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The impact of User-Characteristics and Organizational-Characteristics on End-user Satisfaction with Enterprise Resource Planning (ERP) systems

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Abstract
Purpose: This study aims to examine characteristics that influence end-user satisfaction with ERP systems within the Sri Lankan context to understand what critical factors should be considered in the ERP decision-making processes.
Research methodology: Data collection is conducted through an online questionnaire targeting end-users of ERP systems belonging to various industries.
Results: The study found a significant relationship between five user characteristics and end-user satisfaction, as well as the significance of usability to end-user satisfaction. Minimal memory load was found to have no significant relationship with end-user satisfaction. In terms of organisational characteristics, user training and top-management support had a significant influence on end-user satisfaction as well.
Limitations: Since this study is on ERP systems such as SAP, IFS, and Oracle with a high industry focus, organisations that do not use commercial ERP systems are not considered particularly public-sector organizations.
Contributions: Although previous studies emphasised various factors that contributed to implementation failures, those factors have not been given importance to end-user satisfaction or the success of an ERP system. Within the Sri Lankan context, ERP implementations are still in the early stages, so it would be very useful to understand the factors that affect user satisfaction with such systems.
Novelty: The findings identify what factors ERP vendors can focus on when making changes to their commercial products and give managers an idea of what factors they should consider when choosing the right ERP system for an organization.
Keywords: *End-user Satisfaction, EPR System, Perceived ease of use, Perceived usefulness, Organizational support and training*
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1. Introduction

An Enterprise Resource Planning (ERP) system can be defined as an "integrated information technology (IT) that uses common databases and consistent cross-functional information flow to allow organizations to integrate information from different departments and locations." (Tsai, Lee, Shen, & Lin, 2012). Although ERP systems were first designed for manufacturing contexts, they have evolved through time to cover all of an entity's functions and operations (Chang, Cheung, Cheng, &

Yeung, 2008). More businesses nowadays are realizing the importance of accurate, easily accessible information in order to achieve a competitive advantage (Naab & Bans-Akutey, 2021; Youngberg, Olsen, & Hauser, 2009). Implementing a system of this kind has become increasingly popular recently for many firms worldwide, including Sri Lanka, thanks to ERP systems' quicker information processing and analysis capabilities.

Since they have infamously become a necessary component of running an organization and connecting with other companies, many businesses have attempted to at least deploy ERP systems or information systems over the years. It is crucial to choose a method to assess if a business needs an ERP and whether it will be successful after adoption because doing so is expensive and complex (Wu & Wang, 2006). In the past ten years, there have been several installation failures, and businesses and even ERP vendors have struggled to pinpoint their precise causes. Cost-benefit analyses are routinely used to assess an ERP's success, however, they are not the best method because of the various intangible benefits they offer. A cost-benefit analysis could be helpful when making investment decisions, but it might be unhelpful when trying to evaluate how well a system is actually performing. User happiness is therefore utilized as a substitute assessment to assess the system's effectiveness. Although an employee may not choose to utilize an ERP system, it is still important to understand the system from the user's point of view in order to identify its obstacles and advantages (Chang, Cheung, Cheng, & Yeung, 2008). This will enable vendors and organizations to understand what aspects and functionalities are the most meaningful to the users when using these systems on a daily basis.

Within the Sri Lankan context, it was identified that most multinational organizations have set up these ERP systems to gain a strategic competitive advantage (Wickramaarachchi & Jayasiri, 2015). But still, they are mostly implemented in an organization for financial analysis, and only the finance module is implemented first (Silva, de Silva, & Gunawardana, 2011). Since ERP systems are inherently created to integrate all business functions, it seems like companies are not using their capabilities well enough. This could be due to a lack of knowledge and expertise in this regard. And even after implementation, there was often a reluctance to accept such systems and various challenges organizations faced. Therefore, it is crucial to determine the factors that would influence the users' satisfaction.

This study was conducted to understand whether there is any effect of interface usability characteristics, perceived usefulness, perceived ease of use, organizational support, and user training on the ERP end-users' satisfaction in the Sri Lankan context. Even though ERP systems are still being adopted within industries in Sri Lanka, it is vital to understand what factors would make it a success and if user satisfaction would play an important role in doing so.

In terms of measuring the success of an ERP system, user satisfaction is rarely taken as an evaluation method within organizations. No matter which ERP software is implemented, if it does not fit for the organization and is not compatible with its operations, it will surely fail. For the implementation to be successful, users should be able to use the system, and it should enhance the individual's job performance. If not, they won't value the system and resistance will arise. From the point of deciding to implement an ERP system, there are multiple steps to follow, such as choosing an appropriate vendor, communication, mapping of the business processes, testing, go-live phase, and post-implementation support. This will require both monetary and non-monetary resources and time.

Therefore, it is vital to understand if an ERP system will satisfy the user or not. Otherwise, it will result in the wastage of time and resources of an organization. It is also important to understand whether the organization actually needs to adopt such a system or whether they are acting out of competitors' pressure within the market.

Most of the existing research has incorporated the End-user Computer Satisfaction model (EUCS model) when identifying end-user satisfaction with ERP systems (Edirisinghe & Roshantha, 2018; Kulathunga & Fernando, 2019). The model focuses on five first-order factors such as content,

accuracy, format, ease of use, and timeliness, and one second-order factor named satisfaction. They have not focused much on organizational characteristics such as top-management support, user training, and technical support and their influence on satisfaction. Therefore, this research identifies which user and organizational characteristics would affect ERP user satisfaction within the Sri Lankan context. This study focuses on understanding if user characteristics such as interface usability factors, perceived usefulness, and perceived ease of use would affect end-user satisfaction. Then, it focuses on organizational characteristics such as top-management support, technical support, and user training to evaluate if they would have an effect on user satisfaction. The questionnaire was mainly used to collect data and data analysis was done using the IBM Statistical Package for Social Sciences (SPSS 23).

2. Literature review

2.1. Concept of ERP and ERP Implementation

With their dynamic technological advancement, Enterprise Resource Planning (ERP) systems are regarded as one of the major information technology (IT) innovations of this decade, and are available in on-premises, cloud, and hybrid deployment models (Edirisnghe, 2018). The core database of the ERP system will accumulate data and transmit it to applications that support all business activities across functions, business units, and across the world (Wu & Wang, 2006). Socio-technical challenges due to the complexity of the implementation process make ERP systems differ from any other IT innovation as well. (Rajan & Baral, 2015). In today's context, an ERP system is considered a competitive advantage between companies (Calisir & Calisir, 2004). The significance of such systems is highlighted as they have become a barrier to entry for running a business as well (Wu & Wang, 2006).

