



INFLUENCE OF ERP SYSTEMS SECURITY IMPLEMENTATION ON PROCUREMENT PERFORMANCE OF GUSII WATER AND SANITATION COMPANY, KENYA

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ABSTRACT

Organizations today consider procurement function to be core to organizational performance. One key strategy adopted by service organizations is the implementation of Enterprise Resource Planning (ERP). However, despite ERP implemented, most service organizations record fulfillment of an average of 60 – 70% of the customer requirement. Further, empirical evidence shows that among service organizations that have adopted ERP in their business operations, about half have indicated fair performance, a situation attributed to by poor handling of Critical Success Factors (CSF) during implementation. This study analyzed the influence of ERP Systems security implementation on procurement performance of Gusii Water and Sanitation Company, Kenya. Diffusion of Innovations Theory and the Information Systems Success Model guided the study. A correlational design was adopted. Primary data were collected using structured questionnaires administered to 152 out of 250 employees. Hypothesis was tested using t-test. Results indicated that ERP system security had significant influence on procurement performance ($t = 19.626, p = 0.000$). The study recommends that the organizations need to establish an effective modern ERP systems security measures in order to realize its set objectives that are pro procurement performance. The study findings provide useful insights to the academia, industry professionals and governments seeking to improve on their procurement processes.

KEY WORDS: *Enterprise Resource Planning, Systems Security, Procurement Performance*

1.0 INTRODUCTION

ERP systems have found widespread usage in large and mid-sized organizations worldwide. In the last decade there has been a rapid increase in implementation of ERP systems in management of various functional areas in service organizations (Pollock & Cornford, 2004). Most service organizations turned to ERP systems to replace existing manual system of managing functions. In analyzing rollout of ERP systems in organizations,

focus has been placed on development, implementation and use of both generic and organizations specific functionalities like procurement. These technologies have been used to improve service delivery and cost reduction in organizations as they claim their footing in the competitive business environment.

ERP is useful tool which enables Organization gain a holistic view of procurement therefore identifying opportunities for consolidation and cost

reduction. It has a positive impact on the ability of businesses to improve working capital, implement a Total Quality Management (TQM) culture, lower inventory levels, optimize raw materials and sell and deliver products to the customers (Shtub, 2001). ERP has helped alleviate the arduous job of supporting inflexible systems that in most cases result in cost increases, data redundancy and inaccuracy and above all, various inefficiencies (O'Leary, 2000). Ideally, ERP is an information system that keeps managers informed about what is happening in real-time throughout a corporation and its global connections.

Recent studies indicated that ERP systems implementation is affected by a number of factors: top management involvement, maintenance cost, system security, training and resistance to change (Wei & Thuraisingham, 2012; Al-Nafjan & Abauka, 2011). Similarly other studies support the idea that ERP implementation is affected by these factors (Bhattacharya & Chellasang, 2016; Marnewick & Labuschagne, 2005). While it is true that the mentioned factor affect ERP implementation, the extent to which these factors influenced ERP implementation in relation to procurement performance is not clear. Therefore, the purpose of this study was to analyze ERP implementing factors system security, maintenance costs, resistance of employees training of employees and procurement performance in organizations by establishing the level of influence of these factors with a case of Gusii Water and Sanitation Company (GWSCO). To achieve this, the study was based on Diffusion innovation Theory by Everest, (2013) plus Information Success Model by DeLone & McLean, (2003).

Procurement performance starts from purchasing efficiency and effectiveness in the procurement function in order to change from being reactive to being proactive to attain set performance levels in an entity (Knudsen, 1999). Van Weele (2002) views purchasing performance to be the result of two elements: purchasing effectiveness and purchasing efficiency. Performance provides the basis for an organisation to assess how well it is progressing towards its predetermined objectives, identifies areas of strengths and weaknesses and decides on future initiatives with the goal of how to initiate performance improvements. This means that purchasing performance is not an end in itself but a means to effective and efficient control and monitoring of the purchasing function (Lardenoije, Van Raaij & Van Weele, 2005). Organisations which do not have performance means in their processes, procedures and plans experience lower performance and higher customer dissatisfaction and employee turnover (Artley & Stroh, 2001; Amaratunga & Baldry, 2002).

