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Key influencing factors of information systems quality and success in Jamaican organizations

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Key influencing factors of information systems quality and success in Jamaican organizations

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ABSTRACT

Despite major strides in information technology, the Information Systems (IS) community generally continues to suffer from the delivery of low quality and failed systems. The situation in the English-speaking Caribbean and in Jamaica in particular, is even more stark because interventions such as software process improvement (SPI) processes are neither well known nor used. There is therefore a glaring need to understand the fundamentals of quality determinants in this domain to be able to provide useful insights for improvement. A recent study has indicated that Jamaican developers are unaware of SPI approaches and consequently the potential impact and role of process and people on IS quality. We have also included the perception of quality as a probable determinant of the success of even high quality IS. In this research in progress, we have developed and proposed a research model and propositions to explore the impact of process, people and perception on IS quality and success. We hope to use it in Caribbean studies to provide much needed insights.

Keywords

Information systems quality, information systems success, software process improvement, software development methodology, user perception

INTRODUCTION

The information systems (IS) community has failed to effectively exploit the major and celebrated strides that the information technology (IT) sector has made over the past several years. This has been reflected in the abandonment of several information systems projects and the perception that many of those that have been completed are of poor quality and do not always satisfy the needs of many business organizations or contain the characteristics to increase operational effectiveness and competitive positioning (Bollou and Ngwenyama, 2008; Kamel, Rateb and El-Tawil, 2009; Pino, Pardo, Garcia and Piattini, 2010). The view is that many low quality systems have been developed and delivered (Duggan and Reichgelt, 2006) and perhaps more telling that the software development community is plagued with IS project failures (Standish Group, 2009)

While this notion pervades all IS development efforts, many organizations have relied increasingly on commercial off-the-shelf (COTS) applications. This is even more visible in smaller countries such as Jamaica where Chevers and Duggan, (2010) recently identified a software development crisis in local firms and a glaring lack of awareness of interventions, such as software process improvement techniques to assist with this problem. This has contributed to several developmental problems in Jamaica and the rest of the English-speaking Caribbean. These problems include but are not limited to the inability to provide IT-enabled solutions to pressing national priorities; and to helping to build resilience to economic, social, and environmental vulnerabilities, or merely assisting to conserve and earn scare foreign exchange.

In an attempt to find a solution toward the delivery of higher quality and more successfully deployed systems, several interventions have been attempted, and many studies have been conducted that have provided important insights. The software process improvement interventions and studies, which, arguably, has been the most extensive, have pointed to the notion that process, people, and technology may be the most important determinants of IS quality (Duggan and Gibson, 2006; SEI, 2006). However, Chevers and Duggan (2010) found that a large majority of Jamaican software development firms are neither aware of nor are using any form of process improvement initiatives in the delivery of their software.

There is a large body of literature on IS quality and factors such as objective and measurable properties of quality such as functionality, maintainability, reliability and usability that process improvement programs can provide (SEI, 2006); however, there is the subjective element of quality which is influenced by perception (Davis, 1989). It is posited that many otherwise technically sound information systems have been discarded in the garbage heap of failed systems, because they are not perceived to be useful or easy to use (Duggan, 2004). Hence we believe that there is merit in studying the impacts of process and people on the objective dimensions quality of information systems and on the perception of users and then to evaluate the effects of both these objective and subjective elements on the success of the system.

The setting for the intended research is the English-speaking Caribbean. Our motivation stems from the fact that there is relatively little research in this area in the English-speaking Caribbean (ESC) and in particular Jamaica (Chevers and Duggan, 2007), which may well be a trend setter in this region. Against this background, we have developed a research model with ten propositions to study IS development and determine the extent of the contributions of process, people and perception on the quality and success of IS in Jamaica. The model may be used eventually to support similar research efforts in individual countries or the English-speaking Caribbean region as a whole.

The rest of the paper is organized as follows: in the following section we present a brief review of the information systems literature regarding process improvement practices, people and perception, quality and success. We then discussed the research model and our research method; and finally, offer our conclusions and proposals for future research.

