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Effect of Enterprise Resource Planning Cycle Time on Supply Performance of Oil in the Oil Industry in Kenya: A Survey of Petroleum Firms

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Abstract: ***The objective of the study was to determine the influence of Enterprise Resource Planning on cycle time of supply of oil products in Oil Industry in Kenya. It targeted a population of 175 persons drawn from the top management, middle management and the support staff of Petroleum Firms in Uasin Gishu County. Both stratified sampling and simple random techniques were used to select the respondents. The study used questionnaires for collecting data after which descriptive statistics that were integrated both qualitative and quantitative techniques were used in the analysis. The study findings showed that Enterprise resource planning, Enterprise resource decision support and Information flow has a positive significant effect on supply chain performance. The study concludes that ERP systems contribute to supply chain management particularly in technical areas such as cycle time, standardization, transparency and globalization. ERP integrates both internal and external flows used by the organization. It drives the flow of information between all internal business functions while managing connections to outside stakeholders. In order for firms to update staff payments within shortest time possible, enhance faster transaction between suppliers and the firm, easily retrace complaints of irregular products and improve cash management there is need to implement the ERP system. The ERP system should be used by firms to plan better and for better management of production. In order for firms to facilitate coordination and information flows and access of information from one department and the other there is need for firms to take necessary steps towards ensuring that the EPR system is used accordingly and to the maximum.***

Keywords: Enterprise Resource Planning, Energy Industry, Key Performance Indicators **(KPIs),** Bills of material, SCM

1. Introduction

Enterprise Resource Planning (ERP) is an industry term for the broad set of activities that helps a business to manage the important parts of its business. The information made available through an ERP system provides visibility for Key Performance Indicators (KPIs) required for meeting corporate objectives and goals. ERP software applications can be used to manage product planning, purchasing, inventories, interacting with suppliers, providing customer services, tracking orders and deliveries. In most times ERP can also include application modules for the finance and human resources aspects of a business. Typically, an ERP system uses or is integrated with a relational database system [2].

At the core of ERP is a well-managed centralized data repository which acquires information from and supply information into the fragmented applications operating on a universal computing platform. Information in large business organizations is accumulated on various servers across many functional units and sometimes separated by geographical boundaries. Such information islands can possibly service individual organizational units but fail to enhance enterprise wide performance, speed and competence. In order for a software system to be considered ERP, it must provide a business with wide collection of functionalities supported by features like flexibility, modularity & openness, widespread, finest business processes and global focus. Kleijnen argues that the key objective of an ERP system is to integrate information and processes from all functional divisions of an organization and merge it for effortless access and structured workflow [4]. The integration is typically accomplished by constructing a single database repository that communicates with multiple software applications providing different divisions of an organization with various business statistics and information.

It is postulated that Enterprise Resource Planning (ERP) has been used to solve a number of problems that have plagued large organizations in the past. At the same time, it is not without a number of disadvantages. Being able to weigh the two was to allow a company to decide if this solution properly met their needs. Perhaps one of the most important advantages of ERP is its accounting applications [10]. The company to keep better track of their products, and it can allow the products themselves to be produced with higher level of quality. Another area where ERP can be an indispensable tool is the area of security. It can protect a company against crimes such as embezzlement or industrial espionage [12].

According to Radford moreover, the effect of actual and perceived responsiveness on user willingness to adopt the new system is mediated through user beliefs about the correctness of the configuration [8]. Measuring the benefits from an enterprise system is a difficult task, particularly when the benefits of these systems are strategic in nature. Understanding the value of an ERP system entails examining the amount of duplicated effort that the ERP system eliminates and the increased efficiency that results from having an ERP solution in place. Savings can be derived from a reduction in staff numbers and productivity improvement. ERP helps companies control their purchasing, inventory, manufacturing, finance, and human resource

activities by centralizing information collected from dispersed geographical sites [6].

