

Evaluation of ERP System: A Psychological Impact on End-Users Satisfaction using DeLone and McLean model

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ABSTRACT

Organizations make huge investments in adopting and implementing the ERP system within their organizational boundaries. The main objective of organizing large amounts of expenditure for the ERP system is to improve their business transactions, increased employee productivity, increase customer responses and make strategic business decisions. The benefits that are obtained from an ERP system cannot be directly measured in a traditional tangible form such as return on investment, profits, ARR etc., because ERP systems are a facilitator for organisational growth. Benefits obtained from implementing an ERP system in most cases is non-tangible. So non-traditional methods to measure the psychological impact it has on its End-user is chosen. In this study, we evaluate the benefits obtained from implementing ERP systems in an Organisation using the well-acclaimed DeLone and McLean IS success measurement model. Variables used to measure the ERP system success includes 1System quality, followed by 2Information quality, 3Use of the system, 4Service quality, 5User satisfaction, 6Individual impact on the end-users, and 7Overall organizational impact. Findings from the study indicate that that the impact obtained from using and adopting an ERP system is majorly seen at Individual Level and also at the organisational level i.e., approximately 92.1 per-cent and is statistically significant. ERP service quality and ERP information quality using ERP to be around 95 per-cent and therefore statistically significant. Finally, the study concludes that among other variables of the study the service quality that is being delivered to the end-users is having the highest level of psychological impact on the end-users in making them use the ERP systems effectively and there is also an increase in their satisfaction levels of the end-user after using the ERP systems.

Keywords

Psychological, Quality, Organisation Impact, ERP system, DeLone McLean Model, IS Success, User Satisfaction.

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Introduction

Companies began to use information technology due to globalization and market volatility which has made many companies more efficient and connected to their businesses. ERP believes that the best IT technology for the organization should work effectively with its internal resources to support critical business functions. The ERP system refers to the company's software suites that collect and organize information from various levels of the company. It helps the organization to conduct an important process such as production, Inventory control, logistics, sales & distribution, financial management, Payroll, Human Resource Management, Customer relationships Management etc under a single umbrella (Chou & Hong 2013, Rajan & Baral 2015, Almajali et al 2016). Combining the above process and linking departmental activities via a comprehensive software package. The packages are intended to build operational cooperation and improve business performance in general. This allows businesses to grow and improve their efficiencies

and have a competitive edge over their rival companies in the market. The majority of companies have started using ERP systems or they are in the process of adopting any one type of ERP systems to address competitive pressures and exploit the market opportunities available on the market (Bingi et al 1999). The main objective of using ERP in the organization is to combine information systems in the internal business process that should speed up the company's value-added process. Although the ERP has tremendous benefits, it is considered one of the organization's biggest IT investments. The implementation of ERP in the organization is a time-consuming process and is quite expensive at an organisational level. Companies take many years to implement and the costs for a medium-sized company can be US\$ 10 million. The company spends USD 100 million worldwide on major international companies (Mabert et al 2000). The main goal of organizing large amounts of costs for the ERP system is to improve business processes, accelerate customer response and improve

strategically the business. However after the implementation of the ERP systems also many companies have struggled to achieve their business goals and that have in turn caused a financial crisis (Saade & Nijher 2016, Calisir 2004). In the study, Panorama Consulting said that 67.5% of the organization which is the majority of them did not realize at least half of the expected benefits which are supposed to be obtained once the ERP implementation process gets completed for an organisation. The number of ERP implementation failures that are been registered has increased by 5% (Panorama Consulting Group, 2015). Consequently, many studies concentrated more on dissatisfaction with the ERP system but did not achieve the expected benefits. For evaluating the information system that is being used, the concept of measuring the success of an information system has been widely accepted. The researchers thus want to assess the quality of the ERP system using DeLone and McLean models in this study. The taxonomy and interactive model were framed by DeLone and McLean to have a clear concept for measuring the success or its impact of the information system in the year 1992 and updated in the year 2003. The author indicated seven dimensions, including 1System quality, followed by 2Information quality, followed by 3Service quality, 4Use of the system, 5User satisfaction, 6Individual impact on the end-users, and 7Overall organizational impact. The ERP success measurement model as proposed by Delone and Mclean (2003) is a critically acclaimed ERP success measurement model which has been received a great level of acceptance and evaluation studies have also been conducted using this model frequently by the researcher's community, but the ERP system study in the domain of the Coal Mining Industry has received much less importance. Therefore the researcher takes the idea into account and conducts a study at Mahanadi coalfield in Orissa

Objectives

The study aims to evaluate the ERP system using the IS success model. The IS model assessed ERP's success and identify the impacts of Mahanadi coalfields Limited in Odisha.

