

User Satisfaction Factors of ERP Systems: The Case of a Manufacturing Company in Sri Lanka

Dushyantha Kulathunga^{1*} Malin Krishantha Fernando¹

1.Department of Information Technology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

2.Faculty of Graduate Studies, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

Abstract

The purpose of this study was to examine the factors influencing the user satisfaction of ERP systems. A research model was developed based on prior literature and six hypotheses were proposed. For data collection purpose, a questionnaire was developed by adopting questionnaire items from previous and established literature. Study focused on Alpha company as the case company of this study. The questionnaires were distributed and data were collected from all 45 employees who were using the ERP system. Multiple regression analysis revealed that information content, format, timeliness of the output are the critical success factors affecting the user satisfaction of the ERP system. The present research contributed to the theory by testing a new research model on user satisfaction. It further has implications for the managers by emphasizing the areas to be focused to increase user satisfaction, which would in turn lead to successful and effective use of the ERP system.

Keywords: ERP, User satisfaction, User adoption, Manufacturing sector, Sri Lanka

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1. Introduction

In order to amplify profits, organizations require attending to their business processes with superior agility and accuracy with the immediate availability of real time information at hand. Hence, a spike in the employment of information technology can be witnessed in today's business world. The intense requirement of information has made the businesses more dependent on information technology than ever (Kearens & Lederer, 2004).

Information systems are computer technology based inventions, created and used by societies, organizations and individuals (Allen, 2000). Information systems, as explained earlier, have induced strategic, structural and process change in business organizations (Mukherji, 2002). In the recent history of information systems development, a new product emerged as a sub-category, identified as "Enterprise Systems" (ES) (Longinidis & Gotzamani, 2009). ES, when introduced to companies, resulted in substantial improvements in operational performance and increased productivity, product optimization and growth of financial performance (Davenport, 1998; McAfee, 2002; Davenport *et al.*, 2004; Hendricks *et al.*, 2007). ERP systems emerged as a major ES in mid-1990's in order to respond to the increasingly competitive environment experienced by businesses. According to Davenport (1998), ERP offers "seamless integration of all the information flowing through a company – financial and accounting, supply chain, customer and human resources information etc." It also presents a holistic view of the business (Gable, 1998;). Usage of an ERP system is presently regarded as an entry fee to the business world. The main aims of an organization hosting an ERP system are to obtain accurate and real time information which increases the effectiveness of the organization and to reduce the expense of work and offers more business opportunities for companies. Today, separate ERP modules can be witnessed being launched for sales and marketing, human resources management, accounting and finance, production, supply chain management and logistic etc.

In order to reap the maximum benefit out of an expensive implementation, the management should be aware of the factors that affect the user satisfaction of the ERP system. According to Wu *et al.* (2002), measuring ERP impact directly from costs and benefits, productivity improvements, competitive advantage and impact on decision-making would be ideal but complicated in practical terms. In view of the complexities of using such measurements, user satisfaction has received widespread acceptance as a surrogate tool (Seddon & Kiew, 1994).

2. Research problem and objectives

User satisfaction of a technology is always associated with the successful use of that technology. User satisfaction generally leads to the acceptance or rejection of a technology or a system. Higher the user satisfaction, higher the probability of user acceptance. Therefore, in the context of ERP systems also, user satisfaction is critical since it enhances the acceptance of the system.

Even though there are many studies which have examined the adoption and implementation of ERP systems (Ağaoğlu, Yurtkoru, & Ekmekçi, 2015; Amoako-Gyampah, 2007; Dezdar, 2012; Haddara & Moen, 2017; Juniora, Oliveiraa, & Yanaze, 2019; Ram, Corkindale, & Wu, 2014), conducting research to examine the user satisfaction

¹ Malin Krishantha Fernando was a postgraduate student at the time of doing this research.

of ERP systems has been scarce. Further, it is very much apparent that the researchers who have examined user satisfaction have focused on varying factors indicating that there is rarely any agreement among the researchers on the specific set of factors influencing user satisfaction. For example, Alhirz & Sajeev, (2015) examined “perceived user involvement”; Aljabry (2015) examined “Ease of use” and “Benefits”; Calisira & Calisirb (2004) examined “Perceived usefulness” and “Learnability”; Costa, Ferreira, Bento, & Aparicio (2016) examined “System quality”; and Dezdar, and Ainin, (2011) examined “User training and education”. The most possible cause for the existence of such a list of varying factors may also be due to the dearth of research in this area. A closer examination of past research also reveals the existence of some conflicting findings. Dezdar, and Ainin found that there is a positive and significant relationship existing between “user training and education” and “user satisfaction”. However, Larsen (2009) could not establish a significant relationship between these two variables.