2. Statement of the Problem

According to the Government of Kenya Economic Survey, Kenyan population continues to suffer from shortage of oil products. The irony is that despite the fact that most oil pump stations face acute shortage of oil products, there have been reported cases of oil in deports, and poor storage and supply management practices of oil. This raises issues of effectiveness and efficiency in distribution, demand accessibility and the entire management of oil supply chain. One of the reasons cited by the Ministry of energy for oil shortage in is the enormous cost associated with the procurement and distribution of oil [11]. This study therefore intends to establish the impact of Enterprise Resource Planning on the effectiveness supply of oil in oil industry in Kenya. The quest for such an understanding would help in filling the gaps through the realization of the need to invest in information systems such as ERP so to meet the organizational objectives while meeting the customer requirements in the Oil industry and other related sectors of the economy.

3. Objective

To determine the influence of Enterprise Resource Planning cycle time on supply performance of oil products in Oil Industry in Kenya.

4. Research Hypothesis

Enterprise resource planning cycle time has no significant effect on supply performance of oil products in Oil Industry in Kenya

5. Justification of the Study

The proposed study is useful for any organization intending to modernize ICT. Implementation of ERP brings in more positive effects as they can be in a position to establish some of the areas that have been experiencing difficulties in executing proper responsibilities related to effective procurement, warehousing and distribution of supplies. The highlighted issues can be used to define way forward that would enhance adopting of good distribution strategies enhanced by the adoption of ERP systems.

Secondly, it can enable business organizations to position itself to establish ways in which it can ensure transparency, accountability, effective monitoring and regulation of oil supplies so that these products can reach the intended suffering customers on time and in good quality and quantity. This can only be achieved if the government is in a position to adopt various recommendations that would be put across on the reasons as to the effect of adopting ERP [9].

Thirdly the study was be useful and relevant to other supplies agencies in the sense that they can be in position to use this study to come up with better approaches of carrying out procurement and distribution activities in order to help organizations that may be using outdated supply chain strategies without modern computerized management systems such as ERP [10].

6. Scope of the Study

The established the impact of Enterprise Resource Planning on the effectiveness supply of oil in oil industry in Kenya. The study was carried among oil petroleum firms in Uasin Gishu County. The respondents were drawn from the top management, middle management and the support staff.

7. Theoretical Framework: Theories of Enterprise Resource Planning

Nah argues that Enterprise resource planning (ERP) theories systems have been widely implemented by numerous firms throughout the industrial world. While success stories of ERP implementation abound due to its potential in resolving the problem of fragmented information, a substantial number of these implementations fail to meet the goals of the organization. Some are abandoned altogether and others contribute to the failure of an organization. The theoretical constructs of ERP implementation are followed at varying levels. It offers some fresh insights into the current practice of ERP implementation [7].

8. Agency Theory

Moller argued that Enterprise resource planning (ERP) is becoming rapidly indispensable in order for large and medium sized organizations to run their operations [6]. Therefore, management needs to know the factors that drive successful ERP implementation, a product of the continuous interaction between the implementation consultants and client firms. Agency theory has been successfully used by different researchers to explain relationships between two parties seeking a common outcome. Nah analyses the relationship between implementation consultants and client organizations deploying the ERP systems, and to consequently evaluate how the relationship affects the implementation success together with the success of the organization. Agency theory describes the environment within a firm or between a set of firms in terms of sets of contracts in which one party (the principal) engages another party (the agent) to perform a service on the principal's behalf which involves delegating part of the decision making authority to the agent . Several studies have applied agency theory to study both general project success and IS project success in principal-agent settings in which one group of people have delegated the responsibility of project implementation to another group [7].

9. Theory of Constraints

Theory of Constraints can be a godsend to a manufacturer considering, engaged in, or having given up on, an ERP implementation. It offers Business process improvements that provide fast, direct and often massive whole-company performance improvement. Plus, the Theory of Constraints to project management, Critical Chain, makes the implementation smooth and fast especially if they are in the

middle of an implementation process, perhaps experiencing a stalled implementation [10]. Theory of Constraints provides a set of policies, procedures and measurements that give new focus and momentum to the implementation; it can cause a previously pushed-down ERP system that met resistance to be "pulled in" to the implementation, because people can see the value in what it provides when they understand. And again, Critical Chain can help the management of the project.