When discussing the development of ERP systems, it was noted that businesses produced more units in the 1970s than there was a demand for, resulting in waste and rising stock-holding costs. MRP (material requirement planning) systems were consequently introduced. It enables a business to effectively organize its mass production procedures. These MRP II versions could also include other functional areas, such as finance, engineering, project management, human resources, etc.(Basoglu, Daim, & Kerimoglu, 2007). Many of the current IT and ERP systems were built on this foundation. ERP implementations have been increasing over the last decade within large and medium-sized firms as they facilitate the distribution of timely and accurate information that leads to better decision-making (L.-L. Hsu, Lai, & Weng, 2008). Oracle, Microsoft, and SAP are regarded as market leaders of the leading systems, while IFS, Infor, and Sage are emerging systems (Pervan & Dropulić, 2019).

Implementation is a complex task requiring system design, installation, modification, upkeep, and updates (Nelson & Somers, 2001). That relies on how well the system is implemented and whether the right system is chosen for the organization. Some of the hidden costs of such ERP systems include user training, modifications, legacy integration, and data conversion (Nelson & Somers, 2001). That relies on how well the system is implemented and whether the right system is chosen for the organization. Some of the hidden costs of such ERP systems include user training, modifications, legacy integration, and data conversion (Edirisnghe, 2018). An organization should assess its current IT capabilities before installing a system and pick a system that can adapt to its capabilities and operations. All personnel of an organization should be able to utilize it easily and have access to it (L.-L. Hsu et al., 2008). Rajan and Baral (2015) discovered that users will be more open to accepting the new ERP system if it is compatible with the current technological system and procedures. Despite the numerous advantages of implementing an enterprise resource planning system, many companies encounter failures due to the complexity of the system's customization and the high cost of implementing them. This is a common issue faced by developing countries such as Sri Lanka (Silva et al., 2011).

2.2. Benefits of ERP Systems and Global ERP Vendors

ERP system advantages can be categorized as either tangible or intangible. Visible advantages include better planning for production capacity, accurate market demand estimates, facilitating mass

customisation, increasing inventory turnover rates, lowering inventory levels, and shortening order fulfillment cycle times (L. L. Hsu & Chen, 2004). Some of the intangible advantages of employing ERP systems include better resource allocation across the company, improved departmental communication, information integration inside the company, access to real-time business intelligence, faster order response times, and more customer satisfaction (L. L. Hsu & Chen, 2004). It affects people's behavior and frequently imposes its own logic on business strategy and culture, making it more than just a piece of software (Abbasi, Zamani, & Valmohammadi, 2014).

Due to significant client demand, the ERP market has grown to become one of the world's largest IT investments. Pervan and Dropulić (2019) have discovered that out of more than 100 ERP suppliers, SAP (Systems Application and Products), Microsoft Dynamics, and Oracle are industry leaders, while IFS (Industrial and Financial System), Infor, and Sage are rising ERP systems both locally and globally.

2.3. Significance of end-user satisfaction for the success of an ERP system

With many ERP implementations and changes to business processes, little research is done on individual employees, drivers of process adoption, or factors influencing their resistance.(Rajan & Baral, 2015). Since system implementation is a timely and costly affair, top managers are likely to evaluate the success of the system they wish to implement. User satisfaction is one such evaluation mechanism to understand if an ERP system is a success or not. Studies show that there is a significantly high correlation between ultimate user satisfaction and ERP system success (Wu & Wang, 2006). According to Calisir and Calisir (2004), even if millions of dollars are spent on system implementation, potential users might still not use it. Edirisnghe (2018) argues that factors such as leadership, organizational discipline, communication, and organizational culture can improve and help an organization be ready to adapt to an ERP system. Even practitioners can use satisfaction levels for their ERP systems to compare to expectations and take actions to improve product functionality (Wu & Wang, 2006). Managers should not only focus on making use of the system but also make sure that users are satisfied with it to improve their performance (Rajan & Baral, 2015). Users who believe that a system is providing value are more likely to be satisfied with the system than those who do not (Calisir & Calisir, 2004). The value of an ERP system is determined by its effective usage, which evaluates the extent to which users are satisfied with the system (L.-L. Hsu et al., 2008).

When it comes to ERP vendors, they should focus more on user needs and expectations before adding the necessary components and features to the systems. To be successful, an ERP system must take into account the diverse domain knowledge of its end-users, whose backgrounds are becoming increasingly diverse. It is crucial to comprehend what influences the end-user pleasure in order for the system to be used effectively for its benefits (Calisir & Calisir, 2004; Kulathunga & Fernando, 2019).

2.4. Factor affecting ERP user satisfaction

Finding out what affects users' adoption and use of information systems has been the focus of recent research. (Chang et al., 2008) looked at technology, organization, and users as key components and found that both individual and organizational factors interact to determine the acceptability of ERP systems (Rajan & Baral, 2015) further chose individual, organizational, and technological elements such computer efficacy, organizational support, training, and technological complexity to find the aspects that will affect ERP use. It was shown that the usefulness and simplicity of computers were strongly and favorably connected with computer self-efficacy. However, it has been discovered that technological complexity has a detrimental effect on how useful and simple something is judged to be.

Calisir and Calisir (2004) discovered that end-user satisfaction with ERP systems is influenced by perceived usefulness and learnability. The study looked at six aspects of interface usability, including system capability, compatibility, flexibility, user assistance, learnability, minimal memory burden, and usefulness, to see if any of these criteria had an impact on end-user satisfaction. Perceived usefulness and learnability were revealed to be major drivers of end-user satisfaction in the study.

End-user satisfaction was influenced by learnability in a minor but substantial way. Easy navigation, navigation aids, broad and shallow menu structures, the availability of function keys for frequent control entries, the ability to undo actions, and clear error messages could all help to increase learnability and eventually end-user satisfaction (Calisir & Calisir, 2004).

Wu and Wang (2006) centred their research on three elements of satisfaction; the ERP project team and service, the ERP product; and user knowledge and involvement. The study found that the higher the accuracy, timeliness, and reliability of a system's output, the higher the system's quality, which leads to higher user valuation and happiness. Further, user characteristics such as the user's functional department, position within the organization, formal education level, age, computer experience, and gender were found to have no association with perceived usefulness or end-user satisfaction (Zviran, Pliskin, & Levin, 2005). In the study of Chang et al. (2008), they discovered that social factors contribute most to end-user satisfaction. Findings highlighted that social pressure from colleagues or management would affect people's willingness to use the available systems.

When considering the Sri Lankan context, very little research has been done focusing on ERP user satisfaction (Edirisinghe & Roshantha, 2018). Their study found that out of the factors within the end-user computing satisfaction model, content, accuracy, and format of information contribute to the end-users satisfaction. Kulathunga and Fernando (2019) found that even timeliness could be a contributing factor to end-user satisfaction. Information content, timeliness, and accuracy were found to have a positive and significant effect, and the user's IT background was proven not to have an effect within the same study.

Many theoretical models, such as the Technology Acceptance Model, Computer Self-Efficacy Model, Theory of Planned Behavior, and Task-technology Fit, have been created over the years to explain user adoption of information systems (Rajan & Baral, 2015).

