, closer investigation does challenge these assumptions [7,9,10]. Debates arise over the meaning of digital divide with trends away from a mere focus on technology access towards the use and realized benefits for its users [11]. Roztocki and Weistrofer [12] argue that developing countries have substantially different business environments compared to developed countries in terms of laws and regulations, governmental control, workforce characteristics, management style and customer income characteristics. They stress the high failure rate of IS implementation and point out that IS applications in developed countries have a 'different focus as mature infrastructure is already in place, and project success is often determined by very different criteria' [12]. Additionally, Soja [13] emphasizes the difficulties in IS implementation in developing countries pertaining primarily to the human resource constraints and high costs. However, research on IS evaluation in SMEs in developing countries is very limited [8].

Therefore, attention is critical for ensuring the success of IS implementation in SMEs in developing countries [14]. In this paper, the relevant literature on IS benefits for SMEs in developing countries is reviewed along with existing IS success models. Case studies from developing countries are then analyzed and a preliminary model developed for measuring the benefits for IS in SMEs in developing countries. The proposed model will offer valuable insights to managers and policy makers in developing countries with responsibility for IS implementation to ensure that effective investment is realized.

II. LITERATURE REVIEW

A. Small and medium enterprises (SMEs)

SMEs are vital engines of employment, innovation and growth [1,2]. There is consensus on differentiating characteristics for SMEs from the larger counterparts, which have important implications for the success of IS implementation initiatives [1]. These include organizational structure, management and decision making processes [4-6].

In terms of organizational structure, contrary to large organizations, SME structure is generally centralized and informal [1,5,7,8] While this structure has the advantage of flexibility in adapting to market changes [9,10], it can be criticized for its fragility given its difficulty in function segregation[5,11].

Management of SMEs is usually characterized by dominant owners and the limited delegation of decision making [4,12]. Consequently, senior management is seldomly involved in IS decisions in SMEs [1,13]. Kartiwi and MacGregor [5] note that SME owners usually withhold information from employees.

The uncertainties and risks that SMEs face influence their decision making. SMEs are more vulnerable to uncertainties in the external environment compared to large firms [5]. In particular, SME inexperience often means that they are uncertain about the use of new technologies [4]. Financial risks linked to the difficulty in obtaining credit [1], also lead to limited SME investment in IS implementation and training[13], avoidance of sophisticated software and applications [14-18], project delays and even abandonment [1,19]. Additionally, limited financial resources also result in a lack of IT staff and departments [11]. Hence SMEs are more dependent on outsourced IS services [1,12,13,20].

The high failure rate of IS in SMEs given their decision making in the backdrop of uncertainty, centralized structure and owner-based management, means monitoring the benefits derived from IS implementation is crucial [21]. Despite the emphasis placed in the information systems literature on IS in organizations, there is still a dearth of research on SMEs, also reflecting the low diffusion of IS in SMEs.

B. IS in SMEs in developing countries

IS in developing countries is still challenging due to a number of factors [22,33,24]. IS products are not often tailored to the unique needs of developing countries as they were initially designed for developed markets [24]. Furthermore, limited financial resources, inadequate expertise and human resources in SMEs in developing countries, and the lack of robust regulatory frameworks for IS in developing countries pose major problems[24]. In non-English speaking contexts, the language barrier is also of consideration for developing countries as some citizens may not necessarily know other languages beyond the local language, while for example IS products may be dominated by English-language content [25].

With the growing importance of IS and SMEs in developing countries, researchers have begun to investigate the adoption and use of IS in the developing countries contexts [26-29]. Generally, the focus is on the adoption of IS rather than measuring its benefits [24,30-33].

A limited number of studies attempt to measure benefits of IS in SMEs in developing countries [34]. Kale et al. [35] surveyed 130 Indian SMEs to find out whether and how Indian SMEs are benefiting because of enterprise resource planning (ERP) implementation. That study revealed that most SMEs implemented ERP to integrate the existing information system and found ERP implementation mainly beneficial in reducing inventory, improving customer services and improving communications. Also the study found that top management support, and user involvement and participation are the major contributors to IS success [35]. In Jordan, Hawari and Heeks [36] developed a "design-reality gap" model and applied it to a case study of IS failure in a Jordanian manufacturing firm. Analyzing the situation both before and during IS implementation through a combination of interviews, observation and document analysis, Hawari and Heeks research finds sizeable gaps between the assumptions and requirements built into IS system design, and the actual realities of the client organization [36]. Hawari and Heeks model derived from different IS success measurement models which includes seven dimensions summarised by the ITPOSMO acronym (Information, Technology, Processes, Objectives and values, Staffing and skills, Management system and structure and Other resources) [36]. A study by Ndiege, Wayi, and Herselman [34] focused on assessing the quality of the IS used by SMEs in Kenya. They found low usage of IS within SMEs attributed to low level of IS skills of both the SMEs management and the IS users, and the poorly designed information systems that do not adequately address the needs of the SMEs. They also evaluated the quality of IS in SMEs in developing countries by applying the DeLone and McLean model (D&M) model (explained in the next section) and found them of poor quality for developing countries [34]. In Malaysia, Wei et al. [37] presented a re-specification to the D&M model in which their result provides an expanded understanding of factors that measure IS success and suggests ways to improve IS usage.

