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Developing a model of IS quality and success in Developing countries

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Abstract

The success of information systems (IS) projects continues to be low despite many initiatives to address the issue. Given the importance of IS for organizations, it is a key imperative for software development firms to understand what is needed to deploy high-quality and successful systems. This is systems that are adopted and used, which by extension can contribute to goal satisfaction and business value. The notion of successful systems is even more important for developing regions, such as the English-speaking Caribbean (ESC), as such regions have far less capacity to absorb these failures (when compared to software development firms in developed countries). Understanding the factors that impact the quality outcomes of IS projects (i.e. antecedents of IS success), is considered key to the success of these projects. This study therefore aims to provide a research model that identifies key factors impacting IS project quality and success, while taking into account the unique characteristics of developing countries (in this case, the ESC region).

Keywords

Information systems quality, information systems success, user perception, developing countries

1. Introduction

Significant investments in terms of time, money and resources are made in information systems (IS) projects with the hope of improving firms' efficiencies and competitiveness (Barclay, 2008). However, for many years the IS community has been plagued with the delivery of unsuccessful information systems projects (Standish Group, 2009), which in turn, affects the anticipated benefits. This condition applies in both developed and developing countries (Niazi, Babar, & Verner, 2010) and more so for developing countries which suffers from severe resource constraints (Kimaro, 2006).

It is therefore believed that the failure rate of IS projects is much higher in developing countries in comparison to developed countries (Heeks, 2002). Yet developing countries have less capacity to absorb these failures (Lawler, 1997). In addition, these failures keep developing countries on the wrong side of the digital divide (Heeks, 2002). To reduce the risk

of failures IS professionals and practitioners need to be able to predict and manage the outcome of their efforts. This can be enabled by having a better understanding of the key factors that influence IS project quality and success (Kamhawi, 2007; Szajna & Scamell, 1993), particularly those that pertain and are unique to the developing country context.

Software development can be a critical factor for economic development (Kamel, Rateb, & El-Tawil, 2009; Kodakanchi, Kuofie, Abuelyaman, & Qaddour, 2006; Ngwenyama, Andoh-Baidoo, Bollou, & Morawczynski, 2006). A number of IS quality and success models have been developed (DeLone & McLean, 1992; Duggan & Reichgelt, 2006; Kamhawi, 2007; Livari, 2005; Saleh & Alshawi, 2005; Seddon & Kiew, 1996) with some being extended. A large number of empirical studies have been done using these models in the areas of IS measures and IS quality and success. However, to date, no empirical studies have been conducted with Duggan and Reichgelt (2006) quality model, neither have this model been validated. In addition, most IS quality and success studies have been conducted in developed countries (Kamhawi, 2007), with relatively little research in this domain in developing regions such as the English-speaking Caribbean (ESC). This like many others, is a region plagued with economic, social and technical constraints (Berisso & de Vries, 2010; Chevers, Moore, Duggan, & Mills, 2008; Ngwenyama et al., 2006).

Hence we felt a desire to validate the Duggan and Reichgelt (2006) quality model in an unexplored region, the English-speaking Caribbean. In general, most IS quality and success studies tend to focus on operational measures rather than broader set of impact measures like technology, process, people and environment (Anderson, Birchall, Jessen, & Money, 2006). It is generally accepted in the IS community that the determinants of IS quality are technology, process and people (Gorla & Lin, 2010; Iversen & Ngwenyama, 2005; Krishnan & Keller, 1999). For example, the people measure could be broken down into, commitment to the project, stakeholder influence and project communication and involvement (Anderson et al., 2006). In essence, there is an appeal for a more holistic measurement of IS project quality and success (Saleh & Alshawi, 2005).

This study proposes a holistic model which seeks to assess the key influencing factors of IS project quality and success in developing countries. We are interested in the antecedents of IS project quality and success; hence the research question, "What factors influence IS project quality and success in developing countries?" The result of our study is expected to be relevant to both researchers and practitioners. Managers can gain insights regarding the factors that have the greatest influence on IS project quality, which can assist in software development projects, and by extension increase the likelihood of delivering more successful systems (Anderson et al., 2006; Peslak, 2006). In addition, IS project quality and success studies are of utmost importance to researchers (Bokhari, 2005) and as such we hope to offer a research model to the community. These studies could provide valuable insights regarding the key factors that influence the delivery of high quality and successful IS projects.