2.5. Perceived Usefulness

Perceived usefulness can be defined as the degree to which a person believes that using a system will enhance his/her job performance (Davis, 1989). The simplicity of use has also been demonstrated to influence usefulness in studies. It emphasizes that the more user-friendly a system is, the more valuable it can be (Rajan & Baral, 2015). Calisir and Calisir (2004) back up this claim, pointing out that even user instruction can influence perceived utility. After that, it was discovered that of the study's factors, perceived usefulness had the greatest impact on end-user satisfaction. According to Zviran et al. (2005), there is a substantial link between perceived usefulness and user happiness. Chang et al. (2008) investigated near-term effects, which are comparable to the idea of perceived usefulness, and discovered that they have a considerable impact on end-user satisfaction.

2.6. Perceived Ease of Use

Perceived ease of use is the degree to which a person believes that using a system will require little effort(Davis, 1989). If a system is not seen as easy to use, the users' interest in learning and using the system will be low, which therefore will lead to increased resistance to the system. In their studies (Calisir & Calisir, 2004; Lee, Kim, Rhee, & Trimi, 2006; Youngberg et al., 2009), ease of use was identified as one of the factors affecting system usefulness that will eventually lead to user satisfaction.

2.7. Significance of organizational support for the success of an ERP system

Previous research has identified organizational support as a factor that contributes to end-user satisfaction. All departments and functions of an organization need to work together to achieve its goals and objectives. An integrated approach of this type necessitates that each unit understands its functions and how its decisions affect other functions (Chang et al., 2008). An ERP system provides integration and communication in an effective way. Organizational support will encourage employees to use the implemented ERP system and realize the benefits it provides. Rajan and Baral (2015) found

that organizational support is strongly related to perceived usefulness as well. In their study (Lee et al., 2006), they classified organizational support as technical support and management support.

2.8 Technical support, Top-management Support and User-training

Technical support meant access to IS professionals within the organization and management support meant the resources needed within the organization for the ERP's success. These organizational factors were found to influence actual usage (Slevin & Pinto, 1987). Top-management support can also be viewed in terms of providing the required resources and support to ERP users. It could include hardware, software, training, and information(Slevin & Pinto, 1987). Top-management attitude toward using the system for business operations is essential for users to understand whether using the system is adding value to the work they perform (L.-L. Hsu et al., 2008). Superiors' support, encouragement, and committed leadership are essential for an ERP system to be successful. The expectations of both colleagues and top management have been found to affect the behavior of ERP users. This social aspect has been dropped in many models that are used to evaluate end-user satisfaction.

Education and training are necessary to avoid implementation failures and have a direct impact on end-user satisfaction (L.-L. Hsu et al., 2008). Not only should the ERP product be of high quality, but adequate knowledge should be given to the users to operate it correctly as well. Rajan and Baral (2015) discovered that training was strongly related to perceived ease of use and emphasized the importance of training in assisting users to interact with the system, eliminate any negative perceptions, and develop a favorable attitude toward using the system. Proper training makes employees confident in using the systems and will lead to better technological acceptance (L.-L. Hsu et al., 2008).

The model focuses on five first-order factors, such as content, accuracy, format, ease of use, and timeliness, and one second-order factor, satisfaction. Over the past decade, researchers have focused on ERP systems, but they have given little significance to understanding the characteristics that affect end-user satisfaction (Edirisinghe & Roshantha, 2018). In the global context, much research has been done with regard to developed countries. Such findings would be difficult to apply in developing countries for analytical purposes (Kulathunga & Fernando, 2019). In particular, there are not many empirical findings to understand the factors that affect the end-user's satisfaction in the Sri Lankan context. Even a few studies done in the Sri Lankan context have focused on the overall impact of the factors using the end-user computer satisfaction model (EUCS) (Edirisinghe & Roshantha, 2018; Edirisnghe, 2018). Therefore, this study intends to use a different model to understand usability and organizational characteristics that would affect the end-user's satisfaction when using ERP systems.

3. Methodology

3.1. Population and Study Sample

The population of the selected study is the end-users of ERP systems. To minimise the difficulties of gathering data from such a large number of users across multiple organizations, the study sample is narrowed down to 78 end-users who have been using an ERP system for a minimum of two years. The limit of a minimum of two years is set up to allow some assurance that the users have integrated this system into their job role for a reasonable amount of time and understand its functionalities. Further, the study is expected to gather data from end-users that belong to organizations from different industries operating within Sri Lanka.

3.2. Conceptual Diagram

An understanding of how interface usability characteristics, perceived usefulness, perceived ease of use and organizational characteristics affect end-user satisfaction is provided through a conceptual framework. The operationalisation is given in Annexure 1.

Under usability characteristics, the study has focused on system capability, compatibility, flexibility, user guidance, learnability, and minimal memory load.