Implementation of ERP system ultimately requires significant changes in organizations in terms

of processes and practices. This necessitates organization to reengineer operations leading to number factors to be considered before implementation ERP system. According to Aladwani, (2012) ERP implementation factors can be classified into organizational, technical, and people factors. Authors like Umble, *et al.* (2004) and Stewart, *et al.* (2000) gave importance of these factors and highlighted issues which are key for successfully implementation of ERP in organizational. This study was focused on the following factors; system security, maintenance cost, change resistance and training of staff from different categorization of technical, organizational and people factors (Al-Mashari & Zairi, 2012).

System security includes; operating system, authorization, network equipment, access, application access system functions, data access, virus prevention, intrusion monitoring, tracking data changes, the security of data backup and archiving, security management regulations of the host room, the system and the administrator's supervision. Therefore in the implementation of ERP systems, the wide spread phenomenon of no great importance to system security Such as: Users do not pay attention password confidential, and so on more than super-user authorization. Despite increasing investment in information security and its strategic role in today's business success, effective implementation of information security strategy still remains one of the top challenges facing global organizations (PricewaterhouseCoopers, 2016). Success in such demanding business environments depends in large part on implementing an effective information security strategy to protect information and information assets. It is clear that most ERP implementation failure could be attributed to lack of security measures in organizations to safeguard the ERP system leading to its failure hence this study sought to establish the level of influence of system security on ERP implementation.

2.0 LITERATURE

2.1 Diffusion of Innovations Theory

This theory has its backbone in communications and seeks to explain how an idea or product gains momentum and spreads through a specific population or social system. The result of this diffusion is that users accept the new idea or innovation. Adoption as brought out in the theory assumes that users have different perception on innovation compared to previous products or innovations. This facilitates the diffusion process.

Diffusion of Innovations Theory assert that theoretically, 49%-87% of difference of an innovator's rate of adoption is explained by its perceived attributes, type of innovation decision, and nature of

social system which the innovation is accepted and the extent of the agents promotion efforts in diffusing the innovation (Nzuki, 2012). The theory is useful to both the developers and users of ERP systems in appraising how these systems are implemented in various projects. As argued by Rogers (1995), an innovation such as use of Enterprise systems in organizations is viewed as a technological innovation. This is realized as a result of paradigm shift from stand-alone information systems to integrated information systems.

The research study borrowed from the third (decision) and fourth (implementation) steps in the DOI theory. With the use of ERP systems implemented at GWSCO, it can be interpreted as a technological advancement and the company is assumed to have undergone the first, second, and third

processes in the diffusion of innovations theory as advanced by Rogers (1995). These include gathering knowledge about the ERP systems, persuading stakeholders to support the selected systems in automating their institutional operations and making the decision to effect the systems. While guided by the diffusion of innovations theory, the researcher will sought to establish the institutional experiences during the implementation phase of the ERP systems in organizations. The information systems success model as advanced by DeLone & McLean (2003) borrows from earlier research in communications by Shannon and Weaver as well Mason’s theory on Information Influence.