Scope

The research under focus is for the Evaluation of ERP success and to study its impact using the DeLone and McLean IS success measurement

model. The analysis does not find any attributes apart from the performance model attributes of IS. The study, therefore, paves the way for an organization to recognize whether or not the ERP system offers benefits to it. The IS success measurement model is used in the study to analyse the relationship that exists between the system quality of ERP systems and their net benefits that have been obtained from implementing the ERP systems within an organisation.

Background of the study- As we can see in the ERP success evaluation studies the most appropriate theory used to evaluate the success of an ERP system is done through using the famous and most revered DeLone and McLean model. The theory has identified seven variables of success measurement, included system quality, followed by information quality, use of the system, service quality, user satisfaction, individual impact on the end-users, and overall organizational impact. Theoretically, system quality and Information (knowledge efficiency) are the two key determinants for end-user satisfaction and use of the ERP systems. This has a direct impact on the individual level, which directly leads to an organizational impact.

System quality- This reflects the attractive features of the ERP systems that are desirable to its users. This includes how simple it is for users to use, how versatile it is to use the program, how effective it is for the company, sophisticated, flexible, reliable, and how responsive the system is for its users who use them.

Information quality- It represents how the system has certain features and provisions in them to provide an effective output in the form of data and pieces of information that are required for making crucial decisions for achieving organization as well as strategic goals. It can be the production reports, balance sheets, ledgers, Inventories, statements, etc. It is in the context of timeliness, accessibility and the degree to which users understand it, and the consistency that it provides.

Service quality- It illustrates the degree to which the system users are provided with the quality of support from ERP systems developed organisations and the in-house system support teams within the organisation. In the context of technical competitiveness, accuracy, responsiveness and empathetically understanding

user problems information system organizations and their workers.

Use- It is nothing but how the end-users are using the systems to perform their day-to-day assigned jobs with the help of information made available by the ERP systems. The use of the systems can be in the context of volume to which the systems are being used, the purpose of use, the frequency or number of times in a day the systems are being used, the extent or the level to which the systems are being used, and the appropriateness of use.

User satisfaction- It is nothing but how and to what extent the users are felt satisfied while using the ERP systems within the organization from the Content, Reports, and support services provided to them.

Impacts- The extent to which the ERP systems are contributing or not after they have been implemented and made functional within the organisational boundaries needs to be measured effectively. We have considered the impact that the ERP systems have on its Individual Level and the Organisational level for this study. The impacts are a picture that shows how and to what extent the ERP systems are contributing to making an organisation successful.

Review of literature

This section discusses the literature in the context of the work. The literature review managed to gain sources of journals, publications, and magazines followed by books and technical reports that have contributed to identifying the ERP success measurement studies. This section covers the empirical results of several authors examined and investigated in particular to acknowledge the feasibility of established research objectives.

Zouine & Fenies (2015) has been pointed out that the evaluation of the success model of ERP software. The author evaluates it using approaches, frameworks, and success models previously used by other authors and empirically validates it using the IS field. The Evaluation Success Model was created by considering three attributes, such as technological, followed by environmental and organizational factors. The main objective of assessing the three attributes was to recognize their investment in the IT project. Finally, the assessment obtained from the study helps to analyze the success of an ERP system. We have acknowledged that the authors

have recognized the three attributes of DeLone and McLean. Therefore we have used variables such as the quality of the system and data quality i.e., information obtained from the ERP system to evaluate its success.

Chung et al (2009) stated that the major construction companies used integrated information technology solutions such as ERP to perform the functions effectively. Generally, the construction sector was filled with constraints and therefore the authors focused on how the ERP system was developed and it was a guide for a successful implementation of the ERP system in the construction sector. To identify attributes, the authors have developed a conceptual framework using the TAM and DeLone & McLean ISS model. Using regression analysis, the study assessed both dependent (success) and independent variables (user-related variables, project-related variables, and TAM). The study found that attributes had an indirect impact on success factors. The study, therefore, recognized the success model of D&M IS and used statistically significant variables such as ERP service quality and ERP use for the same purpose in the study.