LITERATURE REVIEW

Customers are demanding the delivery of high quality information systems with the requisite attributes like reliability, usability and functionality. The IS community is forced to respond to these requests but it is struggling. Many delivered systems do not possess the necessary features and functionality to solve business problems and add operational value (Beale, 1996; Staples, Niazi, Jeffery and Abrahams, 2007). On the hand, some high-quality systems with the requisite features and functionalities to solve operational problems are not being used because they are not perceived as being easy to use and useful (Duggan, 2004). From as early as the 1980's there was reference to an "IS Crisis" in which it was said that IS development is fraught with recurrent problems of poor and incomplete practice (Gladden, 1982). The Standish Group (2009) reports that only 32% of IS projects are considered successful. To develop systems with the required quality attributes, have them being used and be regarded as adding business value is considered very difficult (Borovits, Ellis and Yeheskel, 1990). As a result, detailed and thorough planning and execution is required during system development to increase the probability of producing high quality and successful systems. High quality software is a "system that reliably produces required features (with a high probability of correct response) and that is relatively easy to access and use. It should provide consistently good response times, and be delivered on time so that it retains business relevance beyond deployment" (Duggan, 2003, p. 3). In other words, successful information systems are those that accomplish their intended objectives and are used regularly (DeLone and McLean, 1992).

Research has shown also, that people, technology and process are the major determinants in the delivery of systems that are both high-quality and successful (Duggan and Gibson, 2006; Krishnan and Kellner, 1999; SEI, 2006). The three factors have promoted the introduction of various approaches to software development namely, agile software development, technology-driven approaches and plan-driven approaches respectively. Supporters of the agile approach advocate for a high degree of collaboration between developers and users in the development/delivery process; while exponents of the technology-driven approach feel that the introduction and application of the latest technology has the greatest influence. Finally, proponents of the plan-driven view feel that process is the glue that holds the people-technology-process triad (CIO magazine, 2001; Highsmith and Cockburn, 2001; Kendall, Kendall and Kong, 2006; SEI, 2006). In this study, we scoped out technology because it is felt by some scholars that technology is the least influential of the three factors (Kirsch, 2004; Ravichandran and Rai, 2000).

In response to the plan-driven approach (process view) several software development methodologies and process improvement models have been introduced to overcome the “IS crisis”. These include software development methodologies (SDM) like the waterfall method, prototyping, component-based development, object-oriented development and rapid application development (RAD). Additionally, various software process improvement (SPI) models like the capability maturity model integration (CMMI), team software process (TSP), Bootstrap and software process improvement capability determination (SPICE) have been introduced to overcome the challenges. Throughout the rest of the paper the term process improvement practices (PIP) will be used to include both SDM and SPI models.

Process Improvement Practices (PIP)

The PIP models make several prescriptions to guide software development firms to increase their maturity. Maturity is defined as the degree, to which a process is defined, managed, measured, and continually improved (Dooley et al., 2001). The goal is for firms to improve their maturity level with the hope of producing higher-quality and successful systems (Krishnan and Kellner, 1999), which by extension can increase the possibility of winning global contracts (Duggan and Reichgelt, 2006). In support of the process view, Ravichandran and Rai (2000, p. 386) posited that “the challenges facing IS development are more organizational rather than technical in nature”

Further, most of these process improvement practices have been tried and tested in developed countries on large IS projects, but very little done in small organizations. The adoption of many IS programs in developing countries is limited due to many constraints (Berisso and Vries, 2010; Pino et al., 2010). In this study, we adopted the European Commission (2003) definition of small firms and classified most software development firms in Jamaica as being small. Small firms are classified as having less than fifty employees, with annual turnover of EC\$10 million or balance sheet of EC\$10 million. In addition, we adopted Kasunic (2006) definition of software development firms as an organization that develops, maintains, or acquires software.

It is for these reasons that we have included process improvement practices as determinants of IS quality. Hence, the following proposition:

P1: Process improvement practice is positively related to IS quality

People

The IS development team consists of many key players (Kendall et al., 2006). These include top management, project sponsors, project managers, developers (analysts, programmers and technicians) and end-users. We adopted the agile view to software development in which a high premium is placed on the collaboration between developers and end-users (Highsmith and Cockburn, 2001). In terms of the role of developer knowledge and end-users’ commitment in software development, Abrahamsson (2002) stated that, “people are the most fundamental element in any people-intensive activity such as software development” (p. 99). Developer knowledge is required to translate and transfer the business needs as articulated by the end-users into software functionalities to achieve those ends. Likewise, end-users are not only needed to articulate business needs but to use the delivered systems in an effort to realize the intended benefits (Kouki, Poulin and Pellerin, 2010). Shim, Sheu, Chen, Jiang and Klein (2010) found that close collaboration between developers and users in software development can increase the effectiveness of meeting the specified project goal. Hence, a partnership is necessary between developers and end-users for system quality and successful implementation and use.