In the Sri Lankan context too, especially many large organizations have invested on ERP systems spending large amounts of money. However, there is little evidence related to the research focusing on user satisfaction of ERP systems. Therefore, the potential for examining the research area of user satisfaction is vast.

Alpha (the given name for the manufacturing company focused in this study) invested lot of money for a commercially available ERP system. Even though, several years have passed since its implementation, there seems to be user satisfaction related issues with their system, hindering the proper and effective use of it. Given the above background, the researchers formulated the following research question for this study: What are the factors affecting user satisfaction of the ERP system implemented in Alpha?

In order to find answers for the above research question, three objectives were formulated: 1) To identify the factors that affect the satisfaction of the users of the ERP system, 2) To assess the effect of the identified factors on user satisfaction, and 3) To propose recommendations for increasing user satisfaction.

3. A brief introduction to the Alpha Company

Alpha is in the business of manufacturing safety gloves and it is considered as a leading company in this sector. It produces a wide range of gloves ranging from sophisticated chemical resistant gloves to simple protective gloves. It is currently utilizing state-of-the-art manufacturing technologies. At present, more than 1,000 employees are working at Alpha and the company is operating round the clock. It has a customer base covering many countries and regions, including Europe, USA and South America

4. Theoretical background and hypotheses development

4.1 Enterprise Resource Planning (ERP) systems

An Enterprise Resource Planning (ERP) system is one key infrastructure used to manage enterprise wide information (Seethamraju, 2015). They are known to be facilitators of business processes and operations and supporters of management decision making at all levels (Spathis & Constantinides, 2004). An ERP system consists of a set of business modules used to carry frequent business functions such as stock control, logistics, accounting etc. (Kavanagh, 2001). Automating business processes, sharing common data across the organization but most importantly, producing real time data are the main objectives of employing an ERP system. By helping organizations to keep up to date with latest technologies and information, ERP systems accommodate businesses in highly competitive mechanized environments (Seethamraju, 2015).

Spathis & Constantinides’s (2004) survey results suggest that ERP systems are currently becoming a necessary tool for companies to remain competitive in this new business environment rather than constituting a new strategic move. Nonetheless, ERP systems also offer the opportunity for companies to re-engineer their activities and revamp both their information systems and practices.

4.2 Measurement of user satisfaction

Information systems are becoming essential for any type of organization today. However, the implementation of information systems is expensive. After implementation, organizations have to measure and see whether those information systems are functioning properly and effectively. End user satisfaction is a key evaluation measurement used in this task (Ives, Olson, & Baroudi, 1983).

Different researchers have attempted measuring user satisfaction in different ways. Certain authors considered it as a single construct (Doll, Xia, & Torkzadeh, 1994). For example, Bailey & Pearson (1983) developed and tested a questionnaire containing 39 “factors” to measure user satisfaction. This type of a measurement indicates that user satisfaction is a first-order construct. Ives *et al.* (1983) further tested the reliability and validity of the questionnaire developed by Bailey & Pearson and indicated that six items should be dropped due to validity issues.

Some researchers identified that user satisfaction is not a first-order construct, but a second-order construct consisting of several first-order constructs. For example, Doll & Torkzadeh (1988) identified that user satisfaction is a second-order construct consisting of five first-order constructs: Content, Accuracy, Format, Ease of use, and Timeliness. Doll *et al.* (1994) further validated this questionnaire developed by Doll & Torkzadeh and confirmed

that this questionnaire can be used for measuring user satisfaction.

When examining the past literature, it is evident that the most used user satisfaction measurement is the one developed by Doll et al. (1994). Consequently, the present study too used the same measurement in general. However, the researchers of the present study extended this model by adding a new construct identified as “User IT background” considering the importance of it in today’s context. This new construct is a sum of several interrelated components/factors such as prior experience in IT (information technology); training received in using software, and self-efficacy on IT usage. These interrelated factors have been examined separately and also collectively, and prior researchers have identified that they have a significant effect on user satisfaction (Yaverbaum & Nosek, 1992; Shanab, Nor, Pearson & Crosby, 2013).