10. Concept of Enterprise Resource Planning

Whitten and Bentley defined Enterprise Resource Planning as a cross-functional enterprise system driven by an integrated suite of software modules that supports the basic internal business processes of a company. He added that ERP gives a company an integrated real-time view of its core business processes such as production, order processing, and inventory management, tied together by ERP applications software and a common database maintained by database management systems [12].

ERP systems track business resources such as cash, raw materials, and production capacity and the status of commitments made by the business such as customer orders, purchase orders, and employee payroll, no matter which department (manufacturing, purchasing, sales, accounting, and so on) has entered the data into the system. ERP facilitates information flow between all business functions inside the organization, and manages connections to outside stakeholder.

Stratman on the other hand points out that ERP (Enterprise Resource Planning) is an industry term for the broad set of activities that helps a business manage the important parts of its business. The information made available through an ERP system provides visibility for key performance indicators (KPIs) required for meeting corporate objectives. ERP software applications can be used to manage product planning, parts purchasing, inventories, interacting with suppliers, providing customer service, and tracking orders [9].

Harold argues that at its core, ERP helps employees do their jobs more efficiently by breaking down barriers between business units. More specifically, an ERP solution gives a global, real-time view of data that can enable companies to address concerns proactively and drive improvements. It also improves financial compliance with regulatory standards and reduces risk [3].

Enterprise Resource Planning also automates core business operations such as lead-to-cash, order-to-fulfillment, and procure-to-pay processes. In addition it enhances customer service by providing one source for billing and relationship tracking. When these advantages are added up, the value of ERP is clear. With an ERP solution, employees have access to accurate information that enables them to make better decisions faster. Not only that, but ERP software helps to eliminate redundant processes and systems, dramatically lowering the overall cost of doing business [6]

Nah points out that the central feature of all ERP systems is a shared database that supports multiple functions used by different business units. In practice, this means that employees in different divisions for example, accounting and sales can rely on the same information for their specific needs [7].

Stratman goes on to add that ERP contains software that offers some degree of synchronized reporting and automation. Instead of forcing employees to maintain separate databases and spreadsheets that have to be manually merged to generate reports, some ERP solutions allow staff to pull reports from one system. For instance, with sales orders automatically flowing into the financial system without any manual re-keying, the order management department can process orders more quickly and accurately, and the finance department can close the books faster. Other common ERP features include a portal or dashboard to enable employees to quickly understand the business' performance on key metrics [7].

11. Empirical Review: ERP on the Product Cycle Time

When ERP systems are fully realized in a business organization, they can be expected to yield many benefits, such as reduction of cycle time, faster transactions, and better financial management, the laying of the groundwork for e-commerce, linking the entire organization together seamlessly, providing instantaneous information, and making tacit knowledge explicit. ERP can provide the digital nervous system and the backbone in an organization to respond swiftly to customers and suppliers. ERP systems are widely believed to contribute to SCM in technical areas such as standardization, transparency and globalization.

Su and Yang, surveyed about 500 business executives, and revealed the following performance outcomes of ERP: quickened response time, increased interaction across the enterprise, improved order management, improved customer interaction, improved on-time delivery, improved supplier interaction, lowered inventory levels, improved cash management, and reduced direct operating costs [10]

In lead time, application of ERP systems lead to lower inventories because manufacturers can make and buy only what is needed. Demands rather than demand insensitive order points drive time phased plans. Deliveries can be coordinated to actual need dates; orders for unneeded material can be postponed or canceled. The bills of material ensure matched sets are obtained rather than too much of one component and not enough of another. Planned changes in the bills also prevent inventory buildup of obsolete materials. With fewer part shortages and realistic schedules, manufacturing orders can be processed to completion faster and work-in-process inventories can be reduced. Implementation of JIT philosophies can further reduce manufacturing lead times and the corresponding inventories [1].

Improved procurement practices lead to better vendor negotiations for prices, typically resulting in cost reductions. Valid schedules permit purchasing people to focus on vendor negotiations and quality improvement rather than on expediting shortages and getting material at premium prices.

ERP systems provide negotiation information, such as projected material requirements by commodity group and vendor performance statistics.