As a result, we propose breaking down the people construct into developer knowledge and end-user involvement. Our resulting propositions are:

P2: Developer knowledge is positively related to IS quality

P5: End-user involvement is positively related to IS quality

Perception

There is no guarantee that high-quality systems will be successful. High quality is a necessary but not sufficient condition for IS success (Rae, Robert and Hausen, 1995). In fact it has been shown that many technically sound information systems have been discarded in the garbage heap of failed systems (Duggan, 2004). On the other hand, some poor quality systems have been adopted and used by users because they are perceived as adding business value (useful) and user-friendly (easy-to-use). Perceived ease of use (PEU) is defined as the degree to which a person believes that using a particular system would be free

of effort, which perceived usefulness (PU) is defined as the degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989, p. 320). In their study, Elbeltagi, McBride and Hardaker (2005) found that perceived usefulness and perceived ease of use are major determinants of IS success. It is for these reasons that we proposed the following propositions:

- P3:** Developer knowledge is positively related to perceived ease of use
- P4:** Developer knowledge is positively related to perceived usefulness
- P6:** End-user involvement is positively related to perceived ease of use
- P7:** End-user involvement is positively related to perceived usefulness
- P9:** Perceived ease of use is positively related to IS success
- P10:** Perceived usefulness is positively related to IS success

IS Quality

It is felt in the IS community that IS quality can have a positive impact on IS success (Duggan and Reichgelt, 2006). DeLone and McLean (1992) classify IS quality as system quality and information quality. These two broad classifications of quality are seen from the perspective of the developer and the end-user respectively. System quality focuses on the desired characteristics of the information system such as reliability, completeness, flexibility and timeliness. On the other hand, information quality focuses on the quality of the information system output such as relevance, accuracy, precision, currency and format (DeLone and McLean, 1989, p. 64).

We adopted this definition of IS quality because it takes into consideration the internal and external view of IS quality; an approach that Wong (2006) considers to be a comprehensive view of IS quality. In addition, the system quality and information quality approach is in alignment with our intended research and our desire to use developer-user matched-pair sampling in our survey. Hence the IS quality construct in our survey will have questions relating to system quality and information quality (Hussein, Karim, Mohamed and Ahlan, 2007; Wixom and Todd, 2005).

Our resulting proposition is:

- P8:** IS quality is positively related to IS success

IS Success

IS success is defined as the delivery of software with the requisite functionalities to solve business problems, provide business value, and which is adopted and utilized by key personnel in the organization (DeLone and McLean, 1992; Duggan and Reichgelt, 2006). Based on this definition it is important that the delivered systems have the necessary quality attributes, is adopted and used. Empirical studies have found that IS quality is a major determinant of IS success. IS quality has been shown to explain 0.43 – 0.61 of the variance in IS success (Almutairi and Subramanian, 2005; Livari, 2005; McGill and Hobbs, 2003). As a result, we expect to find a significant correlation between IS quality and IS success.

The Research Model

Duggan and Reichgelt (2006) research model was adapted with minor modifications to be used in our study. Their research model included people, process, practices, IS quality, perception and IS success, with IS success being the dependent variable. We considered IS success “a good predictive measure” as our dependent variable, because many high-quality systems are not used (Newman and Robey, 1992). These variables are in alignment with our research concerns because we intend to explore the impact of process, people and perception on IS quality and ultimately IS success. Two minor adjustments were made with their research model. These included the merger of process and practices into process improvement practices (PIP) because we felt that most process improvement models like the CMMI, SPICE and Bootstrap have established practices that firms should adhere to in their quest to increase the maturity of their process. We also broke down the people variable into developer knowledge and end-user involvement because we wanted to assess quality from the perspectives of the developers as well as the end-users.

Based on these thoughts and modifications our resulting research model is shown in Figure 1, as we seek to examine the impact of developer knowledge, end-user involvement, process improvement practices and perception on IS quality and IS success in Jamaican software development firms. We intend to provide somewhat of a richer insight than previous studies, by breaking down some of the variables (like people into developer and end-user, and IS quality from the perspective of the

developer and end-user. We hope to contribute to both research and practice in this domain in small business enterprises. It is hoped that we can offer our research model to other IS researchers and perhaps advise managers on the appropriate mix of variables to achieve high quality and successful systems.