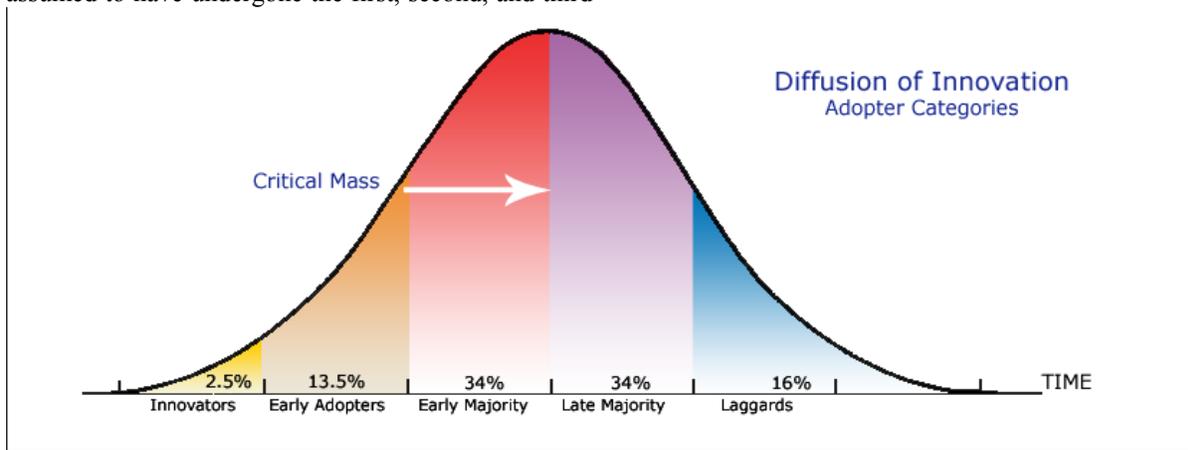


Figure 1: Diffusion of Innovation Adopter Categories

Source: Rogers, (1995)

2.2 Information Systems Success Model

This model is anchored on three key pillars of information systems; System Quality, Information Quality and Service Quality. The theoretical model makes use of a causal relationship to analyze success of implementation of information systems in institutions.

DeLone and McLean (2003) revised the Information Systems Success Model to comprise six interrelated dimensions which influence success in implementation of an information system. These dimensions are information quality, system quality and service quality as independent aspects which affect the intention to use, user satisfaction and net benefits

derived from implementation of an information system. The model stipulates that an information system such as an ERP system can be assessed in terms of information, system and service quality. Additionally the model can determine system use, intended use, end user satisfaction and net benefits from deployment of the system. Net benefits derived from use of an ERP system can be of either positively or negatively influence the satisfaction of users. Net benefits from implementation of an ERP system aid in determining the feasibility of implemented system (DeLone & McLean, 2003).

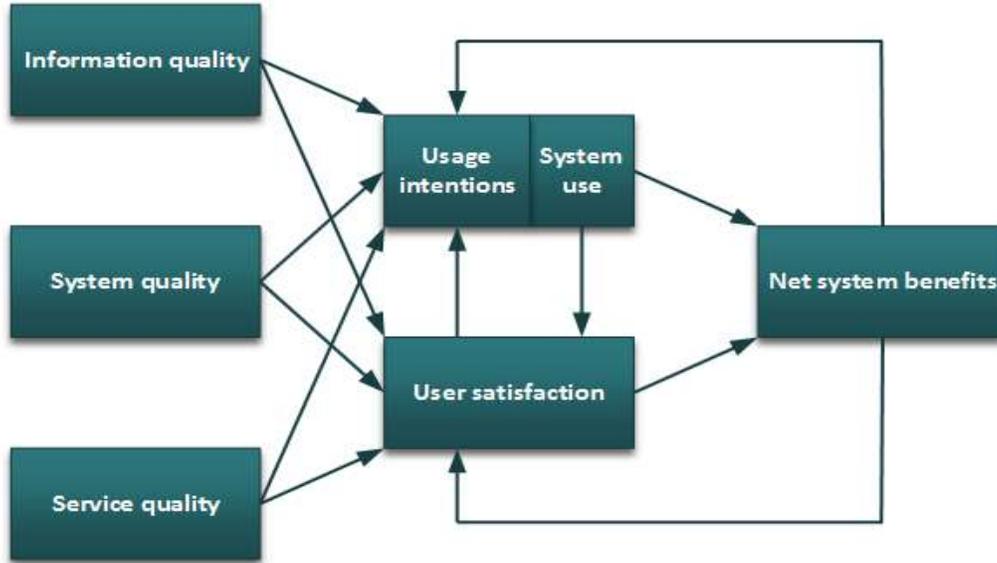


Figure 2: ISSM model

Source: DeLone & McLean, (2003)