C. IS Measurement models

Measuring the benefits of IS has a long debates in IS literature. Many methods are used to measures IS success each has its pros and cons. For the purpose of this research, the following subsections review prevailing IS success models.

The DeLone and McLean model (1992, 2003):

The DeLone and McLean (D&M) model [38] which is the most prominent, existing model, emerged from a review of the research published during the period 1981–1987. A full set of 119 success measures were summarised into six dimensions of IS success: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. The model has been widely tested, modified and improved [39- 47].

Based on many suggestions, DeLone and McLean updated their model and proposed a new DeLone and McLean's 2003 IS Success Model. There are two main enhancements for the dimensions in the updated IS Success Model 2003[48]. Firstly, Service Quality became a dimension of IS success not a subset of "system quality". Secondly, Individual impact and Organizational Impact dimensions are combined into one dimension "Net benefits" to hold levels other than individual and organizational levels including workgroups, industries, and societies impacts [49,50]. Again, D&M model opened the gate for many researchers to either empirically test the model in different contexts or to critique the model and enhance it in some aspects [3,51-53].

The IS-Impact model

On the basis of DeLone and McLean's IS success model, and tests of other researcher's work [54,55] Gable et al. developed a comprehensive "IS-Impact" model [56]. The authors define the IS-Impact of an Information System (IS) as "a measure at a point in time of the stream of net benefits from

the IS to date and anticipated, as perceived by all key user groups"[56]. The IS-Impact model comprises 27 measures along four dimensions; Organizational Impact, Individual Impact, System Quality and Information Quality. The model divided into two halves; the impact half and the quality half. The impact half measures net benefits to date and the quality half measures of probable future impacts [56].

In the current study, the IS-Impact model is adapted as the theoretical foundation. The IS-Impact model is anticipated to be robust and simple yet generalizable. This study also considered other tested models in the analyses to derive the new model for developing countries and SMEs contexts.

III. Model Building

This research aims to develop a benefits measurement model for IS in SMEs in developing countries based on the characteristics of SMEs and developing countries. This is will be accomplished through three main steps: (1) an extensive literature review for SME characteristics and developing countries characteristics. (2) A content analyses of 30 published customer success stories across developing countries to develop the preliminary model. (3) A confirmation survey. (See figure 1.Research Design).

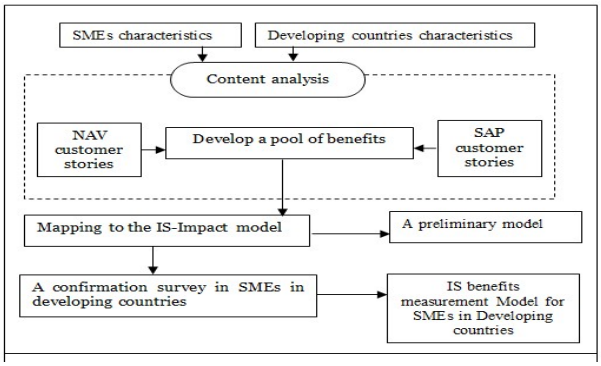


Figure 1. Research Design

Content analysis

Content analysis technique is used by this study to identify the benefits of IS in SMEs in developing countries. Content analysis as defined by many scholars [57-61], is a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding. The data source is customers' success stories in the commercial press of vendors' websites. Success stories published by the vendors on their websites represented a rich source of carefully collected, accessible, up-to-date information about IS benefits. They also describe this data as a detailed picture of IS investment, that includes business environment, background, objectives, competitive strategy, system support, system implementation and benefits realized, wherein the data can be traceable for verification purposes [55]. The inclusion of commercial press as a source of evidence can be justified by several factors. The benefits in the form of quoted statement or a video interview represents the customer's exact statement about the system. In addition vendors would have had to gain approval from customers' companies to publish stories about them. Additionally, the development of the model will be guided by the previous studies and models and will be analyzed and justified in the light of SMEs' and developing country characteristics.