12. Research Design

The study used descriptive research design, which was the most applicable for the study, as the study focuses on describing independent variables. This scientific method of investigation involves collection and analysis of data in order to describe a phenomenal in its current condition or status, Kothari continues to indicate that this design is preferred because it is time saving, it is possible and easy for the researcher to obtain current factual information from the employees in the organization. The study targeted 167 oil marketing companies located in Eldoret and they should be currently registered and active. The sampling technique used was random sampling because the researcher intended to select the respondents best suited for his study. The sample was selected using purposive sampling where 100 oil marketing companies were selected for the study. The study used random sampling because the study only needs to select companies that have the required information with respect to the study [5]. In this study the researcher employed a questionnaire as the instrument of data collection. These were given to different personnel in the organization who thereafter gave back the necessary information and details.

Validity and reliability of the instruments was established using expert judgment and performance of various tests. The reliability is consistency in measurement [5].To check on reliability of the instrument, the questionnaires will be pre-tested through a pilot study to ascertain their effectiveness in soliciting the information intended. Pilot study will be carried out in Nakuru County in order to determine the questionnaires' internal consistency and to detect any difficulties that the respondents were likely to face when responding to the items. Split half technique will be used to obtain X and Y scores. X distribution will take odd positioned items, whereas Y distribution will take even positional items. Pearson moment correlation (r) will be used to calculate the reliability coefficient. The coefficient obtained will be then converted into an appropriate correlation for the entire test using Spearman and Brown prophecy formula. The reliability coefficient of 0.5 and above will be accepted as a good measure of reliability

Data collected was analyzed by use of quantitative technique; quantitative data was analyzed using descriptive statistical method, the statistical tools such as frequency distribution, tables. Measures of central tendency such as mean, mode and media were used. The data collected was analyzed using Pearson moments of correlation and multiple regression analysis Correlation analysis was used to measure the degree of relationship between the two variables Kothari says the coefficients assumes that there is linear relationship between the two variables and that the two variables are casually related which means that one of the variables is independent and the other is dependent [5].
Regression analysis is used to test hypothesis about the relationship between the variable independent and dependent variable

13. Model Specification

The multiple regression models to be used in this study is given as;
$Y= \alpha + \beta_1 X_1 + \varepsilon$
Where, Y = supply performance
α = constant
$\beta_1 \ldots \beta_4$ = Coefficients of independent variables $X_1 \ldots\ldots\ldots\ldots X_4$
X_1 = Product Cycle Time
ε = error term

14. Results

The researcher found important to establish if there is reduced product cycle time with the use of the ERP system. Findings revealed that there is reduced time in the production of receipts with the adaptation of the ERP system (mean = 4.24). Additionally, the firm is able to update staff payment within the shortest time possible (mean = 3.66). Likewise ERP ensures faster transaction between suppliers and the firms (mean = 4.45). Also, improved cash management has been realized through the use of the ERP system (mean = 4.55) and complaints of irregular products are easily retraced within the ERP system (mean = 4.99). From the research findings, it would be true to state that ERP has indeed improved on time delivery (mean = 4.99). From the findings, ERP has proved to be both effective and efficient. Generally, Product cycle time summed up to a mean of 4.48, standard deviation 0.956, Skewness 0.443 and a negative kurtosis of -1.285. These results have been summarized in table 1

Table 1: Product Cycle Time

Product Cycle Time	*Mean*	*Std. Deviation*	*Skewness*	*Kurtosis*
ERP reduces time in production of receipt	4.24	1.837	0.824	-1.318
The firm is able to Updating of staff payments within shortest time possible due to ERP	3.66	1.868	0.276	-1.863
ERP ensures faster transaction between suppliers and the firms	4.45	1.326	-2.171	2.886
ERP improve cash management	4.55	1.891	0.57	-1.662
Complaints of irregular products are easily retraced within the ERP system	4.99	0.11	-8.971	79.45
ERP has improved on-time delivery	4.99	0.11	-8.971	79.45
Product Cycle Time	4.48	0.956	0.443	-1.285

Correlation Statistics

Pearson Correlations results in table 2 showed that product cycle time was positively related with supply chain performance ($r = 0.475$, $\rho<0.01$) an indication that product cycle time had 47.5% significant positive relationship with supply chain performance. The results are summarized on table 2

Table 2: Correlation Statistics

	Supply chain performance	*Product cycle time*
Product cycle time	.475**	1

** Correlation is significant at the 0.01 level (2-tailed).

14.1 Model Summary

Table 3 illustrates the model summary of multiple regression model, the results showed that product cycle time explained 44.3 percent variation of supply chain performance. This showed that considering the study independent variable, there is a probability of predicting supply chain performance by 44.3% (R squared =0.443).