2. Background

Information systems are essential components of organizations' strategic imperatives (Bokhari, 2005). So it is important that these systems satisfy user's needs and fulfill organizational objectives. But information systems project failure is a prevalent problem in the IS community (Standish Group, 2009). References are made to the high degree of uncertainty and volatility of IS projects (Lee & Xia, 2002; Raz, Shenhar, & Dvir, 2002; Shenhar, Tishler, Dvir, Lipovetsky, & Lechler, 2002), project abandonment (Ewusi-Mensah & Przasnyski, 1991), and project escalation (Keil, 2003).

These problems and their resolution are more critical in developing countries because these countries have less capacity to absorb such failures due to their limited resources. In addition, the cultural norms in developing countries are different from developed countries. For

example, there are resource poverty in finance, labor, equipment & material (Berisso & de Vries, 2010; Thong, Yap, & Raman, 1996), highly centralized structures, with the CEOs making most of the critical decisions (Vreede, Jones, & Mgaya, 1999), cultural issues like aversion to change and low productivity (Herrera & Ramirez, 2003), unavailability of IS specialists (Thong et al., 1996), heavy reliance on imported IT products and solutions (Bhatnagar, 2000), and foreign exchange shortages, low economic growth and scarcity of technical personnel due to migration (International Monetary Fund, 2006). For these reasons, different results are expected from IS project quality and success study in developing countries in comparison to the studies conducted in developed countries (Kamhawi, 2007). This has lead to an appeal for the development of an IS quality and success model for developing countries (Kamhawi, 2007).

Evaluating the quality of IS projects is very important (Almutairi & Subramanian, 2005; Kim, 1999). Hence, it is important to identify those critical success factors (CSFs) which increase the chances of delivering high quality IS projects (Rodriquez-Repiso, Rossitza, & Salmeron, 2007). A wide range of factors can influence the development and delivery of high quality IS projects. Quality information systems projects are defined as those that deliver the software product with pre-agreed level of quality within the given time and cost (Agarwal & Rathod, 2006). Although the Standish Group (2009) considers successful software projects as those that meet all three objectives – time, cost and desired quality. This study is not concern about time and cost. The focus of this study is the desired quality in terms of meeting expectation and achieving business success – a call which is being made in the IS community (Agarwal & Rathod, 2006).

The determinants of successful IS projects are the delivery of high quality software product and good user perception (Duggan & Reichgelt, 2006). Software product quality is defined as the desired characteristics of the system such as reliability, completeness, relevance, accuracy and currency (DeLone & McLean, 1992). The ISO/IEC 9126 quality characteristics operationalized these dimensions as efficiency, reliability, usability, functionality and maintainability (Jung, Kim, & Chung, 2004). However many high-quality systems at times are also not being used because of users' perception (Markus & Keil, 1994; Newman & Robey, 1992). User perception are often measured using two concepts namely perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" and perceived ease of use refers to " the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320).

The shortcomings in some of the current IS quality and success models have influenced an extensive literature survey to assess the IS evaluation approaches of these models (Irani, 2002). The approaches can be divided into three themes namely:

- Evaluating an IS as a product
- Evaluating the processes which underpin the development of an IS
- Evaluating the maturity of IS within an organization in terms of IS planning, infrastructure, utilization and management

These findings support the notion of a holistic approach to the assessment of IS quality. To this end, we adapted (Duggan & Reichgelt, 2006) information systems quality model to conduct our study. Their model takes a holistic measurement approach (Saleh & Alshawi, 2005) to IS quality and success, with IS success being the dependent variable. It incorporates project management practices, process maturity and people involvement and commitment as determinants of IS quality, then software product quality and user perception as determinants of IS success (see Figure 1). It is important to note that the model resonates on the premise that IS project success may not at all times be directly correlated with high quality software product; and that user perception can be another influencing factors (Davis, 1989; McGill &

Hobbs, 2003). The latter is so because many high-quality systems may not be used in part, because they may be perceived by users as not being useful and/or easy to use (Markus & Keil, 1994; Newman & Robey, 1992). Unused or underutilized systems can cost firms millions of dollars each year (Markus & Keil, 1994), a resource that is very scarce in developing countries. Hence, it is important to understanding those factors that enhance the delivery of high quality and successful IS projects.