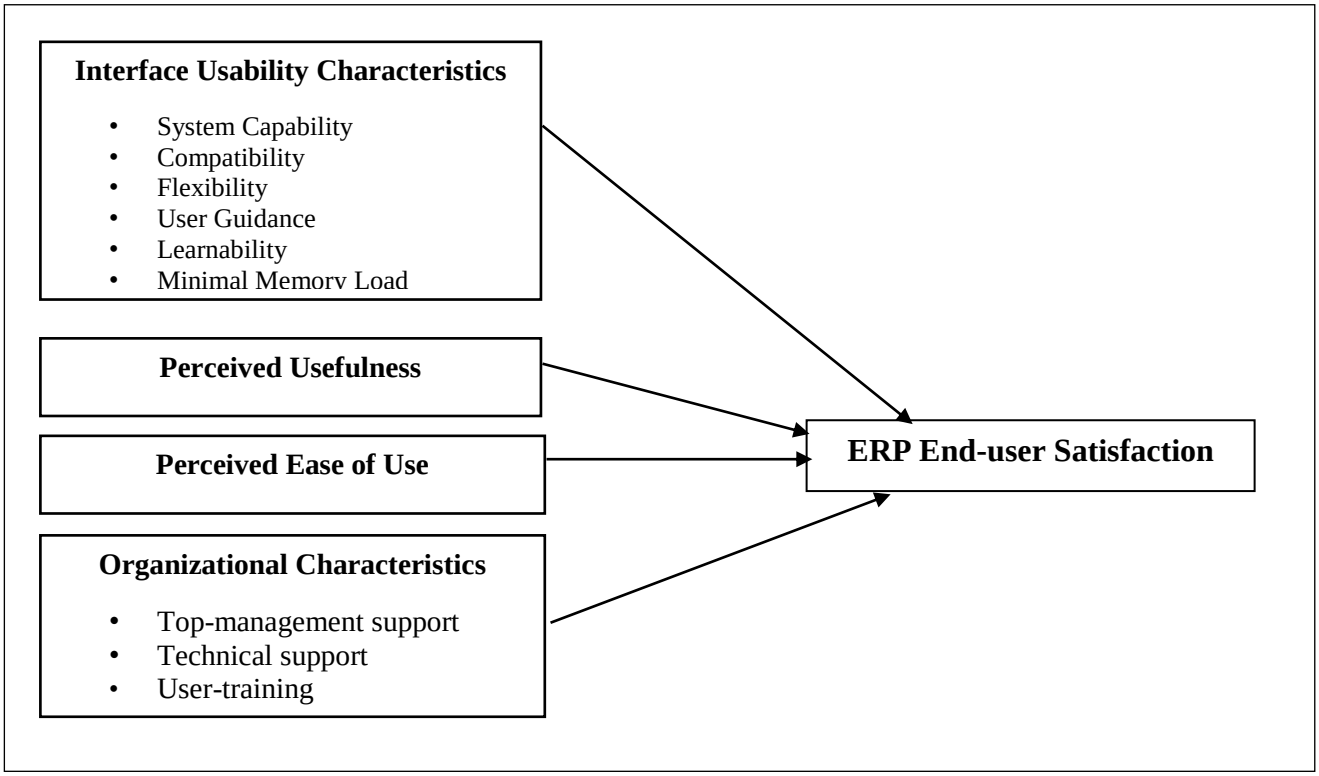

Figure 1. Conceptual Framework

Hypothesis

Model 01: Hypothesis

H1: System Capability is positively affecting end-user satisfaction
H2: Compatibility is positively affecting end-user satisfaction
H3: Flexibility is positively affecting end-user satisfaction
H4: User Guidance is positively affecting end-user satisfaction
H5: Learnability is positively affecting end-user satisfaction
H6: Minimal Memory Load is positively affecting end-user satisfaction

Model 02: Hypothesis

H7: Perceived Usefulness is positively affecting end-user satisfaction.

Model 03: Hypothesis

H8: Perceived Ease of Use is positively affecting end-user satisfaction

Model 04: Hypothesis

H9: Top-management support is positively affecting end-user satisfaction
H10: Technical support is positively affecting end-user satisfaction.
H11: User-training is positively affecting end-user satisfaction.

3.3. Sources of Data and Data Collection

Data was gathered through a survey methodology. An online questionnaire was sent out to ERP end-users of selected organizations. The questions for the survey were adopted from previous studies such as Calisir and Calisir (2004) and Rajan and Baral (2015) It consisted of four parts. Part one comprised demographic questions, part two of measuring the ERP system's overall satisfaction level, part three of measuring satisfaction with usability aspects, and part four of measuring organizational attributes.

3.4. Data Analysis Strategies

The results of the online survey were analyzed with IBM's Statistical Package for Social Sciences (SPSS 23). The reliability of the selected interface usability features, perceived ease of use, perceived

usefulness, and organizational qualities are assessed using descriptive and inferential statistics. The data analysis methodologies employed are detailed below.

1. Under Descriptive statistics, measures of central tendency such as the mean and standard deviation were computed (Calisir & Calisir, 2004; Rajan & Baral, 2015).
2. The frequency analysis of the demographic details was done using pie charts.
3. To ensure the instrument's validity and reliability, Cronbach's alpha measurement was used. Kaiser-Meyer-Olkin (KMO) test was done to ensure the sample adequacy of the study (Calisir & Calisir, 2004; Rajan & Baral, 2015).
4. To assess the construct validity of the study- The principal components analysis was done. (Calisir & Calisir, 2004; Lee et al., 2006; Rajan & Baral, 2015).
5. To test for normality, Skewness and Kurtosis were calculated along with using histograms. (Rajan & Baral, 2015).
6. To identify the relationship between each variable, Pearson's coefficient was calculated as well (Calisir & Calisir, 2004; Rajan & Baral, 2015).
7. Multiple Regression Analysis was used to determine which variables contributed significantly to predicting end-user satisfaction with ERP systems and to examine the connection between the variables.
8. For each independent variable, the Coefficient, T-statistic, and significance level would be included in this study (Calisir & Calisir, 2004; Kulathunga & Fernando, 2019).

4. Results and discussions

The findings are heavily weighted in potential business decisions. Therefore, it is critical to ensure the output's integrity and dependability in these circumstances. The majority of data analysis is based on responses from the intended sample. The availability of data collection, which is the key factor here, is critical to the dependability of such a study. If there is any missing data found within the collected data, it could indicate that the study was not adequately conducted. Google Forms were used to create the survey, and advanced settings were used to ensure that all responses were logged. This option removed the missing values from the data set, and no such attributes were found in the responses received.

4.1. Demographic details of the sample

4.1.1. Gender and age analysis

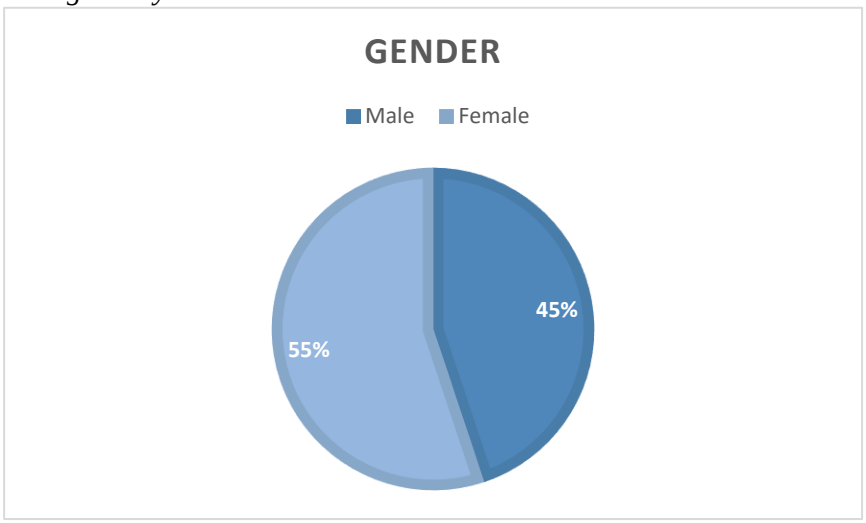

Figure 2. Gender analysis of the sample

The respondents were split between females 55.1% and males 44.9%.

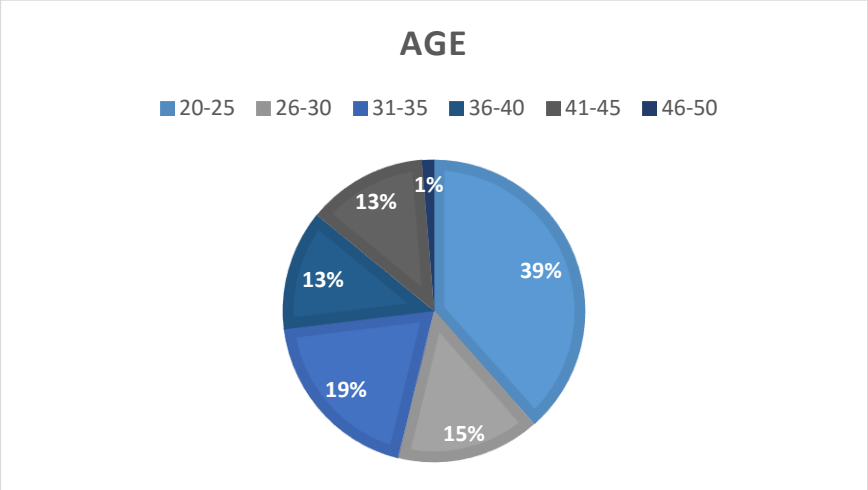

Figure 3. Age analysis of the sample

The age of the participant was asked as the first question of the survey. The graph above shows the total number of people who responded to the survey by age group. According to the data, the majority of responses (39 percent) came from people between the ages of 20 and 25. 19% of the respondents were between the ages of 31 and 35, and only 15% of participants were between the ages of 26 and 30, according to the findings. The statistics show that only 1% of respondents are between the ages of 46 and 50, which is significant to notice. According to this graph, more than half of the respondents are in their 20s and 30s.