Mukti & Rawani (2016) has stated in their study that success measurement was used to evaluate, plan and implement the ERP system to have an effective organizational outcome. In this study, the authors reviewed all models and the execution of the studies using secondary data. The authors attempted to point out the different dimensions of the model to recognize the unique characteristics of model. In assessing the models, the authors stated that the attributes were crucial in assessing the success of the system, including attributes relating to human touch, organizational clarity, and vendor. Also, some attributes, such as SQ (System Quality) of an IS, followed by IQ (Information Quality) of an IS, OI (Organizational Impact) of an IS, and assessment of project success and benefits of use, are vital for assessing the success of the system. Because of the factors, the researcher acknowledged that the most important attributes had been taken into account in assessing the organization's success of the ERP.

Tsai, et al., (2009) have stated that the ERP system has linked business processes and the information system to make it more reliable and to meet the real-time requirements on time. Because

of the inconsistency, the authors surveyed Taiwanese firms implementing the ERP system. The key objective the researcher has focused on the evaluation of factors and attributes that are involved in measuring the success of an ERP system with the help of the DeLone-McLean model. In their research, the authors considered five attributes of service quality and all the attributes of the success model. The study found that Taiwanese companies have a higher quality of service due to continuous support from ERP system vendors and consultants. This, in turn, has made the organization more effective in the organization.

Lin et al (2006) in their study represented the redefined success model of DeLone and McLean to evaluate ERP systems. To evaluate it, the authors used the attributes of success and the balanced scorecard. Assessing the attributes of the 257 Taiwan companies. The findings obtained from the study shows that the success of the ERP system was assessed using the IS model and the outcome was highly consistent. The variable that was used to measure the IS success i.e., 1System quality and 2information quality are having a significant impact on the using of ERP systems and also have a significant impact on the end-user satisfaction levels of the users who are using the systems. Also, the individual impact positive gains is mainly due to the end-users using the systems and the level of end-user satisfaction. Balance Score Card Perspectives stated that all variables had an individual impact on the selected organization in Taiwan.

Vachiraporn Khayun et al., (2011) in their study of evaluating the success of e-Excise Tax using the D&M Model have found that building trust among the users who are using the ERP systems is significant and necessary for any ERP system to be successful. The level of trust amongst

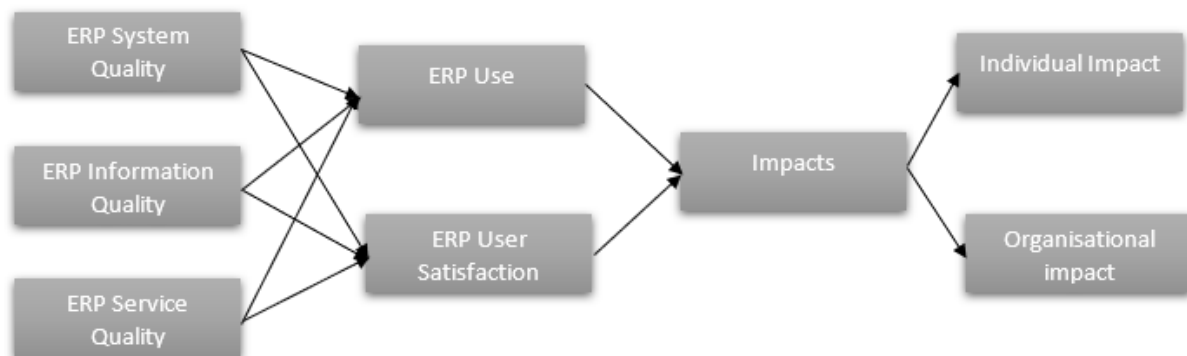
individual users can be improved by providing continuous support and enhancing the variables of quality.

Michael Wambwere Makokha (2014) in his research proposal for finding the Success of ICT's in Coffee Research Foundation using Delone and Mclean Model – Most of the users using the ERP systems for performing their day-to-day job will use the systems more frequently if they are satisfied with the 1System quality of an ERP system, 2Information Quality of an ERP system and 3Service Quality of an ERP system. Any improvements in the Quality of the System, Information, and Service delivered will lead to having positive reverberations on the use and user satisfaction variables, and this, in turn, leads to having positive or negative impacts respectively.

Sakineh Saghaeiannejad-Isfahani et al., (2014) in their combined Survey for considering the User Satisfaction of HIS using the D&M Model in Isfahan City, Iran. The study states that the evaluation process of the ERP systems and their impacts is endless and continuous. The evaluation of the ERP systems without analyzing the impact it has on its end-users, its evaluation is incomplete. The satisfaction of the users who are using the ERP systems is regarded as the performance guarantee. A system if it fails to satisfy its end-users and is not regarded as a consumer-based system is adjudged as a weak and inefficient system.