Table 3: Model Summary

R	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
.666a	0.443	0.425	0.19521	2.444

a) Predictors: (Constant), Product cycle time, Decision support, Information flow
b) Dependent Variable: supply chain performance

14.2 ANOVA Model

Study findings in ANOVA table 4 indicated that the above discussed coefficient of determination was significant as evidence of F ratio of 25.127 with p value 0.000 <0.05 (level of significance). Thus, the model was fit to predict supply chain performance using decision support, information flow and product cycle time.

Table 4: ANOVA Model

	Sum of Squares	*Df*	*Mean Square*	*F*	*Sig.*
Regression	4.788	5	0.958	25.127	.000b
Residual	6.021	158	0.038		
Total	10.809	163			

a) Predictors: (Constant),Product cycle time , Decision support, Information flow
b) Dependent Variable: supply chain performance

14.3 Coefficient of Estimate

Hypothesis 1 (H_{o1}) stated that there is no relationship between product cycle time and supply chain performance. Findings showed that product cycle time had coefficients of estimate which was significant basing on β_1= 0.161 (p-value = 0.034 which is less than α = 0.05) which indicates that we reject the null hypothesis stating that there is no significant relationship between product cycle time and supply chain performance. This implies that for each unit increase in product cycle time, there is up to 0.161 unit increase in supply chain performance. Also the effect of product cycle time is shown by the t-test value of 2.14 which implies that the effect of product cycle time surpasses that of the error.

Table 5: Coefficient of Estimate

	Unstandardized Coefficients		*Standardized Coefficients*			*Collinearity Statistics*	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	0.711	0.311		2.287	0.024		
Product cycle time	0.033	0.016	0.161	2.14	0.034	0.625	1.601

a Dependent Variable: supply chain performance

15. Summary

The main purpose of this study was to establish the impact of Enterprise Resource Planning on the effectiveness supply of oil in oil industry in Kenya.The target population for the study consisted staff of Hass Petroleum Group at the headquarters summing up to 175 employees. The study also made inference on the hypothesis that enterprise resource planning cycle time, enterprise resource decision support and information flow have no significant effect on supply performance of oil products in Oil Industry in Kenya.

16. Enterprise Resource Planning Cycle Time and Supply Performance

Enterprise resource planning has a positive significant effect on supply chain performance basing on β_1= 0.161 (p-value = 0.034 which is less than α = 0.05). Cognate to study findings, previous studies have shown that ERP facilitates information flow between all business functions, manages connections to outside stakeholders, faster transactions, better financial management, linking the entire organization together seamlessly and making tacit knowledge explicit. Further, a survey of 500 business executives by Su and Yang revealed that the ERP system contributes to quickened response time, efficient data sharing throughout the enterprise, improved order management, improvement of the company's relationships and collaboration with outsourcing suppliers, customers, improved cash management and reduced direct operating costs. As evidenced from these studies, enterprise resource planning indeed has a positive significant effect on supply chain performance [10].

17. Conclusions

In light of the research findings, enterprise resource planning cycle positively impacts on supply chain performance. For instance, full utilization of the ERP system in an organization yields a wide array of benefits. Just to mention a few, there is reduction of cycle time, faster transaction and better financial management. Additionally, it is widely believed that ERP systems contribute to supply chain management particularly in technical areas such as standardization, transparency and globalization.

18. Recommendations

From the study findings it was conceived that enterprise resource planning cycle positively impacts on supply chain performance. In order for firms to update staff payments within shortest time possible, enhance faster transaction between suppliers and the firm, easily retrace complaints of irregular products and improve cash management there is need to implement the ERP system. When you submit your paper print it in two-column format, including figures and tables. In addition, designate one author as the "corresponding author". This is the author to whom proofs of the paper will be sent. Proofs are sent to the corresponding author only.

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