4.1.2. Duration of ERP System Usage

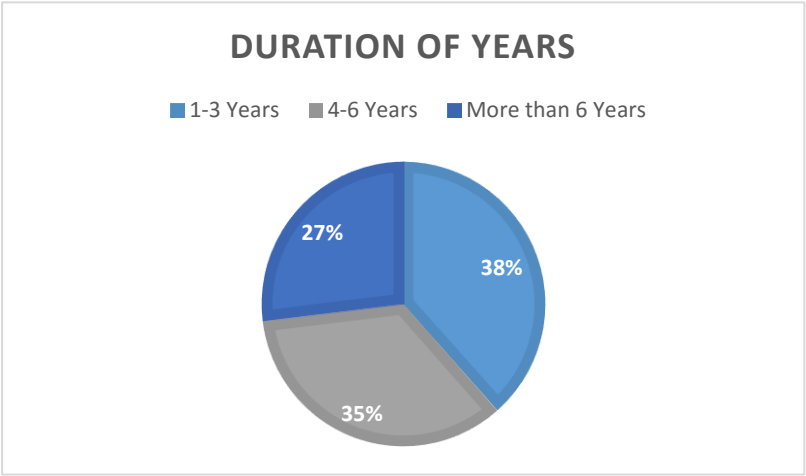

Figure 4. Gender analysis of the sample

The next survey question enquired about the participant's ERP experience. The graph above shows the overall number of respondents to the survey, broken down by ERP experience. According to the data, the majority of responses came from people with 1-3 years of experience, accounting for 38% of the total. 35% of the respondents had 4-6 years of experience. According to the findings, just 27% of participants have more than 6 years of experience. Since the study was intended for end-users with a minimum of two years of experience, all respondents satisfy the criteria intended.

4.1.3. Frequency of ERP System Usage

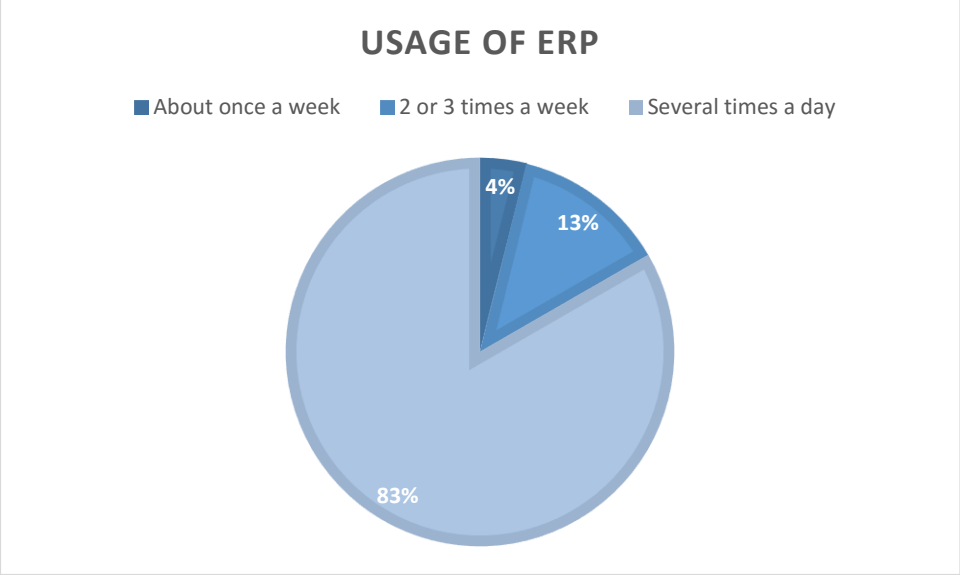

Figure 5. Analysis of ERP Usage

The next survey question enquired about the participant's ERP usage. The graph above shows the overall number of people who responded to the survey, divided by ERP usage. The majority of responses, 83 percent, came from individuals who use it many times a day, according to the data. 13 percent of those polled said they used it twice or three times per week. According to the findings, only 4% of respondents use it once or twice a week.

4.2. Identification of Variables

For the purpose of data analysis, the variables are coded as follows.

Table 1. Identifying the variables and their symbols

Symbol	**Variable**
SYS	System capability
COM	Compatibility
EAS	Ease of use
FLEX	Flexibility
GUI	User guidance
LEAR	Learnability
MEM	Minimal memory load
USE	Perceived Usefulness
TMS	Top-management Support
TECH	Technical Support
TRAI	User-training
SAT	User satisfaction **(Dependent Variable)**

Source: Author constructed

4.3. Instrument validity and reliability

The reliability and validity of the instruments were calculated to ensure that the findings were accurate and free from error. If it resulted in errors, it would tamper with the trustworthiness of the study as well. In terms of reliability, it measures the internal consistency of data, and Cronbach's alpha measurement was used as it is one of the most popular methods to measure reliability. The measurement value was found to be greater than 0.70 for each independent variable, which is considered a sufficient level in normal practice. Table No. 4.2 illustrates the alpha measures of each variable. The highest reliability was shown for perceived usefulness, flexibility, and top-management support.

Table 2. Item statistics

Item Statistics					
	Mean	Std. Deviation	N	Cronbach's Alpha	KMO Test
SYS	5.3977	1.36187	78	.760	.674
COM	4.9295	1.38340	78	.700	.500
EAS	5.0817	1.51288	78	.843	.726
FLEX	4.7244	1.66593	78	.903	.815
GUI	5.1462	1.31788	78	.844	.754
LEAR	5.3654	1.48515	78	.807	.500
MEM	5.2223	1.23085	78	.770	.613
USE	5.4263	1.39695	78	.924	.893
TMS	4.9936	1.58472	78	.903	.834

Source: Author constructed

Prior to running a factor analysis, a Kaiser-Meyer-Olkin (KMO) was done to ensure that the sample used for each variable is adequate for the factor analysis. All variables accounted for a Value of more than 0.5 ensuring sample adequacy. (Refer table 2).