4.3 Development of hypotheses

Bailey & Pearson (1983) identified that factors such as users’ understanding of the system and degree of training received by users have a positive effect on user satisfaction. Ives et al. (1983) confirmed that factors such as user confidence in information systems, training provided to users, users’ understanding of the system, and technical competence of users positively contribute to user satisfaction. A study done by Yaverbaum & Nosek (1992) using MBA students revealed that education and training received by users have a positive and significant effect on user satisfaction. Shanab (2013) who examined knowledge workers found that self-efficacy significantly affects the user satisfaction. Accordingly, we hypothesize the following:

H₁: There is a positive effect of User IT Background on End User Satisfaction

Doll et al. (1994) proposed that information content has a positive effect on user satisfaction. DeLone & McLean (1992) who performed a comprehensive literature review found that information quality (which closely resembles information content construct of the present study) positively affect user satisfaction. In their study, Petter, DeLone, & McLean (2008) also found a strong relationship between information quality and user satisfaction. Shanab, Nor, Pearson & Crosby (2013) who examined users of a computerized student information system (SIS) in a university found that information quality has a positive and significant effect on user satisfaction. Rai, Sandra, Lang, & Welker (2002) have also confirmed this relationship. Consequently, the researchers hypothesize the following:

H₂: There is a positive effect of Information Content on End User Satisfaction

Bailey and Pearson (1983) proposed that the correctness of the output and security of data are positively related with user satisfaction. Ives et al. (1983) found that accuracy of the output and precision of the output are positively related with user satisfaction. Doll et al. (1994) also confirmed that accuracy of the output has a significant effect on user satisfaction. Hence, we hypothesize the following:

H₃: There is a positive effect of Accuracy of the System on End User Satisfaction

Bailey and Pearson (1983) indicated that means of the output (by which a user receives the output) and format of the output positively affect user satisfaction. Ives et al. (1983) found that means of the output is positively related with user satisfaction. In their study, Doll et al. (1994) also confirmed that format of the system has a positive and significant effect on user satisfaction. Accordingly, we hypothesize the following:

H₄: There is a positive effect of Format of the Output on End User Satisfaction

In their studies Bailey and Pearson (1983) and Ives et al. (1983) indicated that convenience of accessing the system has a positive effect on user satisfaction. Rai et al. (2002) who examined university students using a computer-based information system confirmed that ease of use has a positive and significant effect on user satisfaction. In a study done on mobile phone users in Malaysia, Amin, Rezaei, & Abolghasemi (2014) established a significant relationship between perceived ease of use and user satisfaction. Costa, Ferreira, Bento, & Aparicio (2016) who examined ERP users found that system quality (which closely resembles ease of use of the present study) has a positive effect on user satisfaction. Hence, the researchers hypothesize the following:

H₅: There is a positive effect of Ease of Use of the System on End User Satisfaction

Bailey and Pearson (1983) proposed that the availability of the output in a timely manner and currency of the output are positively related with user satisfaction. In their study, Ives et al. (1983) confirmed the same two relationships. Doll et al. (1994) also confirmed that there is a significant relationship between timeliness of information received and user satisfaction. Accordingly, we hypothesize the following:

H₆: There is a positive effect of Timeliness of the System on End User Satisfaction

4.4 Research Model

The research model that was tested is given in Figure 1. It shows the relationships existing among seven constructs. The research model consists of six independent constructs, namely: User IT Background, Information Content, Accuracy of the System, Format of the Output, Ease of Use of the System and Timeliness of the System. The dependent construct is End User Satisfaction.

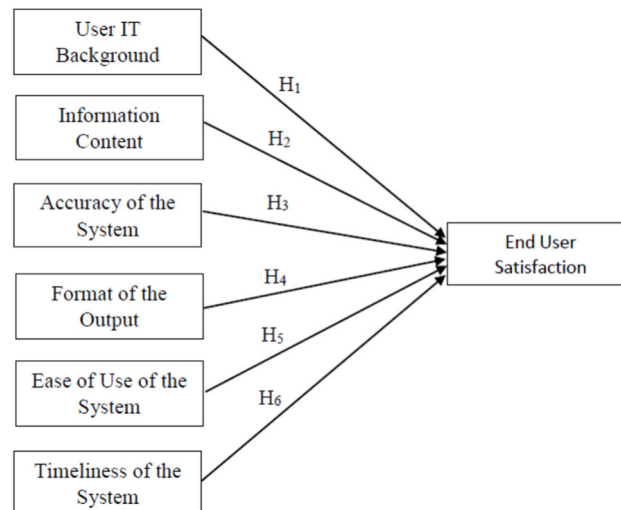


Figure 1: Conceptual framework of the project

5. Research Methodology

5.1 Research Design

A survey approach was used for data collection in this study. A questionnaire was developed primarily based on a comprehensive literature review. Questionnaire items for each construct were adapted from empirically validated several previous research (Bailey and Pearson, 1983; Ives et al., 1983; Calisir & Calisir, 2004; Eom, 2012; Alhirz, & Sajeev, 2015). However, selection of questionnaire items was carefully done to ensure that they fit the present study and also the research model used for this study.

