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Determinants of Information System Success in Public Sector Organizations: With Special Reference to Organizations Located in the Matara District of Sri Lanka

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Abstract

Public sector organizations in Sri Lanka have started implementation of ICT based solutions rapidly along with the recent e-government initiatives. Despite the increase in the number of beneficiaries of such systems, their success and productivity remain unsatisfactory and has been subjected to severe criticism. However, due to lack of literature, the reasons behind the poor performance of Information Systems are largely unknown particularly in the context of public sector organizations in Sri Lanka. Therefore, this study investigated the effect of *system quality, user quality and service quality* on the Information system success based on the data collected during 2013 on 32 public sector organizations located in Matara District through a questionnaire survey supplemented by interviews. The findings suggest that, issues associated with the *system quality, service quality* and lack of a clear and centrally planned mechanism for implementing information systems have seriously diluted the potential benefits associated with information system success. These findings emphasize the necessity of focusing on a central ICT policy and implementation of consistent and interoperable solutions rather than ad hoc locally developed solutions for improving the information system success at public sector organizations. Provision of necessary infrastructure, support services and qualified staff are also essential in ensuring the successful implementation of information systems in the public sector.

Keywords: *DeLone and McLean model; information systems; public sector organizations; Sri Lanka*

1. Introduction

With the emergence of computer and internet, people are increasingly using computerized information systems to facilitate various activities ranging from agriculture to space exploration. Moreover, with the development of modern communication technologies organizations have interconnected with other service providers to overcome the bottlenecks associated with traditional isolated systems. This has enabled them to better satisfy their clients through providing a better service at a relatively lower cost.

An information system (IS) can be viewed as a set of interrelated components that collect, process, store, and distribute information to support decision making, coordination and control in an organization (Laudon & Laudon, 2012). ISs, in general, accelerate routine tasks while increasing accuracy. Importantly, ISs facilitate and accelerate the decision making process and thereby create dynamic effects on the future developments. Therefore, successful implementation of IS is crucial.

There is a clearly identifiable difference in the ISs being implemented in public sector compared to

those in private organizations particularly in developing countries (Rosacker & Olson, 2008). More precisely, due to many reasons, the status of IS implementation in public sector organizations is still lagging behind. Further, existing ISs in public sector organizations are largely concerned with financial management and auditing (Newcomer & Caudle, 1991). In contrast, private sector organizations make huge investments on Information and Communication Technology (ICT) and implement advanced ISs not only to handle financial management but also to process various other types of information. Therefore, their service quality and level of customer satisfaction are perceived to be higher relative to those of public sector organizations (Punchihewa, 2004). This implies that public sector needs to focus more on ICT-based solutions to upgrade their service quality (Tarabanis, Peristeras, & Fragidis, 2001).

Nevertheless, public sector organizations in many developing countries have recently adopted innovative ICT based solutions to enhance the quality of their services. For example, public sector organizations in Sri Lanka have introduced a number of ICT based solutions during the last few years under the e-government initiatives. This has enabled the Sri Lankan Government to provide handful of services through electronic media. However, despite the huge investments, the quality of those services is still questionable and the popularity of those services among the clients remains unsatisfactory.

Sri Lanka is historically having a highly literate population. Computer literacy of the population has also been rapidly increased during recent decades. For example, computer literacy among the employed population has been 40 percent as of 2009 (DCS, 2009). Given these circumstances, it is quite puzzling why the outcomes of recently implemented ICT solutions are not up to the expectations. Concurrently, a comprehensive study on this issue could not be found in the Sri Lankan context relating to public sector organizations. As a result, the drawbacks associated with those systems and the reasons behind their lower effectiveness remains unclear.

Therefore, this study investigates the effect of three key IS specific factors on the success of ISs in public sector organizations in Sri Lanka based on a survey conducted using 200 respondents from public organizations located in the Matara district. The study draws heavily on Delone and McLean (2003) model due mainly to its popularity in evaluating IS success. However, several modifications were made as discussed in section three to improve the fitness of the model to the Sri Lankan context.

This paper consists of five sections including this introductory section. Section two explores the literature. Section three discusses the methodology whereas section four discusses the results and findings. Finally, section five concludes the paper with a discussion on implications.