In order to test for normality, Skewness and Kurtosis were calculated using histograms. Table no 3 illustrates the results produced for normality on the eleven independent and one dependent variable

Table 3. Summary of Skewness and Kurtosis results of variables

Variable Name	Skewness	Kurtosis
SYS	-1.153	1.087
COM	-.718	.352
EAS	-.774	-.139
FLEX	-.430	-.929
GUI	-.782	-.067
LEAR	-1.110	.491
MEM	-1.373	2.546
USE	-1.429	2.240
TMS	-.924	.157
TECH	-.536	-.775
TRAI	-.885	.514
SAT	-1.570	5.783

Source: Author constructed

The goal of the study was to determine the relationship between user attributes, organizational factors, and end-user satisfaction with ERP systems. As previously indicated, the author's primary interest in

the study process is performing a multiple regression. Certain assumptions must be checked in a multiple regression analysis. As a requirement for multiple regression, normality must exist. Normality is a measure of the distribution of data used in the statistical analysis of the report.

4.4. Correlation Analysis

Correlations are used to determine if there is a meaningful relationship between two variables in the study. The study examines the correlation between components based on the study's previous phases. The analysis will be carried out using these Pearson's correlation values. The Correlation value is shown in the table below.

Table 4. Correlations of among each variable

	SYS	COM	EAS	FLEX	GUI	LEA	MEM	USE	TMS	TECH	TRAI
SYS	1										
COM	.746**	1									
EAS	.661**	.723**	1								
FLEX	.610**	.661**	.778**	1							
GUI	.727**	.669**	.696**	.675**	1						
LEA	.705**	.552**	.621**	.591**	.812**	1					
MEM	.645**	.569**	.622**	.563**	.774**	.765**	1				
USE	.689**	.659**	.537**	.502**	.744**	.695**	.752**	1			
TMS	.424**	.561**	.560**	.512**	.547**	.587**	.565**	.633**	1		
TECH	.484**	.509**	.479**	.409**	.521**	.453**	.549**	.450**	.727**	1	
TRAI	.588**	.565**	.577**	.426**	.549**	.489**	.599**	.631**	.559**	.715**	1
SAT	.597**	.571**	.562**	.452**	.543**	.496**	.558**	.662**	.501**	.568**	.876**

** Correlations significant at the 0.01 level (2-tailed)
Source: Author constructed

When determinants are greater than zero, they are proven to have a positive value, whereas negative values imply that they are decreasing (they go below zero). As shown in the graph above, all independent parameters are positively associated with user satisfaction in this study. with a positive correlation ranging from 0.4-0.8. According to the findings, it seems that there is a high correlation between user guidance and learnability, as indicated by the value of. 812. The highest correlation exists between user training and user satisfaction, indicating the significance of focusing on user training for ERP systems. According to the data, all independent factors showed various sorts of correlations, with user training showing a high level of association with user satisfaction.

4.5. Multiple regression Analysis

The standard deviation and the mean of all variables are shown in the table above. (Table no 2) Thereafter a multiple regression analysis was done to identify what factors have a significant contribution to determining the user satisfaction.

Table 5. Multiple Regression Analysis

Model	Research objective	Predictive power of the model (R^2)	Hypothesis and corresponding paths	Significant Value	Coefficients (β)	t - values	Accept/Reject
01	To examine if interface usability characteristics influence end-user satisfaction with ERP systems.	0.455	H1: System Capability is positively affecting end user satisfaction	0.004	0.261	2.995**	Accept
			H2: Compatibility is positively affecting end user satisfaction	0.002	0.015	2.189**	Accept
			H3: Flexibility is positively affecting end user satisfaction	0.001	0.181	-1.376**	Accept
			H4: User Guidance is positively affecting end user satisfaction	0.003	0.008	2.077**	Accept
			H5: Learnability is positively affecting end user satisfaction	0.022	0.340	-3.395**	Accept
			H6: Minimal Memory Load is positively affecting end user satisfaction	0.067	0.158	1.714**	Reject
02	To determine if perceived usefulness affect end-user satisfaction with ERP systems.	0.381	H7: Perceived Usefulness is positively affecting end user satisfaction	0.000	0.300	5.448**	Accept
03	To examine if perceived ease of use has an effect on end-user satisfaction with ERP systems.	0.241	H8: Perceived Ease of Use is positively affecting end user satisfaction	0.001	0.172	3.528**	Accept
04	To determine whether organizational characteristics have an effect on end-user satisfaction with ERP systems.	0.326	H9: Top Management support is positively affecting end user satisfaction	0.005	0.260	4.410**	Accept
			H10: Technical support is positively affecting end user satisfaction	0.043	0.170	3.233**	Accept
			H11: User Training is positively affecting end user satisfaction	0.002	0.261	3.230**	Accept

** Correlations significant at the 0.01 level (2-tailed)
Source: Author constructed

As shown in table no 4.5 The coefficient of determination – R^2 was used to measure the variance in the dependent variable that is predictable from the independent variable. Accordingly, the explanatory power of the above models measured as R2 was ranging from 24% to 50%. Each of the R^2 measurements is discussed in detail below.

When assessing the first research objective of examining the impact of usability characteristics on end-user satisfaction, six hypotheses was developed under model 01.

Model 01: Hypothesis

H1: System Capability is positively affecting end-user satisfaction
H2: Compatibility is positively affecting end-user satisfaction
H3: Flexibility is positively affecting end-user satisfaction
H4: User Guidance is positively affecting end-user satisfaction
H5: Learnability is positively affecting end-user satisfaction
H6: Minimal Memory Load is positively affecting end-user satisfaction
As per the result, the model was valid since the significant values of the independent variables were all under the significant level of 0.05.

The model explained 45.5% of user satisfaction when referring to the R^2 Value.
When discussing hypothesis 01-System Capability is positively associated with end-user satisfaction was supported since it showed a statistically significant path coefficient. ($\beta = 0.261$, $P < 0.000$).

In terms of hypothesis 02 - Compatibility is positively associated with end-user satisfaction. There was also a statistically significant path coefficient. ($\beta = 0.015$, $P < 0.000$) with a 98% confidence level. Therefore, hypothesis two was accepted as well.

Hypothesis 03- Flexibility is positively associated with end-user satisfaction was also supported within the findings since it showed a statistically significant path coefficient. ($\beta = 0.181$, $P < 0.000$) with a significance level of 0.001.

H04: User Guidance is positively associated with end-user satisfaction, which was the fourth hypothesis that was developed under this model, and was supported within the research findings since it showed a significant path coefficient. ($\beta = 0.008$, $P < 0.000$) under a confidence level of 97%.

Hypothesis 05- Learnability is positively associated with end-user satisfaction was also accepted since it showed a significant path coefficient ($\beta = 0.340$, $P < 0.000$) under a significance level of 0.022.

Hypothesis 06, Minimal Memory Load is positively associated with end-user satisfaction was rejected due to the significance value being higher than 0.05. (0.067) It indicated that there was lesser confidence in the statistical findings that would show a relationship between an ERP system having a minimal memory load and its affecting end-user satisfaction. With the above statistical measures, the hypothesis was rejected.