The first part of the questionnaire consisted of questions measuring certain demographic characteristics such as sex, age, educational level, organisational position etc. The second part of the questionnaire included the items measuring independent and dependent constructs. All items were measured using a five-point Likert-type scale (1 = Strongly Disagree to 5 = Strongly Agree).

The first draft of the questionnaire was pretested with two academics and four respondents in the sample. Their comments were used for modifying certain questionnaire items to improve the clarity and understandability of those items.

5.2 Sampling and data collection

The population for this study was ERP users for all companies operating in Sri Lanka. However, since the study focused on a case study at Alpha Company, sample was limited to ERP users of this company. Printed form of the self-administered questionnaire was distributed among all 45 ERP users of Alpha. Using personal contacts, data were collected from all the 45 users, ensuring a 100% response rate.

6. Data analysis and findings

The first part of the data analysis involved the use of descriptive statistics showing the frequencies and percentages related to demographic variables of the respondents. The second part focused on determining the factors influencing the user satisfaction of ERP systems. A multiple regression analysis was used for this purpose.

6.1 Demographic Profile of Respondents

Table 1 illustrates the demographic profiles of respondents. While there are 51% of males, we can also see that 51% are more than 36 years old. Interestingly, 60% possess undergraduate or postgraduate degrees. Further, 51% employees are having less than 5 years' experience in the company indicating that they are somewhat new to the company.

Table 1: Demographic profiles of respondents

Measure/categories	Frequency	Percent	Cumulative (%)
<i>Gender</i>			
Male	23	51%	51%
Female	22	49%	100%
<i>Age</i>			
Less the 25	3	7%	7%
26-35	19	42%	49%
36-45	16	36%	84%
46 years old and above	7	16%	100%
<i>Education</i>			
Advanced level	15	33%	33%
Bachelor's Degree	16	36%	69%
Master's Degree	11	24%	93%
Diploma/Professional	3	7%	100%
<i>Organizational Position</i>			
Officer	25	56%	56%
Executive	14	31%	87%
Assistant Manager	4	9%	96%
Manager	2	4%	100%
<i>Employment with this company</i>			
Less than 5 years	23	51%	51%
6 to 10 years	15	33%	84%
More than 11 years	7	16%	100%

6.2 Reliability test of data

Reliability of constructs was tested using Cronbach alpha values. Results are shown in Table 2. Since Cronbach alpha values of all constructs are above 0.7, we can conclude that internal consistency of all constructs are established (Nunnally, 1978).

Table 2: Reliability of data

Independent variable	Cronbach's Alpha
IT background of the user	0.888
Information content of the system	0.711
Accuracy of the system	0.810
Format of the Output	0.856
Ease of use of the system	0.730
Timeliness of the system	0.708

6.3 Testing of multiple regression assumptions

"Linearity" is one assumption to be verified before performing a regression analysis. This was done using scatter plot diagrams. The researchers drew scatter plot diagrams to identify the relationship between each independent variable and the dependent variable. The diagrams showed that data are randomly distributed towards to the regression line. This confirmed the existence of linear relationships between each of the independent variable and dependent variable.

Another regression assumption that was tested was "homoscedasticity". According to Hair et al. (2014, p.80), homoscedasticity refers to the assumption that the dependent variable exhibits a similar amount of variance across the range of values of an independent variable. Residual plots between each independent variable and dependent variable indicated that standardized residuals with respect to the standardized predicted values do not have a systematic pattern, indicating that the variance of residuals has a constant behavior. Accordingly, the homoscedasticity assumption was validated.