2. Related Literature

Along with the rapid developments in ICT, many organizations implemented ISs to aid their decision making processes and to provide a better service to their clients. Developing countries as well have witnessed rapid developments in the field of ICT in recent decades (Gunatunge & Karunanayake, 2004). For example, innovative business models like mobile computing, social networks, and interactive web technology have emerged recently (Rosacker & Olson, 2008). Concurrently, business organizations in Sri Lanka also have started implementing ISs particularly since early 1990s. However, it is often argued that the implementation of ISs in public sector organizations in Sri Lanka so far was relatively lower (Gunatunge & Karunanayake, 2004).

Success of an IS is often viewed in relation to its return on investment (Dehning & Richardson, 2002). Some authors view IS success in terms of user satisfaction (Ives, Olson, & Baroudi, 1983; Seddon & Kiew, 2007; Zviran & Erlich, 2003). For example, Seddon and Kiew (2007) argued that IS success should be measured according to the goals and the determinents of success are dependent on the context. Further, Satu-Maria and Maiju (n.d.), stated that, IS success is dependent on its stakeholders. DeLone and McLean (1992) identified six major factors that affect IS success, namely, system quality, information quality, use, user satisfaction, individual impact, and organizational impact. They further emphasized the necessity of considering the effect of contingency variables and characteristics of the system in assessing IS success. For example, they identified organizational structure, size, and technology as key contingency variables. Davis (1993) identified

user acceptance as a strong determinant of IS success because of the importance of the feedback of IS users. On the other hand, (Petter, DeLone, & McLean, 2008) categorize the determinants of IS success as human, organizational and environmental factors while some researchers like Romi Ismail (2011) as investigated the impact of organizational culture on IS success. Li (1997) has identified 46 factors that affect IS success.

Therefore, it is evident that the literature is not straightforward concerning the factors that affect IS success and related indicators (Sabherwal, Jeyaraj, & Chowa, 2006; Seddon, Staples, Patnayakuni, & Bowtell, 1999; Sedera & Gable, 2004).Therefore, further research needs to be carried out to assess the success of IS and investigate its determinants in a given context (Petter et al., 2008)

3. Methodology

This study aims to identify the determinants of IS success in public sector organizations in Sri Lanka. The literature has used different models to identify the determinants of IS success. For example, (DeLone & McLean, 1992) introduced an IS success model, as illustrated in figure 1, by incorporating most commonly identified four IS success factors after reviewing around 180 previous studies. The four dimensions were *system quality, information quality, use, and user satisfaction*. More precisely, they have identified the impact of those factors on the organization through the impact on individuals. This classification and the formation of a temporal and casual model for IS success remain as crucial contributions (Seddon, 1997). As a result, their model has been used by numerous researchers (Delone & Mclean, 2004; Iivari, 2005; McGill, Hobbs, & Klobas, 2003; Petter & McLean, 2009; Wei, Loong, Leong, & Ooi, 2009).

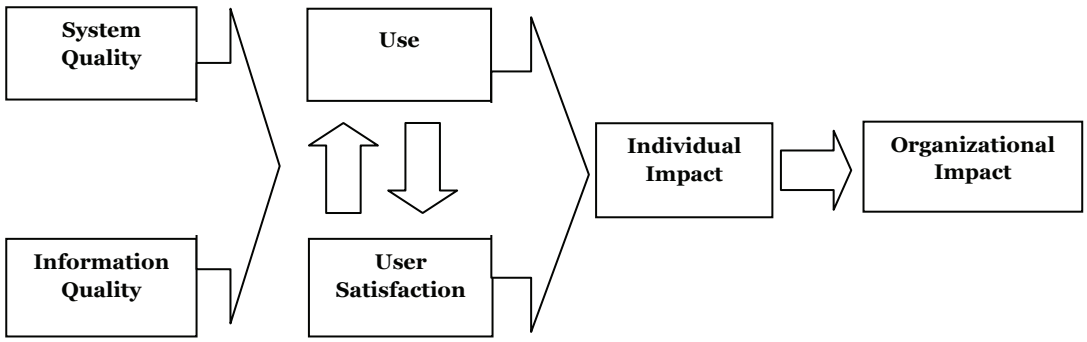

Figure 1: DeLone and McLean (1992) IS Success Model

A number of different alternatives have also been proposed to the DeLone and McLean (1992) model. For example, Seddon and Kiew (2007) have replaced the *Use* with *Usefulness* and have added *User Involvement* as a new dimension. Subsequently, DeLone and McLean (1992) revised their initial model, as illustrated in figure 2, by adding *Service Quality* and *Intension to use* as new dimensions. Further, they have combined *Individual Impact* and *Organizational Impact* and named it as *Net Benefit*. Here, *Intension to use* has been considered as an attitude whereas the *use* as a behavior.