Avoiding the emphases on specific benefits related to a specific product, two leading IS companies were selected, Microsoft for their solution for SMEs Microsoft Dynamic NAV and SAP for three solutions for SMEs, namely, SAP business one, SAP business by Design and SAP business all in one. Using their websites, analysis was carried out on the published customers' "success stories" to develop a pool of IS benefits for SMEs in developing countries. Ensuring model completeness, we identified keywords from the customer's quotation and then synthesized the benefits using a guideline of content analysis similar to those of the Shang and Seddon (2002) [55]. The synthesis procedure aims to reduce the identified benefits by removing overlapping measures to achieve mutual exclusivity and parsimony of the model. The guidelines employed in synthesis include: (1) identify synonyms of the keyword benefits, (2) merge identical / similar benefits into a single one, (3) link the derived IS benefits to a measurement dimensions. As a result of these steps a pool of benefit of IS in SMEs in developing countries was produced. Table 1 shows some examples of selected cases and the derived IS benefits associated with the customer's quotation from the vendors' web sites. The process of the content analysis of 30 published case studies containing 299 customers quotations, yielded 566 identified benefits were then synthesized into 60 non-overlapping benefits.

TABLE I. Examples of IS benefits

Country	Full quotation	IS benefits
Turkey	"The solution is saving between 25 and 30 person days a month in..."	employee effectiveness
Nigeria	"The rate of adoption of the software by employees was much faster …"	easy to learn
Lithuani	"Ultimately, we wanted a unified business management system ..."	unified (integration)
Lebanon	"The application needed to be flexible and easy-to-use…"	flexible - easy to use
UAE	"The company is well prepared to meet its global expansion plans…"	support growth plans

Mapping and analysing the Benefits

After the process of identifying the salient benefit of IS in SMEs, the next step was to map those benefits statements into a conceptual foundation stemming from the prevailing IS-impact model. The reasons for adapting the IS-Impact model in this study are: IS-Impact represents a wider and qualitative benchmarking of the IS. It also measures the current impact of the IS, and at the same time seeks the potential of the systems in the future. Furthermore, the model is easy to understand and can be used by multiple staff perspectives in an organization.

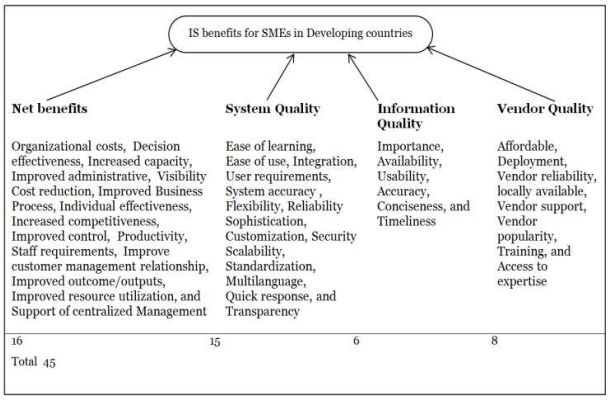
In this research, the process of developing the preliminary model follows the guidelines suggested by [62,56] of clarity, completeness, parsimony and mutual exclusivity. The study

also applied a "top-down approach" to develop the model using Gable et al.'s IS-Impact model. The top-down approach employs deduction, and starts with a logical framework or model to categorize the responses [56]. The mapping procedure of the 566 measures to the IS-Impact shows 318 mapped measures and 248 unmapped measures. Unmapped measures from the IS-impact are critically analyzed in view of SMEs' and developing countries' characteristics and accordingly were subject to be kept or removed from the model. Since the purpose is to collect a comprehensive wealth of benefits, keeping any mentioned benefits was desirable unless they are completely unrelated to the current SMEs and developing countries characteristics in which case keeping them will complicate the model. For instance, E-government measure in the organizational impact dimension is not applied to SMEs in developing countries, so removing it is preferable in the adapted IS-Impact model.