2.3 System Security

A system security is responsible for controlling access to a computer system's resources; sensitive data and operating system files and preventing unauthorized persons from entering or accessing a system. A system must therefore include a certain amount of protection for such data, and must in turn control access to those parts of the system that administer this protection. System security controls involves processes and methodologies which keep information confidential, available and assuring its integrity. ERP being an IS it requires these controls to ensure its success. Information Systems Success Model (ISSM) by DeLone & McLean (2003) stipulates that a system is safe when it has quality data, information, system and service; this can only be achieved when an organization has put in place tight security control measures that ensure the system is not infiltrated.

2.4 ERP System Security and Performance

A study in the USA by Wei and Thuraisingham, (2012) established security solution in ERP as well as directions for secure ERP systems. Findings show that security is critical for ERP systems and organizations need to develop security policies using the approach of network layer, presentation layer and application layer. Although the findings indicate that security issues are key in successful ERP implementation, the scholars did not illustrate the extent to which these issues affect ERP implementation. Moreover, the study did not link ERP implementation to procurement performance. Therefore this study sought to establish the extent to

which security policies affect ERP implementation in service organizations.

A study conducted by Grabski, Leech and Lu,(2001) on risks and controls in implementation of ERP systems in USA indicated that ERP systems implementation is different from other information systems and significant risk affecting ERP implementation were, technological change, organizational change and project complexity. The study indicated that these risks were hallmarks of most (if not all) ERP implementation. The study further indicated that the risks need to be understood and mitigated using controls like project team members skills and knowledge, consultant involvement, post implementation review and training sessions. The study concluded that ERP system implementation is dependent in first instance on identifying the major business risks alongside the controls to minimize the risks involved in ERP implementation. The findings provide evidence that ERP systems are different from other information systems. However, the study did not indicate these differences and extent to which the risks affect ERP implementation. This study sought to bridge the gap by establishing the extents to which the risk identified affect ERP implementation in relation to procurement performance in organizations.

In India Bhattachrya and Chellasang, (2016) carried out an analysis on security issues in ERP implementation process in India power distribution companies. They study aimed to establish the security issues in ERP implementation. Their findings on security measures during and after ERP implementation was essential for successful ERP

implementation. ERP security is necessary for data integrity and finally security for important data is of great importance in ERP implementation. The researchers concluded that security is a vital element for overall successful implementation of ERP, which has both regulatory and financial impact which cannot be ignored. From conclusion of the researchers it can be noted that security is vital and has both regulatory and financial impact which cannot be ignored however the researcher did not indicate the extent which the financial and regulatory impact will affect ERP implementation if ignored. This study looked at the extent to which the financial and regulatory impacts affected ERP if overlooked in the implementation process.

Ramdas, Wanare, Mudiraj, (2014) carried out a study on system issues and their counter measure in ERP implementation. Their purpose was to establish the importance of ERP system security and various issues tackled by the organizations. They found out that, for organizations to overcome system security issue they need segregation of duties controls, support and keep updates with ERP development team and have better security policies and making them by creating awareness among stakeholders. They concluded that many organizations are not giving the importance of security constrains of database information which is key in successfully implementation of ERP additionally they noted that information protection mechanism is key in successfully implementation of ERP systems. From the findings of this study it can be acknowledged that system security is a concern for successfully implementation of ERP however the study missed out on how these key issues like influence implementation of ERP in relation to procurement performance. This study thus established the extent to which information protection mechanism relate to ERP system security implementation.