This study employs a modified version of Delone and McLean (2003) models since its validity as a model for assessing IS success have been demonstrated by a number of researchers through extensive deal of empirical investigations. The model used in this study is illustrated in figure 3 in which *user quality* has been added as a new dimension. This dimension remains particularly important in the context of public sector organizations in Sri Lanka because the *user quality* in terms of their readiness for ICT based solutions seems to be still developing. Even though the computer literacy of the country has increased dramatically in the recent past, the computer literacy among the senior employees of the public sectors seems to be poor. Moreover, *net benefit* was renamed as *IS success* in the proposed model.

Further, *information quality* and *system quality* were combined as termed as *system quality* because they are substantially interdependent where separate measurements can be confusing. Most of the previous

studies have used a qualitative approach for the analysis whereas this study supplements such analysis with a regression model. Therefore, to facilitate the regression analysis three intermediary outcomes, namely, intention to use, use and user satisfaction, were eliminated. In fact, the user satisfaction is included in the variable termed as IS success in the proposed model because IS success accounts for individual impact as well.

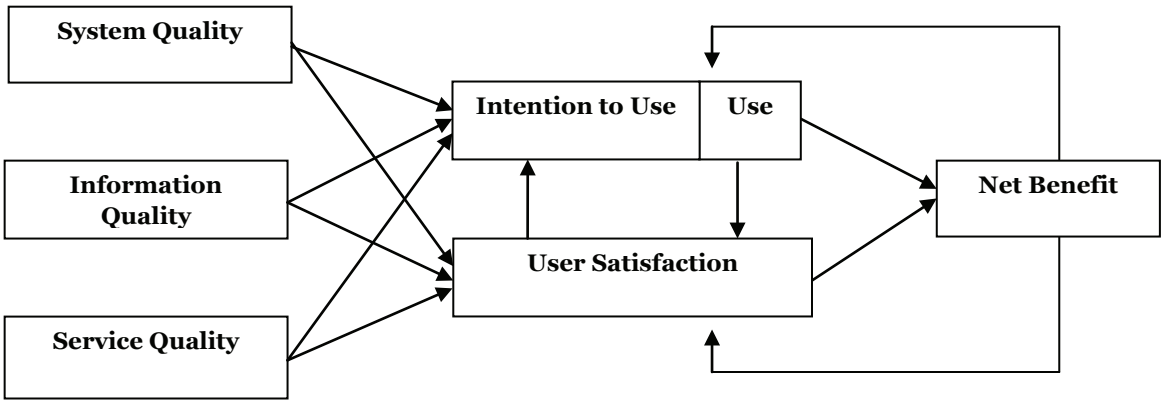

Figure 2: Delone and McLean (2003) IS Success Model

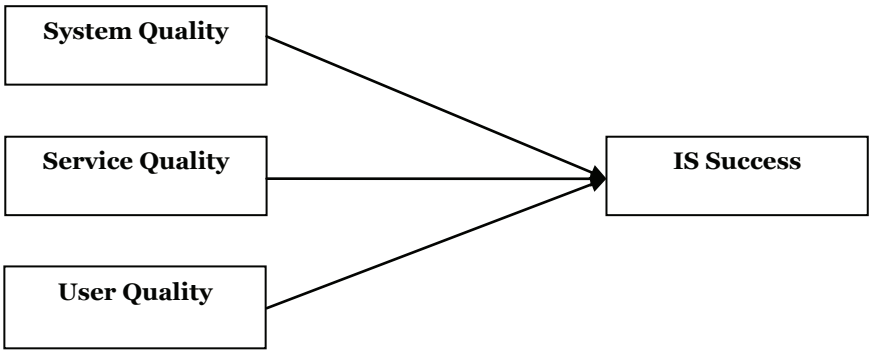

Figure 3: Proposed IS Success Model

After the modifications, the proposed model contains three factors contributing to IS success. In the proposed model, *system quality* refers to the easiness of the system for the potential user. For example, when the appropriateness of contents, accuracy and timeliness of the information, user friendliness, and easiness of the IS increase the *system quality* is increased. This may vary within the same IS as well depending on the particular level of the employee and/or the type of the user. *service quality* refers to the different services available under the IS. For example, availability of supportive staff, help desks, documentations, and trainings etc. increase the *service quality*. Finally, *user quality* refers to the users' readiness for using the IS. For example, *intention to use* the IS, level of education, computer literacy, and English language fluency tend to increase the *user quality*.