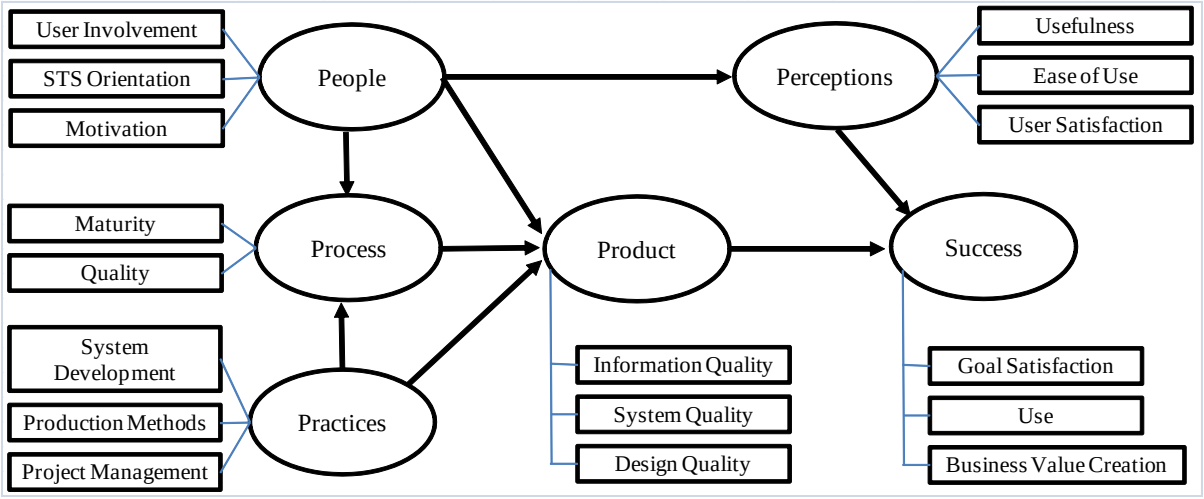

Figure 1: Duggan and Reichgelt (2006) Information Systems Quality Model

The Research Model

In adapting Duggan and Reichgelt's (2006) model we retained the dependent variable – success. However, minor modifications were made to suit our research effort bearing in mind that there is resource poverty in finance, labor, equipment and material in the ESC (Berisso & de Vries, 2010; Thong et al., 1996). Firstly, the names of three constructs in the original model – product, perceptions and success were renamed IS quality, user perception and IS success respectively, to explicitly reflect their functions in the developmental cycle. Secondly, IS quality was operationalized using ISO/IEC quality characteristics such as efficiency, reliability, usability, functionality and maintainability (Jung et al., 2004). Thirdly, the indicator variables for the 'people' construct were user involvement, developer knowledge and developer commitment. These variables were considered relevant in an ESC setting because of the scarcity of IS professionals in developing countries (Avgerou, 2008; Berisso & de Vries, 2010; Kimaro, 2006; Kodakanchi et al., 2006; Ngwenyama et al., 2006; Qureshi, Kamal, & Wolcott, 2009). This scarcity is due mainly to the migration of personnel to developed countries. The International Monetary Fund (2006) reported that the Caribbean region loses 70% of its tertiary graduates annually due to migration. Coupled with the migration there is reference to highly centralized structures, with CEOs who might not be knowledgeable about information systems making most of the critical decisions (Vreede et al., 1999). Based on these conditions in the ESC our expectations are that user involvement and developer knowledge will impact IS quality. As a result, the first proposition is:

P1: People involvement will have a positive impact on IS quality

A preliminary study in the Caribbean revealed that a large majority of software development firms are not aware of software process improvement (SPI) and its benefits, nor are they using or intend to use any forms of SPI programs in the near future (Chevers & Duggan, 2010). Based on these findings it could be argued that the process maturity of firms in the

ESC is low (perhaps at levels 1 – 2). For these reasons we believe that process maturity will have no significance on IS quality. Hence:

P2: Process maturity will have a negative impact on IS quality

The IS literature makes reference to cultural issues in developing countries such as aversion to change and low productivity (Herrera & Ramirez, 2003). These traits can cause resistance to change to developmental practices being supported by top management or project managers/developers during IS projects implementation. Hence old embedded practices can retard the likelihood of higher-quality software being delivered. So out third proposition is:

P3: Developmental practices will have a negative impact on IS quality

Advocates of agile software development (Highsmith & Cockburn, 2001) focus on the importance of people in the developmental process. They emphasize having dedicated and collocated users, working closely with developers to produce software functionality with high business value. High business value can positively influence users' perception of the delivered software. This kind of collaborative approach to software development is even more critical in the ESC as they strive to get things right the first time, due to the limited resources. Hence:

P4: People involvement will have a positive impact on user perception

Many technically sound information systems are not being used because there are perceived by users as not being useful or easy to use (Markus & Keil, 1994; Newman & Robey, 1992). For the 'user perception' construct, we used (Davis, 1989) indicator variables of perceived ease of use, perceived usefulness and user satisfaction. Perception is very powerful irrespective of whether there exist financial or human constraints. Our expectation are that user perception (i.e. perceived usefulness and perceived ease of use) will impact IS success in the ESC. As a result, the fifth proposition is:

P5: User perception will have a positive impact on IS success

Bhatnagar (2000) posited that there is heavy reliance on imported IT products and solution in developing countries. These imported solutions are usually perceived as being of higher-quality that those developed in developing countries. This reliance and perception could bias the results to more successful IS projects. As a result, we believe that IS quality will have a positive impact of IS success. Hence:

P6: IS quality will have a positive impact on IS success

Lastly, for the IS success construct, we used (DeLone & McLean, 1992) indicator variables of system usage, goal satisfaction and business value. Bringing together the above propositions, the resulting research model is shown in Figure 2.