6.4 Correlation analysis

Pearson's correlation analysis was performed to identify the relationships existing between each independent variable and the dependent variable. Results are shown in Table 3. Results indicate that each of the independent variable is significantly associated with the dependent variable (End user satisfaction). Further, it is apparent that all correlation coefficients are less than 0.9. Therefore, we can conclude that there is no considerable degree of multicollinearity among the variables in the study (Saunders, Lewis & Thornhill 2009, p.463). This is also a validation of another assumption for performing the multiple regression analysis done in this study.

Table 3: Summary of correlation analysis

	ITB	ICS	AS	FS	EU	TS
ICS	.359*					
AS	.048	.187				
FS	.172	.350*	-.020			
EU	.315*	.370*	.105	.343*		
TS	.152	.539**	.372*	.183	.272	
OS	.326*	.558**	.344*	.405**	.362*	.551**

*- Correlation is significant at the 0.05 level (2 tailed), **- Correlation is significant at the 0.01 level (2 tailed).
 N= 45

Note: ITB – IT Background; ICS – Information content of the system; AS – Accuracy of the system; FS –Format of the system; EU –Ease of use; TS – Timeliness of the system; EUS – End user satisfaction

6.5 Multiple regression analysis

Multiple regression analysis is used to measure the relationship between two or more independent variables (also known as predictor variables) and a dependent variable. Multiple regression analysis is identified as a powerful method of predicting the value of an unknown dependent variable from a known set of independent variables. Since the researchers were interested in identifying the effect of a set of identified independent variables on end user satisfaction, the researchers decided to use multiple regression analysis for testing the hypotheses.

Model summary of the multiple regression analysis is presented in Table 4. This indicates that 50.5% (R Squared value) of the variation of end user satisfaction is explained by the six independent variables used in the research model. The explanatory power of the research model cannot be considered as very strong since there is almost another 50% of variance explained by some other factors.

Table 4: Model Summary^b

Model	R	R Squared	Adjusted R Squared	Std. Error of the Estimate
1	.710 ^a	0.505	0.426	0.457

a. Predictors: (Constant), Timeliness of the system, User IT Background, Format of the system, Accuracy of the system, Ease of use, Information Content of the system

b. Dependent Variable: End User Satisfaction

ANOVA results generated along with the regression analysis is shown in Table 5. ANOVA results indicate the statistical significance of the regression model that was run. Since $p < 0.05$, it is apparent that the regression model predicts the dependent variable (i.e. end user satisfaction) significantly well.

Table 5: ANOVA results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.073	6	1.345	6.45	.000 ^a
	Residual	7.927	38	0.209		
	Total	16	44			

Multiple regression coefficients generated from the regression analysis are shown in Table 6. It also indicates whether those coefficients are significant or not. A significant p value indicates that the corresponding independent variable has a significant effect on the dependent variable. Accordingly, it is apparent that Information Content, Accuracy, and Timeliness variables are significant ($p < 0.05$). Therefore, we can infer that each of those three variables has a significant effect on end user satisfaction. Consequently, the hypotheses H_2 , H_3 , and H_6 are accepted. However, it can be seen that regression coefficients related to User IT Background, Format of the Output, and Ease of Use are not significant ($p > 0.05$). Hence, hypotheses H_1 , H_4 , and H_5 are rejected.

Table 6: Multiple Regression Coefficients^a

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	-0.148	0.670		0.137	0.891
User IT Background	0.118	0.109	0.190	0.104	0.917
Information content	0.252	0.176	0.136	4.247	0.000
Accuracy of the system	0.209	0.136	0.216	3.361	0.001
Format of the output	0.171	0.091	0.237	1.463	0.146
Ease of use	0.056	0.119	0.061	1.235	0.219
Timeliness of the system	0.258	0.132	0.283	2.133	0.035

a. Dependent Variable: End User Satisfaction

7. Discussion and Conclusion

This research extended the model originally presented by Doll et al. (1994) to include end user IT background as an additional variable to measure user satisfaction of ERP systems. The research proposed six hypotheses. While three of them (H₂, H₃, and H₆) were supported, other three (H₁, H₄, and H₅) were not supported.

According to multiple regression coefficients analysis, Information Content of the output has a positive and significant effect on user satisfaction. This finding is consistent with many previous findings (Eom, 2012; Petter et al., 2008; Rai et al. 2002; Doll et al. 1994; Delone & McLean, 1992). Accordingly, it is apparent that if the ERP system provides precise information and sufficient amount of information that would lead to increased user satisfaction. Further, it is important for the ERP systems to meet the specific information needs of end users, the way they want to increase their satisfaction.