In the proposed model, IS Success, synonymous to *net benefit* in Delone and McLean (2003) model, refers to the degree of contribution of the IS towards the success of the organization and satisfaction of the employees. Improvements in internal operations, quality and diversity of the services, customer satisfaction, user satisfaction, and overall productivity are used mainly in assessing the IS success.

The required data for assessing each of these components was collected based on a questionnaire survey distributed to 200 individuals selected from 32 public sector organizations in the Matara district of Sri Lanka. A pilot survey was also conducted prior to the actual survey to fine-tune the questionnaire. Public sec-

tor organizations located in Matara District were selected purposively for the study whereas the respondents were selected using stratified random sampling technique. Matara district is a representative cluster among other districts that are in the process of implementing ICT solutions. Individuals selected for the sample are either employees who use the IS regularly in performing their duties or non-employees (clients) who use the IS as end users. As far as the employees are concerned, different levels of IS users like operational level, middle level and top level were selected to make the sample more representative of the real population.

The questionnaire consists of 30 questions formulated around four dimensions indicated in figure 3. The sample covers regional centers of the central government, the Southern provincial council and local governments located in the selected area. The questionnaire was translated into native language, Sinhala, to increase the response rate and reliability of the responses.

4. Results and Findings

The analysis of this study was performed in two stages. In the first stage, along with the data collection through the questionnaire, a number of key informants from public sector organizations were interviewed. Information gathered during the interviews revealed that majority of top level managers/administrators were highly concerned with improving the standard of IS and with motivating their subordinates to effectively engage with IS. Some of the drawbacks and issues associated with existing IS could also be explored during the interviews.

For example, majority of the public sector organizations in Matara district are using IS mainly for financial management activities. Most of the organizations were using the same IS for financial management activities. This is because, these ready-made ISs have been mainly provided by the Central or Provincial Governments. For example, SIGAS accounting package can be identified as one of such centrally implemented IS. In contrast, ISs focused on other activities have been mainly developed locally by the employees of respective organizations and showed a substantial diversity among organizations. Importantly, some systems have been developed by employees voluntarily. Concurrently, many organizations use general spreadsheet management applications (i.e. MS Excel etc.) for their routine activities. These systems heavily depend on the particular employees who developed the system. Moreover, interoperability of these isolated systems developed locally is unsatisfactory. Hence the sustainability of such system is questionable. Therefore, the employees are in the view that consistent ISs should be developed and implemented by the central government or provincial governments. However, such mechanism has not been well-established yet. As a result, the organizations that do not have qualified staff to develop IS, in general, cannot implement ISs. Especially, it was revealed the difficulty of attracting and retaining such qualified staff due mainly to lower salaries in the public sector. Moreover, recently recruited graduates with high literacy of software development and usage have not been used effectively to implement a long term ICT plan.

Further, it was observed that a proper mechanism to motivate employees is not available at present. Lack of required infrastructure and facilities to effectively implement ISs can also be identified as a serious issue related to IS success in public sector organizations. Importantly, most of the IS users were not satisfied with the degree of support provided by the relevant parties with respect to issues associated with IS implementation. This was severe in relation to the systems developed outside the organizations. Hence the necessity of a local technical team was emphasized by a number of interviewees. Concurrently, most of the employees had a negative attitude towards IS due mainly to lack of compatibility of IS with their daily activities, necessity to maintain manually system as well in parallel to the IS.

To further investigate the factors that affect the IS success, a regression analysis were performed based on the data gathered using the questionnaire. Response rate remained at 58 percent, i.e. 117, duly completed responses were received. Table 1 illustrates composition of the respondents. For example, 44 percent of the respondents were male. Moreover, 51 percent of the respondents were operational level employees whereas 21 percent are non-employees. These non-employees represent the clients of respective organizations. Out of 30 questions, six questions on IT knowledge were combined to form one composite figure. Similarly, two

questions focusing on English language were also combined. Therefore, final number of items focused on the four dimensions dropped to 24.