A key observation is that many unmapped measures are largely related to the benefits associated with the vendor/supplier. In the D&M revised model [48], Service Quality became a dimension of IS success not just a subset of "system quality". This dimension is not included in the IS-Impact model. Gable et al. justified,"… as the unit of analysis herein is the Information System, not the IT function, Service Quality was considered inappropriate" [56]. Given the SMEs and developing countries characteristics, and that many citations in this study are strongly emphasizing the support from the vendors, a new dimension was created in the proposed model, it tentatively labeled as "Vendor Quality" instead of "Service Quality". In the context of SMEs and developing countries, Service of IS is provided by an external vendor/supplier because of the organizational lack of IT staff and department [1,12,13,20,63-65]. This dimension consists of many measures related to the vendor such as vendor support, local access to the vendor, and vendor popularity. Other measure are related to training and access to expertise or related to the quality of the deployment process and the affordability of the system provide be the vendor.

All the unmapped measures are related in some way to characteristics of SMEs or developing countries. For example, the "scalability" measure reflects the growth seeking characteristic of developing countries [66,67]. Similarly, the existence of "Support of multiple languages and currencies" measure reflects the language barrier in adopting IS in developing countries [25]. Another observation is the "Support of centralized management" which directly reveals the centralized organizational structure of SMEs [1,7,8,68]. Furthermore, it is very clear that the technology and skills limitations on SMEs and developing countries have a great impact on many measures. Firstly, the existence of measures such as "user friendliness", "familiarity", "ease of use" and "ease of learning" reflects their low level of IS knowledge. Moreover, Limited knowledge of IS affects how the benefits are expressed. For example "better information" is an expression that would include all the measures that related to information quality dimension such as importance, usability, content accuracy, conciseness, timeliness and uniqueness.

A final observation to address is the low number of quotations related to the individual impact which reflects the organizational orientation in SMEs [12]. Blili and Raymond [4] indicated the dominant role of the owner with limited information sharing and limited delegation of decision-making. SMEs seldom have senior management involvement in IS decisions [1,13]. Kartiwi and MacGregor [65] specify SME owners often withhold information from colleagues. Accordingly, The Organizational Impact dimension is merged with the individual Impact dimension to form the net benefit dimension akin to the D&M revised model to cover all other impacts of IS including workgroup and society [48]. For simplicity of the model, some different measures with minor differences representative of SMEs in developing countries were combined. This includes productivity and efficiency; data accuracy and content accuracy; data currency and timeliness; and some other similar measures in the system and information quality dimensions. The mapping and analysis process yielded the preliminary model of this study as shown in figure 2.



Preliminary Model for Measuring the Benefits of IS for SMEs in Developing Countries.

IV. CONCLUSION

This study contributes an IS success measurement model for SMEs in developing countries. It reviews the literature for IS in SMEs in developing countries. The preliminary model was derived using content analysis of 30 published case studies from developing countries in the Middle East and Africa. Analyzing customer quotations, the study identified 566 benefits which were then synthesized into 60 non-overlapping benefits. The benefits finally mapped to the IS-Impact measurement model as the conceptual foundation of this research. Many benefits which emerged were not covered in existing IS-Impact models, which demonstrates that a new benefits measurement model for IS in SMEs in developing countries is necessary. Based on characteristics of both SMEs and developing countries, combined with the findings, the study consolidates a preliminary measurement model for IS in SMEs in developing countries. The model consists of 4 dimensions with 45 benefit measures. As a further step in this research, a quantitative survey will be conducted in SMEs in developing countries to test the IS benefits measurement model for SMEs in developing countries.

The study offers important implications to policy makers and managers in developing countries. At the government level, for example, this research can help policymakers in determining interventions for optimizing the monitoring of IS initiatives to ensure that scarce public funding is effectively allocated. As such development goals pertaining to redressing digital divide concerns in relation to the realized benefits of IS can be achieved. SMEs would also find this research valuable in offering insights for developing processes to manage IS implementation to ensure that organizations reap the anticipated benefits. By assessing the benefits of IS, this research can also help IS vendors identify key growth opportunities for achieving desirable benefits and in application evaluation to address any shortfall in promised benefits. Hence, this study can provide valuable insights to both government and business for developing strategies for realizing the anticipated benefits of IS for SMEs in developing countries.

Despite the contribution of the study, it should be interpreted in light of a number of limitations. Mainly, secondary data sources based on vendor-published successful stories were used in this study and can reflect biases by vendors who may overstate the successes and benefits of their products. However, given that the focus of the study is to develop a benefits model that can be later employed to gauge the 'level of success' in a number of organizations, the use of such success stories do not have a great issue. Future steps in this research will test this model using primary quantitative data. Also, drawing from a larger number of respondents would naturally convey reliability to the findings and enable further comparisons. Nevertheless, this study is a necessary first step in equipping SMEs in developing countries with a useful framework to assess benefits of IS.

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