Multiple regression results show that Accuracy of the system has a significant effect on end user satisfaction. These results are consistent with the research outcomes of Doll et al. (1994). This relationship points out that accuracy of the systems as well as the reliability of the information provided by ERP systems are greatly valued by customers. Further, their perception related to the security provided by ERP systems against loss, damage, or unauthorized alteration of data lead to increased satisfaction among the users.

According to the results, Timeliness of the system also has a positive and significant effect on end user satisfaction. This is similar to the findings made by Doll et al. (1994). These findings indicate that when the users receive the information at the time they want, without being late, their satisfaction towards the ERP system goes up. Further, providing up-to-date information by the ERP system adds to the satisfaction of users.

Amongst the three constructs which were identified as having significant effects, the most important construct can be identified as the Timeliness of the system since beta value is the highest for this construct. This may be due to the fact that before the ERP system was implemented at Alpha company, the employees faced greater difficulties in receiving the information on time and also receiving up-to-date information which resulted in frustration among employees and also causing many issues in their day-to-day activities as well as in their decision making.

Contrary to expectations, User IT background does not have a significant effect on end user satisfaction. User IT Background construct consisted of items focusing on prior experience of users on computer-based systems, the training and education they received in using the ERP systems and self-efficacy of using ERP systems. The present findings support the previous finding of Eom (2012) where he found that there is no effect of self-efficacy on user satisfaction. The present finding is also consistent with the findings of Al-Jabri (2015) where he found that training received by users does not affect significantly on user satisfaction.

Results also showed that the effect of Format of the output on user satisfaction is not significant. This result is consistent with the findings of Ilias, Razak, Rahman & Yaso (2009), where they found that the format of output produced by Computerised Accounting Systems in specific government agencies does not have a significant effect on user satisfaction. However, this contradicts with the findings of Doll et al. (1994). The respondents seem to be not bothered about the format of the output received and also the customizability of the interfaces of the ERP system. On the other hand, they seem to be more concerned about the accuracy, currency, and timeliness of the information they receive rather than on the format and appearance of the output.

Results further revealed that Ease of Use does not have a significant effect on user satisfaction. This finding contradicted the findings of many others (Eom, 2012; Petter et al., 2008, Doll et al., 1994). However, this finding is consistent with the findings of Munap, Ahmad, Hamid, & Beg (2018). According to the findings, it is apparent that users are not much concerned about the user-friendliness of the system. Thus, they seem to be more concerned about the final outcome of the ERP system rather than certain individual features of the system which enhances the convenience of using this system.

8. Research Implications and Future Research

The research findings have both theoretical implications as well as practical implications. At the beginning of this research, the researchers identified a gap existing in current literature related to user satisfaction of ERP. It could be revealed that majority of literature have focused on developed countries. The applicability of their findings to a developing country is questionable. Further, the researchers could not identify any promising research which has examined the Sri Lankan context in relation to the present research area. Therefore, the present study would contribute to the existing academic research area by providing empirical evidence to support the existing theories and models examining the user satisfaction of ERP systems. Study also revealed that information content, accuracy and timeliness of the system positively and significantly affect end user satisfaction of ERP systems. This is a new contribution added to the existing literature, especially from a developing country perspective.

Since the study revealed that information content, accuracy and timeliness of the system are predictors of user satisfaction, this provides useful information to the organization focused in this study. First, the organization has to ensure that the end users receive precise information and sufficient amount of information that would suit their specific purposes, through the ERP system. Second, the organization has to ensure that it produces accurate and reliable information and also help the end users and the organization to protect its vital and valuable information from loss, damage, theft, or unauthorized alterations. Third, the organization has to ensure that the ERP system provides timely and up-to-date information. Providing information with such characteristics to end users would undoubtedly lead to more user satisfaction with the ERP systems and better decision making. User satisfaction has been identified as a factor leading to the effective use of ERP systems. Therefore, proper addressing of the areas mentioned above can be expected to lead to more effective use of the ERP system at Alpha company which would in turn lead to positive performance implications for the company.

There are certain limitations of this study as well. This study is organization specific. Therefore, the generalizability of the findings is difficult. Future researchers may focus on performing a large scale survey within the Sri Lankan context to increase the generalizability of their findings. Most of the constructs used in this study focused on system specific characteristics. However, there can be other constructs related behavior of individuals, environment, and culture etc., which may affect end user satisfaction of ERP systems. Therefore, future researchers can focus on incorporating such constructs in to their studies.

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