Under model 01, all hypotheses were accepted except for H06.
The second research objective was to determine if perceived usefulness had an effect on end-user satisfaction with ERP systems.

With this objective in mind, under model 02, one research hypothesis was developed.
Model 02: Hypothesis
H7: Perceived Usefulness is positively affecting end-user satisfaction.
The overall model was valid since the significant value of the independent variable was under the significant level of 0.05. The model explained 38.1% of user satisfaction when referring to the R^2 Value.
When discussing Hypothesis H7: Perceived Usefulness is positively associated with end-user satisfaction was supported since it showed a statistically significant path coefficient. ($\beta = 0.300$, $P < 0.000$).
Under model 02, all hypotheses were accepted.

The third research objective was to examine if perceived ease of use had an influence on end-user satisfaction with ERP systems. Under this objective, a third research model was developed with one hypothesis as shown below.
Model 03: Hypothesis
H8: Perceived Ease of Use is positively affecting end-user satisfaction
The overall modal was valid since the significant value of the independent variable was 0.001. The model was able to explain 24.1% of user satisfaction when referring to the R^2 Value.
In terms of the hypothesis 08, this was supported by the research findings since it showed a significant path coefficient. ($\beta = 0.172$, $P < 0.000$) and was accepted.
The fourth research objective is to determine if the organizational characteristics we have focused on this particular study have any influence on ERP end-user satisfaction. With this intention in mind, a fourth research model was developed as shown below. Under model 03, all hypotheses were accepted.

Model 04: Hypothesis

H9: Top-management support is positively affecting end-user satisfaction
H10: Technical support is positively affecting end-user satisfaction.
H11: User-training is positively affecting end-user satisfaction.
As per the result, the model was valid since the significant values of the independent variables were all under the significant level of 0.05.
The model explained 32.6% of user satisfaction when referring to the R^2 Value.
In terms of hypothesis 09 related to top-management support, research findings were supported since it showed a significant path coefficient. ($\beta = 0.260$, $P < 0.000$) and was accepted.
When discussing Hypothesis 10- Technical support is positively associated with end-user satisfaction was supported since it showed a statistically significant path coefficient. ($\beta = 0.170$, $P < 0.000$).

In terms of hypothesis 11- User-training is positively associated with end-user satisfaction, the research findings were supported with a significance path coefficient. ($\beta = 0.261$, $P < 0.000$).
Under model 04, all hypotheses were accepted.

The first research question focused on six usability characteristics. In terms of hypothesis testing under model 01, all hypotheses were accepted apart from hypothesis 06, which concluded that minimal memory load had no significant positive influence on user satisfaction.

System capability means that the ERP system is suitable enough to carry out its intended purpose well. The respondents have shown that when a system is fast in its functions and there is reliability in the information it provides, users experience a higher level of satisfaction. One of the main purposes of implementing ERP systems is to achieve this level of reliability and faster data processing capabilities. The study findings show that system capability is one of the key factors organizations need to consider when choosing an appropriate ERP system for themselves. The more reliable and faster a system is, the easier it is to use that data in performing job roles and decision-making processes (Calisir & Calisir, 2004; Rajan & Baral, 2015).

When talking about the compatibility of an ERP system, it focuses on a system's being adaptive to customer needs and wants over time. Recently, with the surge of cloud facilities, ERP vendors such as IFS and SAP are moving their products to cloud-based platforms to make the applications available through the web rather than installing them on a machine. This makes it easier for users to log into systems at any time through any device.

To increase compatibility, these applications are designed in a way such that the screens can be viewed from tablets, laptops, and even mobile devices. Although some functions cannot be done on certain devices, they sure give you the opportunity to access applications on the go. With recent work from home and remote working facilities, such compatibility allows users to access real-time information with any device they have access to at a certain moment. Such benefits contribute to the success and satisfaction of an ERP system.

In terms of flexibility, when users have the option to name certain screens and add customizations, it becomes a more tailored system for the particular user. This could increase the meaningfulness of information more than using the standard application. The standard functionalities might not suit a particular organization and creating a customized ERP system could be a costly affair. Therefore, using the standard functionalities while adding certain tweaks and tricks to make them more appropriate to an organization is the usual business practice seen globally. Companies like SAP, Microsoft, IFS, etc. offer the ability for companies to get customizations done either directly through them or their partners. Such services offer users a customizable working system for their operations.
When individuals start their job roles or move into new companies, they have to either get used to a new system or use a system they have prior knowledge of. Even if they have prior knowledge, every business uses their systems for different purposes. For example, we often see instances where the ERP system is only used for financial purposes and the rest of the business functions, such as HR and

manufacturing, use other systems. In such cases, even though you have expertise, you still need guidance to understand how it is implemented in each organization and how much of an ERP system is implemented in a company. It is vital that any system has some sort of user guidance in forms such as tutorials, videos, help pages, online support, etc. In terms of IFS, which is one of the ERP systems discussed in the study, for each window in the application, there is a help page available. Each column and field in these windows, they have a brief description of them as well. End-users can also get access to vendor websites to get training and tutorials for each module, such as finance and supply chain. human capital management, maintenance, etc. The same can be seen in SAP as well. These methods make the user familiar with the system to a certain extent. These findings were confirmed in earlier studies such as Hancerliogullari Koksalmis and Damar (2019) and Calisir and Calisir (2004). The more support a user receives through the methods mentioned above, the more satisfied they will be with using such a system as well.

The study findings showed that user guidance has a positive influence on user satisfaction. An effective ERP system should show error messages that are descriptive and meaningful. That helps to understand what the error is and resolve it by themselves if possible. A meaningful error message would also assist an external support consultant to look into an issue in depth as well. That will save time and effort, resulting in higher satisfaction. It should also provide the ability to undo their actions or cancel their records for creative transactions. It makes it easier for a user to correct any mistakes they have made. In terms of corrective actions, in IFS and SAP, there are multiple ways in which we can undo actions or cancel records. But in some instances, they are not given such options due to their impact on financial numbers. Most of the screens have these options available. The recent cloud platforms have to undo options since they are web-based.

In terms of learnability, the study showed that it has a positive effect on satisfaction. In ERP systems such as IFS and SAP, there are function key options available to access certain functionalities in the system much more easily. For example, in IFS, using F1 will open up help pages, and the F2 key will populate existing records on a particular screen. The availability of such keys makes the work easier, and users are more satisfied.

Minimal memory load points out the importance of having the necessary information on screens and easier access to them. Within this study, it was shown to have no positive relationship with user satisfaction. In most ERP systems, there are certain abbreviations and acronyms that are used. But these terms are specific to each system, and whenever a user is switching to an unfamiliar system, they would have to familiarize themselves with it. This could be one of the reasons it is affecting user satisfaction negatively. The results showed that this does not have any significance for user satisfaction either.

In most instances, we identified that most of the interface characteristics affect the users positively, so it can be taken as an indication for ERP vendors to make changes or updates to their systems to make them more user-friendly.