Based on the arguments presented earlier, ten propositions are proposed. These are:

- P1:** Process improvement practice is positively related to IS quality
- P2:** Developer knowledge is positively related to IS quality
- P3:** Developer knowledge is positively related to perceived ease of use
- P4:** Developer knowledge is positively related to perceived usefulness
- P5:** End-user involvement is positively related to IS quality
- P6:** End-user involvement is positively related to perceived ease of use
- P7:** End-user involvement is positively related to perceived usefulness
- P8:** IS quality is positively related to IS success
- P9:** Perceived ease of use is positively related to IS success
- P10:** Perceived usefulness is positively related to IS success

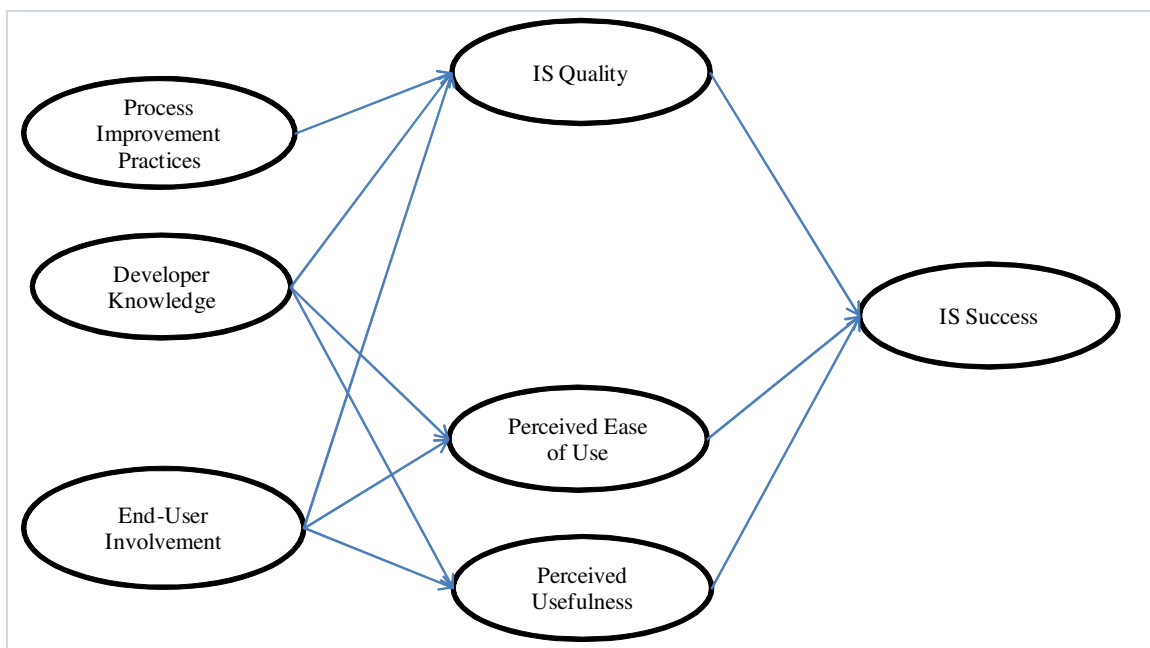


Figure 1. The Research Model

METHODOLOGY

Matched-pair sampling approach (Ko, Kirsch and King, 2005) will be used because we intend to seek responses from both developers and end-users of the same IS project in the targeted organizations. Based on this approach (matched-pair) we feel that the survey method might be more appropriate (Babbie, 2004). In an attempt to improve the validity of our survey instrument we plan to conduct pre-testing of the instrument with graduate students at the University of the West Indies who are pursuing their masters in information systems. Our sample frame is software development firms in Jamaica (firms that develop software for internal and external use), which is approximately sixty in total. The proposed unit of analysis is IS project and we are prepared to conduct the survey on more than one IS project in the same organization. The objective of this approach is an attempt to increase the number of responses, more so because we seek responses from both developers and end-users of the same project (matched-pair sampling).

This will be a quantitative study in which a five-point Likert-type scale will be used. The questionnaire will be designed to capture relevant data from developers and end-users about the knowledge of developers, involvement of end-users, process practices, perception and quality of the delivered system as well as the success of the system.

Based on the fact that there are not many software development firms in Jamaica, coupled with the match-pair sampling approach that we propose to employ, we believe that our sample size might be small. As a result, we are proposing to use PLS to do the data analysis because PLS is best suited to deal with small sample sizes (Chin, 1998).

CONCLUSION

It is important to deliver high-quality and successful systems in both developed and developing countries. Several research efforts have been undertaken in the developed world; very little in the Caribbean. We believe that the insights gleaned from our proposed quantitative study can provide the basis for further qualitative studies to obtain richer insights beyond what the numbers are likely to tell us. The results will go a long way towards assisting firms in this area to create indigenous IS that specifically target the peculiar problems they have and to reduce the perpetual risk of low quality and failed systems. This is relevant, particularly because countries in this region have less capacity to absorb failed systems and to recover from wasted expenditures. We believe also that the research model may be used generally with or without modification, and we offer it to the community of researchers in this area. .

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