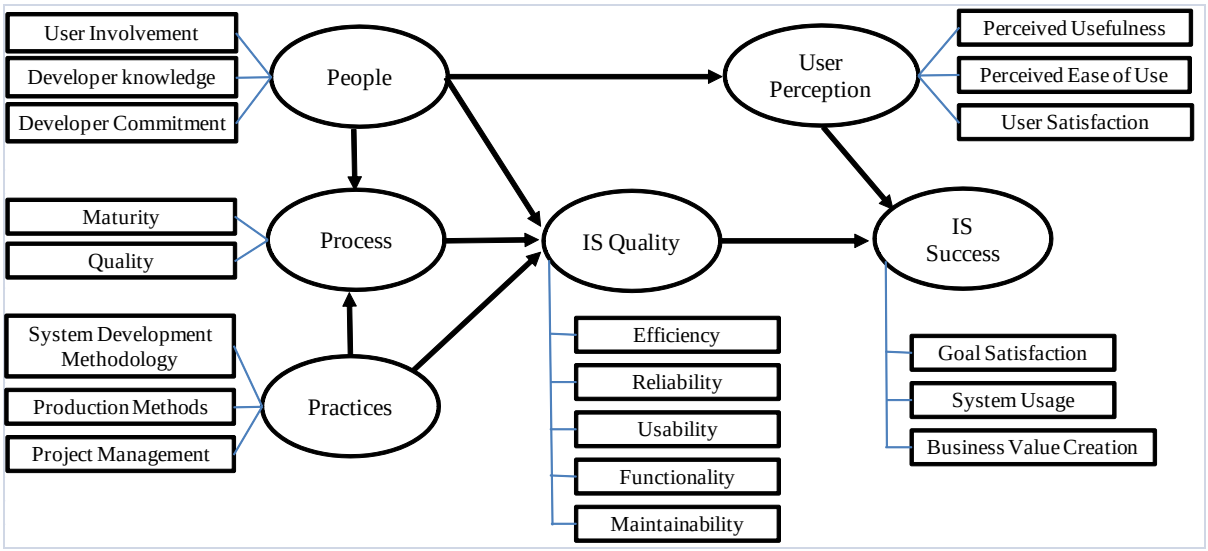

Figure 2: The Research Model

3. Implication for Practice

The quality and success of the delivered systems is of importance to both IS researchers and practitioners (Livari, 2005). Likewise both project and business managers can improve their performance if they have a better understanding of the determinants of IS project quality and success. Equally important is how these factors impact outcomes (Anderson et al., 2006; Kamhawi, 2007).

Resources are scarce in developing countries and it is hoped that where the determinants of IS project quality and success are individually understood and measured, then project outcomes can be improved and resources utilized better (Thomas & Fernandez, 2008). This is a goal that most IS professionals and software development firms strive to achieve and it is even more critical in developing countries.

Hence, we plan to assess and validate the research model through a survey in ESC software development firms. A five-point likert type scale will be used, with the unit of analysis being IS projects. The study is intended to utilize a matched-pair sampling approach (Ko, Kirsch, & King, 2005) in which responses will be sought from developers and users of the same IS project. Pre-testing would be recommended before the real study with ESC firms who develop systems for internal and external use. It is expected that the sample size might be small and so PLS (Chin, 1998) would be recommended to do the data analysis of the measurement and structural models.

The outcomes should provide further insight into key elements impacting IS project quality and success particularly as this relates to IS development and deployment in developing countries, especially the ESC. The proposed research model should therefore be useful to both practice and the research community and offer a useful base for further research and refinement.

4. Conclusion

It is imperative that developers, project managers and users develop and deploy high-quality and successful IS projects. Projects which deliver systems that are used, provide goal satisfaction and create business value, which in turn can improve the efficiency and competitiveness of firms. This can be achieved if there is a better understanding regarding the determinants of IS project quality and success. We believe that such knowledge is very

important in developing countries, and more so the ESC which has less capacity to absorb failed systems and wasted resources.

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