The biggest reason an ERP system fails to achieve its desired objectives is mainly due to ignoring and paying limited or little attention to human-related factors influencing the system. There should be a proper interface between the ERP systems and their end-users which can create a sense of ownership among them towards the system.

Conceptual framework



Research methodology

The analysis is quantitative since the researcher uses an online survey to carry out the survey. Research sees the population as employees of Mahanadi coalfields Limited in Orissa. Samples are chosen based on probability sampling, taking simple random sampling into account. The researcher measures ERP system quality variables followed by ERP information quality, followed by ERP service quality using D&M Model 2003) while organization & individual impact variables were taken from Roky, H., & Al Meriouh, Y. (2015).-Yes. All variables were evaluated using a five-point scale. The key objective of using a five-point scale is to reduce the level of frustration among respondents and to increase the response rate and quality.

Data analysis and interpretation- This section examines DeLone and McLean success variables IS model variables such as 1System quality, 2Information Quality, 3Service quality, 4Use, 5User Satisfaction, 6Organisational Impact, and 7Individual impact using correlations and regressions.

- The relationship between independent and dependent is determined by the Pearson correlation
- The find out the impact that the independent variable has on the dependent variable is determined by multiple linear regression. In this study, the researcher includes quality of 1System, 2Information, 3Service, and 6Individual impact are treated as independent variables while the dependent variables are 4Use, 5User satisfaction, and the 7Organization Impact.

Particulars	Correlation value	Sig	Outcome
Use and DeLone and McLean’s success attributes			
Service quality	.211	.000	S
Information quality	.196	.000	S
System quality	.283	.321	IS
Individual impact	.026	.128	IS
User satisfaction and DeLone and McLean’s success attributes			
Service quality	.107	.000	S
Information quality	.135	.000	S
System quality	.057	.112	IS

Correlation between Use and DeLone and McLean’s success attributes- The first variable (use and service quality) indicates that the correlation value is 0.211 and has a P-value is 0.000. It thus concluded that there is a link between use and service quality.

The second variable (information quality and use) shows that the correlation value is 0.196 which has a P-value is 0.000. Therefore it is evident from the results obtained that the information quality and use of the systems have a strong positive association.

The third variable (system quality and use) reveals that the correlation value is 0.283 which has a P-value is 0.321. It thus concludes that system

quality and use of the systems do not have any significant relationship between them. The last variable of measuring the ERP success being individual impact and use of the systems it is found that the correlation value is 0.026; the P-value is 0.128. Hence it is concluded that between individual impact and use there is a non-significant relationship.

Correlation between the User satisfaction variable and success attributes of the D&M Model- The first variable i.e., Service quality and End-User satisfaction indicate the correlation value as 0.107 and the significance value as 0.000. The Service quality imparted by the ERP systems to its end-users has a positive association with the success measuring variable i.e., User satisfaction.

Linear regression showing the impact of DeLone and McLean’s success attributes

Particulars	R-square	F	Sig	Beta	Outcome
Organizational impact and individual impact	.921	.036	.000 ^b	.029	S
Use and Individual impact	.950	1.760	.000 ^b	.046	IS
Use and Service quality				.271	S
Use and Information quality				.209	S
Use and System quality				.146	IS

The second variable i.e., Information quality obtained by the ERP systems and the level of End-User satisfaction commanded by the ERP systems shows that the correlation value as 0.135 and the P-value is 0.000. Thereby it is evident that the information quality or the data obtained by the ERP systems which are used by the End-users for performing their tasks is sufficient enough and thereby has a strong and positive association with User satisfaction. The last variable i.e., System quality and User satisfaction have revealed that the values of correlation are 0.057 and the P-value as 0.112. The users are not in the favour of System quality that is being reproduced by the system, there is a need for an improvement in the quality of the system for making the end-user satisfied. Presently as we can see that there is a non-significant relationship between the system quality and end-user satisfaction.

Organizational impact and individual impact- It can be seen from the table above that the R-square value is 0.921 which is high and suggesting a close relationship between the variables. So the R-square value shows that the organizational impact has a 92.1 per-cent impact on the

individual. The ANOVA indicates that the F-value is 0.036 and the significance level is 0.000. The regression test shows that the beta value is 0.029, and the P-value is 0.000. It is concluded that there is a strong positive influence on Organizational impact and individual impact.