The second research question focused on under testing the impact of usefulness on user satisfaction. With the statistical analysis, there was a significant positive relationship, and these findings were supported by earlier studies (Calisir & Calisir, 2004; Davis, 1989; Rajan & Baral, 2015; Zviran et al., 2005). The usefulness is mainly measured when an ERP system enhances the job performance of an individual. If it saves time, effort and increases the accuracy of the information, it becomes useful to an individual and thus makes the user satisfied. Therefore, we can justify the positive relationship between usefulness and ERP satisfaction.

The third research question focused on organizational characteristics such as top-management support, technical support, and user-training. Research findings show that there is a positive relationship between top-management support and user satisfaction. Their support includes providing the organization with the necessary funding, resources, and other facilities to carry out ERP

implementation and post-live projects. It also involves the management frequently getting feedback on these systems and encouraging the users to utilize them when performing their daily tasks.

No matter what ERP system is to be implemented, if there is no keenness within the top management to actually go through with such projects, implementations will surely fail, resulting in major financial losses. During implementation, it is the top management's responsibility to communicate and make sure the employees understand and embrace the changes these systems will bring to an organization. Even after implementation, if top-management doesn't encourage or does not provide the necessary funding for the maintenance and upgrading of systems, systems become redundant. Therefore, it is vital that there is top management support for ERP projects. ERP-related decisions should be incorporated into the strategic decision-making processes as well. Having a sound and reliable ERP system can be a competitive advantage for the organization as well. Therefore, management needs to focus on these aspects in business decisions.

Technical support focuses on providing hardware and software support for end-users. No matter which system is implemented, the end-users face technical issues on a daily basis. Such errors disrupt productivity, lowering employee satisfaction. Business operations get affected or halted sometimes. Therefore, it is essential to have personnel that can sort out such issues in a timely manner. This technical support can be provided by an internal team or outsourced. They can be done through hotlines, on-call consultants, automated voice response systems, etc. Whatever the method used; they should be well-equipped with the appropriate knowledge. And the end-users should have a clear idea of who to contact or raise issues with when needed. Study findings showed that top-management support had a significant influence on user satisfaction which was also confirmed in earlier studies (Rajan & Baral, 2015; Yusuf, Gunasekaran, & Abthorpe, 2004).

User training is another organizational characteristic focused on in this study. The study found that this was one of the organizational factors that had a positive association with user satisfaction. If users are given training that is adequate and detailed enough, their expertise and confidence will improve. This will affect satisfaction drastically. The greater the investment in training, the easier it is for users to begin working in a system and adapt. Getting proper training will reduce the mental burden, stress, and anxiety of using a system and give them a better idea of how this system will actually aid them in their work. Even the trainers should be skilled in making demonstrations as well. It's the top-management's responsibility to ensure that skilled trainers are hired or employed. When a user gets enough training, they become confident enough to use the system, and their satisfaction thereafter increases.

5. Conclusion

This research focused on identifying the factors that would have an impact on a user's satisfaction. In the Sri Lankan context, ERP systems were incorporated into companies only a few years ago. Therefore, companies often struggle to understand the factors that would lead to the success of such a system. Therefore, this study used interface usability characteristics, perceived usefulness, perceived ease of use, and organizational characteristics as user satisfaction criteria. Data was collected through an online questionnaire from 78 end-users belonging to a wide range of industries in Sri Lanka. A frequency and regression analysis were done to understand the demographic factors and the nature of the relationship between said factors and user satisfaction. The study identified that usability characteristics such as system capability, flexibility, and learnability had the most influence on user satisfaction. Thereafter, perceived usefulness had a significant relationship, which proved that the more useful a system is when performing a job, the more satisfied the user gets with it (Calisir & Calisir, 2004; Edirisnghe, 2018; L. L. Hsu & Chen, 2004; Rajan & Baral, 2015).

Based on the findings, it was evident that a flexible and compatible system is useful for an individual. If there is useful guidance and support, that affects a higher level of satisfaction as well. Users are more likely to be motivated to work with such systems if top-level management and technical consultants provide sufficient support and training. findings identify what factors ERP vendors can

focus on when making changes to their commercial products and give managers an idea of what factors to look into when choosing the right ERP system for an organization.

5.1. Limitations

The study has only focused on commercial ERP systems such as IFS, SAP, Oracle, etc. But many companies in Sri Lanka use in-house IT and ERP systems for their operations. Therefore, further research studies can focus on doing either a case study analysis or a qualitative study to understand what factors in those systems affect user satisfaction. As public sector IT systems rarely use commercial ERPs, incorporating them into a study could be a valuable approach. Although the conceptual framework of the study only focused on the relationship between each of these factors and user satisfaction, future studies can be conducted to examine significant inter-relationships between each of these factors.

5.2. Suggestions

This could be a valuable approach to incorporating public sector IT systems into a study as they rarely use commercial ERPs. Further studies can focus on more ERP vendors that are operating in the Sri Lankan and global markets as well.

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Annexure 1-Operationalization

Variable	Working decision	Measurement
System Capability	Is the ability of a system to carry out tasks objectives as needed (Calisir & Calisir 2004)	A seven Point Likert-Type Scale
Compatibility	compatibility as the "degree to which an innovation is perceived as being consistent with existing values, needs, and past experiences of potential adopters." (Rajan & Baral 2015)	A seven Point Likert-Type Scale
Flexibility	Within the context of ERP systems, flexibly is the "ability to meet every end-user' tasks or give appropriate results with their expectations to satisfy them." (Ozen & Basoglu 2006)	A seven Point Likert-Type Scale
User Guidance	A system is believed to have good user guidance if it reduces the mental workload of the individual and no additional effort is required to perform tasks. (Koksalmis & Damar 2019)	A seven Point Likert-Type Scale
Learnability	Learnability can be defined as the ease of human-computer interaction with in which new users can start effective interaction and achieve maximum performance. (Ozen & Basoglu 2006)	A seven Point Likert-Type Scale
Minimal Memory Load	A system is known to have a minimal memory load when it provides easily recognizable, sufficient and necessary detailed screens and offers simple solutions. (Ozen & Basoglu 2006)	A seven Point Likert-Type Scale
Perceived Usefulness	Perceived usefulness can be defined as "the degree to which a person believes that using a particular system would enhance his or her job performance". (Davis 1989)	A seven Point Likert-Type Scale
Perceived Ease of Use	Perceived ease of use is defined as "the degree to which a person believes that using the system will be free of effort" (Davis 1989)	A seven Point Likert-Type Scale

Top Management support	Top management support can be defined as the willingness of the top management to provide the necessary resources, authority /power for the success of a project. (Slevin & Pinto 1987)	A seven Point Likert-Type Scale
Technical support	Technical support is defined as the individuals that assist users of computer hardware and software products. (Wilson 1995)	A seven Point Likert-Type Scale
User Training	User training is the process providing the management and employees with the logic and the overall concepts of the ERP system (Yusuf, Gunasekaran,& Abthorpe, 2004)	A seven Point Likert-Type Scale