In South Africa, Marnewick and Labuschagne (2005) carried out a study on a security framework for an ERP system. The researchers carried out interviews along aside review of literature to establish the security framework used when implementing ERP. They found that the generic information security framework existed and it consisted of three components; people, policy and technology which are

interdependent such that any change to one of the component will affect the other two, ERP cannot be implemented or managed without taking the security framework into consideration and finally security framework provides guidelines, policies and standards to implement and manage the ERP system. They concluded that security framework ensures that all aspects surrounding IT and corporate security are built into ERP and ERP security measures are ongoing process that requires checks and controls. Even though these research found that security framework consisted of three components people, policy and technology which are interdependent such that any change to one of the component will affect the other two, the failed to indicate effects of removing one component during implementation and extent it will affect ERP issues. This study thus sought to establish the effects of removing either component of security framework and extent to which it will affect ERP system security implementation.

3.0 METHODOLOGY

The study adopted correlational design to determine the extent to which the variables were related. Primary data were collected through questionnaires to a sample of 152 out of the 250 employees of Gusii Water and Sanitation Company. The sample was obtained using Morgan and Krejcie sample size table.

Validity of the research instrument was obtained using Content Validity Index (CVI). CVI is item rated 3 or 4 by both judges divided by the total number of items in the questionnaire. The CVI obtained was 0.78 which is acceptable in research. Test re-test method was adopted to gauge the reliability where six employees drawn from each of the six departments were given the questionnaires to fill and the same was repeated and over 70% consistency in responses was ascertained. Both descriptive and inferential statistics were used to analyse the data.

4.0 RESULTS AND DISCUSSION

The study hypothesized that ERP systems security has no significant influence on procurement performance. Descriptive analysis of the data gathered gave out the results in Table 1 below:

Table 1: ERP Systems Security Control and Procurement Performance

	N	Mean	Std. Deviation	Std. Error Mean
System Security Control	146	3.12	1.307	.108

To find out this a t test table was used to test the hypothesis. From the t test (Table 1)indicated this factor had a mean of 3.12,std deviation of 1.307 and (Table 2) indicating degree of freedom was 145 and significance confidence level was 95%.A critical t value from the student table, t table t(0.05) is 1.660.This critical t value was then compared against the computed t value of 19.626 .From the comparison it was established that 19.626 > 1.660 leading to failure to accept the null hypothesis(ERP system analysis has no significance influence on procurement performance) hence the alternative hypothesis(ERP system analysis has latest significance influence on

procurement performance. From the analysis above it can be concluded that ERP system security had at least significance influence on procurement performance. This implies that if security issues are not well managed in organization the system can be infiltrated hence exposure of organization to internet crimes and competitors. This finding is consistent with that of Severin, Stewart and Bai, (2012) in their study by asserting that security issues are pertinent in ERP implementation due to increased internet crimes which can to exposure of organization if systems in organizations are not secured.

Table 2.One-Sample Test

Test Value = 1						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
System_Security_Control	19.626	145	.000	2.123	1.91	2.34

N= the total sample size (Respondents interviewed) = 146
 Degree of freedom of 145
 The significant confidence level of 95% on one tailed test

The critical t value from the student t Table, t (0.05) is 1.660. This critical t value of 1.660 was compared against the computed t value of 19.626 and it was established that 19.626>1.660 leading to failure to accept null hypothesis(ERP systems security has no significant influence on procurement performance) thus alternative hypothesis was accepted (ERP systems security has significant influence on procurement performance).

CONCLUSION

Based on the findings that ERP system security had a significance influence on procurement performance, the study concludes that both service and manufacturing organizations should implement ERP system security as it positively influences on procurement performance. These organizations need to establish effective modern ERP systems security measures in order to realize the set objectives for improved procurement performance.