Use and individual impact- The R square value is 0.950 which is high, suggesting a close relationship between the variables. So the R-square value shows that the user has a 95% impact on the individual. The ANOVA shows that the F-value is 1.760 and the P-value is 0.000. The regression test indicates the beta value is 0.046 and the P-value is 0.128. It is concluded that there is no influence of Use and individual impact.

Use and Service quality- The regression test shows the coefficient value is 0.271 and the P-value is 0.000. Thus it is evident that there is a strong positive influence on Use and Service quality.

Use and Information quality- The regression test reveals the coefficient value is 0.209 and the P-value is 0.000. Thus it is evident that there is a strong positive influence of Use and Information quality.

Use and System quality- The regression test indicates the coefficient value is 0.146 and the P-value is 0.321. Thus it is evident that there is no positive influence of Use and System quality.

Empirical analysis

- The coefficient of correlation between ERP service quality and ERP use secures value as 0.211 and it's statistically significant.
- The coefficient of correlation between ERP Information quality and Use of the ERP systems secures a value i.e., 0.196 and it's statistically significant.
- The coefficient of correlation between ERP system quality and Use of ERP Systems secures a value i.e., 0.283 and it's not statistically significant.
- The coefficient of correlation between individual impact and ERP use secures value as 0.026 and it's not statistically significant.
- The correlation coefficient between ERP service quality and ERP user satisfaction secures value as 0.107 and it's statistically significant.
- The correlation coefficient between ERP information quality and ERP user satisfaction secures value as 0.145 and it's statistically significant.
- The correlation coefficient between the ERP system quality and the user satisfaction of the ERP systems secures a value of 0.057 and is not statistically significant.

Considering regression, the impact of using an ERP system having an individual impact which influences the organization impact of about 92.1% and its statistically significant. ERP service quality, ERP information quality, having an ERP uses' to be around 95% and hence it is statistically significant.

Discussion

The study indicates that the quality and effectiveness of information and data being generated from the ERP systems have a positive impact on ERP users' satisfaction. Studies by authors such as Teo & Wong demonstrated the same outcome (1998), Coombs et al. (2001); Scheepers et al. (2006). ERP service quality is also a positive link to the ERP system used in the

organization. However, the results of the study by Gefen, 2000; Gill, 1995 are quite contradictory. Furthermore, we can also conclude that more the use of an ERP system by its end-users will lead to having a positive relation with the ERP systems individual impact on the users using them. The results of Belcher et al., 1993, Teng et al., 1996; Devaraj et al., 2003; Zhu et al., 2005 and Leclercq studies, 2007 have likewise been demonstrated. Finally, the study concludes that there is a strong link between the Individual impact of an ERP system and its Organisational Impact respectively. Furthermore, it is also analysed that the individual impact of an ERP system has a consequential positive effect on the organizations' impact as a whole. The study of HanaeRokya*, Youssef Al Meriouhb showed results.

Managerial implications

The findings show that the ERP system offers the organization benefits. It is essential to accelerate productivity, increase client satisfaction with our services and facilitate information sharing within the company's internal departments. This enables the organization to obtain a high level of performance. The researcher will assess the ERP system in the organization. Based on observations, it is clear that the top management can determine how the system works towards the organization's goals. They can also find ways to improve the system further. The results show that the model helps to measure the ERP system's success in the organization. The researcher has found that the service quality of the ERP system that is delivered to its end-user has a dominating influence on making the users use the ERP systems, Influence End-user satisfaction, make an impact on the individual level of the users who are using these systems and as well as have an organizational level impact. Due to these aspects of making an ERP system successful, the top management can allocate enough resources to speed up and update the quality of information being delivered to its end-users

Conclusion

The study aims to evaluate the relation between DeLone and McLean ERP success measurement model with all its success measurement variables' and to analyse their psychological impact on the end-users at an individual level and the organizational levels as a whole. The study shows that the variables are strongly and positively

related to other variables. The regression analysis has resulted in the highest psychological impact that has been taken place on the end-users using the ERP systems and there is also a psychological impact on the levels of user satisfaction to that of the service quality that is being delivered to them while performing their jobs. It has also indicated that a positive and significant level of psychological impact on the End-users of an organisation at an individual level will in turn have a positive effect that reverberates at the organisational level.

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