Table 1: Composition of the sample

	Employees			Non-employees	Total	Percentage (%)
	Operational Level	Middle Level	Top Level			
Male	22	13	7	9	51	44%
Female	38	8	5	15	66	56%
Total	60	21	12	24	117	100%
Percentage (%)	51%	18%	10%	21%	100%	

Cronbach's alphas suggested that the reliability of the questionnaire used in the study is satisfactory. Kaiser-Meyer Olkin measure of sampling adequacy (KMO=.779) and Bartlett's Test of Sphericity (p<.001) suggested that the sample is factorable. Therefore, the data gathered from 117 respondents were analyzed using a factor analysis with a Varimax rotation of 24Likert scale questions. The extraction was made based on four fixed factors because the extraction based on Eigenvalue did not yield satisfactory results.

Nine questions were loaded into the dependent variable, *IS success* (ISS), while six, five and four questions were loaded into *system quality* (SysQ), *service quality* (ServQ), and *user quality* (UsrQ) respectively. In the second stage, ISS was regressed on SysQ, ServQ, UsrQ using the following OLS regression model. Regression model was statistically significant where the selected variables account for 15.6 percent of the variation in IS success (R^2=.156, $F(3,117)=6.978$, $p<.001$).

$$ISS_i=\alpha+\beta_1 SysQ_i+ \beta_2 ServQ_i+ \beta_3 UsrQ_i+\varepsilon_i$$

The regression results indicate that only the *service quality* has a statistically significant impact on the IS success. In other words, lack of proper support systems and documentations, infrequent upgrades, lack of training for users and lack of required infrastructure etc. have affected negatively on *IS success* in terms of its contribution to the organization and individuals. Effect of *system quality* and *user quality* was not statistically significant. This, in general, implies that these two factors do not act as bottlenecks in gaining the potential benefits associated with IS in the selected context. Therefore, as per the regression results, the quality of the systems adopted and the level of competency of the people is less questionable compared to the extent of support services available for IS users.

Table 2: Regression results

Variable	Description	B	Std. Error	*p* -value
α	Constant	3.052	0.377	0.000
SysQ	System Quality	0.066	0.097	0.500
ServQ	Service Quality	0.230 *	0.070	0.001
UserQ	User Quality	-0.012	0.079	0.882

Notes: R^2 =.156. * p <.001

The findings derived based on the regression analysis are highly consistent with the observations made during the interviews even though *system quality* and *user quality* was not statistically significant. According to the observations made during the interview it was seen that most of the employees tended to view these two issues are also results of the poor service provide to them. This can be the main reason behind lack of statistical significance for those two variables.

5. Conclusions

Public sector organizations are rapidly implementing ICT based solutions along with the recent e-government initiatives. As a result, the number of citizens served based on ISs is increasing rapidly. However, it is often argued that the degree of IS success, in terms their productivity, in public sector organizations is unsatisfactory. Nevertheless, due to lack of studies particularly in the context of public sector organizations in Sri Lanka, the causes behind unsatisfactory performance were largely unknown. Therefore, this study investigated the determinants of IS success in public sector organizations located in the Matara District mainly using a questionnaire survey. More precisely, the effects of *system quality, user quality* and *service quality* on the IS success were investigated using a regression model based on the data collected though the questionnaire along with required qualitative discussions based on the information gathered through the interviews.

The findings suggest that, even though the literacy of the Sri Lankan public sector employees is substantially higher, the degree of IS success is not satisfactory due mainly to issues associated with *system quality* and *service quality*. Importantly, strong evidence is available to suggest that the degree of services and infrastructure provided in connection with IS implementation are inadequate in the public sector. Lack of clear mechanisms for developing and implementing ISs has also acted as a bottleneck in achieving potential benefits of IS. For example, the interoperability of the systems has been seriously compromised due to implementation of inconsistent and locally developed IS at different public sector organizations.

Therefore, attempts aimed at improving the IS success at public sector organizations need to focus on developing a central ICT policy and adopting consistent and interoperable solutions rather than ad hoc locally developed solutions. In the meantime, establishment of necessary service facilities like technical training, infrastructure, continuous support through help desks and technical staff etc. are essential in ensuring the successful implementation of IS in the public sector.

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