REFERENCES

1. Aladwani, A. M. (2012). *Change management strategies for successful ERP Implementation Business Process Management Journal*, 7 (3).
2. Al-Mashari.M, Al-Mudimigh, A & Zairi.M, (2013).*Enterprise resource Planning a taxonomy of critical factors. European Journal of Operational Research*, 146 (2), 352-364.
3. Al-Naffjan, A. N. & Abdullah S. A. (2011). "The impact of change management in ERP system: A case of Madar." *Journal of Theoretical & Applied Information Technology* (23), 2.
4. Amaratunga, D. & Baldry, J. (2002). "Characteristics of supply chain management and the implications for

- purchasing and logistics strategy". International Journal of Logistics Management*, 4(2), 13-24.
5. Artley, W., & Stroh, S. (2001): *The Performance-Based Management Handbook, Volume II*. Retrieved March 24, 2017, from Oak Ridge Institute for science and education.
6. Bhattacharya, T. & Chellamy, P. (2016): *An analysis of ERP security issues in ERP Implementation process of Indian power distribution companies (Discoms)* *International Journal of Applied Research*; 2(7): 34-38
7. DeLone, W.H., & McLean, E.R. (2003). "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems* 19(4), 9-30.
8. Stewart, G., Milford, M., Jewels, T., Hunter, T., & Hunter, B. (2000). "Organizational readiness for ERP implementation," *Proceedings of the Americas Conference on Information Systems*, 966 - 971
9. Grabski, Leech & Lu, (2001). *Risks and controls in the implementation of ERP systems. The Internal Journal of Digital Accounting Research*, 1(1)
10. Knudsen, K. D. (1999). *The struggle for accountability: The World Bank, NGO, and Grassroots Movements*. Massachusetts Institute of Technology. ISBN 0-262-56117-4.
11. Krejcie, R. V. & Morgan, D. W. (1960). *Determining sample size for research activities. Educational and Psychological Measurement*, 30, 607 - 610.
12. Lardenoije, E. J. H., van Raaij, K. & van Weele A, J. (2005). *Performance management models and purchasing: Relevance still lost*.
13. Marnewick, C. & Labuschagne, L. (2005). *A conceptual model for Enterprise Resource Planning (ERP). Information Management & Computer Security*, 13(2), 144 - 155.

14. Nzuki D. (2012) *Factors Affecting Adoption of Enterprise Resource Planning Software in the Manufacturing Sector in Nairobi Metropolitan, Kenya (Phd Thesis)*. Kenyatta University
15. O'Leary, D. (2000). *Enterprise Resource Planning Systems: Systems, Life cycle, Electronic commerce and Risk*. New York: Cambridge University Press
16. Pollock, N., & Cornford, J. (2004). *ERP systems and the university as a "unique" organisation*. *Information Technology & People*, 17(1), 31-52.
17. PricewaterhouseCoopers, (2016). *Enterprise systems solutions: Establish an effective and controlled execution of business processes*, January.
18. Ramdas S. W. & Mudiraj, A. R (2014). *Security Issue and their Countermeasures in ERP Implementation International Journal of Management and Social Sciences Research*, 6(3) 2319-44213
19. Rogers, E. M. (1995) *Diffusion of Innovations*, 3th edition; 4th edition, New York: Free Press.
20. Severin V. Grabski ,Stewart A. and Leech B (2012), *Risks and Controls in the Implementation of ERP Systems;The International Journal of Digital Accounting Research*. 1(1), 47-68
21. Shtub, A. (2001). *A framework for teaching and training in the Enterprise Resource Planning (ERP) era*. *International Journal of Production Research*, 39(3), 567 - 576
22. Umble et.al (2004), *Enterprise Resource Planning: Implementation procedures and Critical success factors; European Journal of Operational research; 146 (2), 241 -257*
23. van Weele, A.J. (2002) *Purchasing and Supply Chain Management. Analysis, Planning and Practice*, 3rd edition. Thomson Learning, London.
24. Wei, S. & Thuraisingham, B. (2012). *Security for Enterprise Resource Planning Systems*. University of Texas at Dallas, Richardson, TX, USA