

Influence of Electronic Payment on Business Efficiency in Petrol Stations in Nyanza Region, Kenya

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ABSTRACT

The Oil Sector Over the centuries, the oil industry has remained a predominant player in the world's economy. This sector is known for its great contribution to many nations. The National Oil Board states that consumption of oil and petroleum products is projected to grow from 4.5 million metric tons to 12 million metric tons by 2030, yet currently, petroleum products procured face challenges. Recent findings have shown low efficiency in the procurement process at petrol stations in the Nyanza region. The study specifically looked at the influence of electronic payments on business efficiency in petrol stations in the Nyanza region of Kenya. This study employed a descriptive study design with a target population of 134 and a sample of 100 employees of petrol stations in the Nyanza region of Kenya. The study used closed-ended Likert scale questionnaires for data collection. The data was analyzed using both descriptive and inferential statistics, where descriptive statistics involved frequencies and percentages. Inferential statistics are based on Pearson correlation and simple linear regression. SPSS software 23 was useful in the analysis. The findings were that electronic payment had a significant influence on business efficiency among petrol stations ($t = 10.209, p < 0.05$). The study recommends that petrol stations adopt electronic payment practices to minimize queues during physical payment. Furthermore, electronic payment eases audits and minimizes cases of corruption.

Keywords: Business Efficiency, Electronic Payment, Petrol Stations

I. INTRODUCTION

Electronic payment systems have revolutionized the way businesses operate in the modern digital age, leading to increased efficiency and effectiveness in financial transactions. Efficiency, in this context, refers to achieving maximum output with minimal resources, while effectiveness involves achieving the best outcomes (Aboelmegeed, 2020). In the global economic landscape, the oil sector has maintained its dominance for centuries, playing a pivotal role in the development of nations and the generation of substantial wealth.

One striking example of the transformative power of the oil industry can be traced back to the discovery of oil in Pennsylvania in 1859. According to the American Oil and Gas Historical Society Organization, this discovery not only raised living standards but also boosted the American economy, spawning significant individuals like John D. Rockefeller, who in 1865 became the first oil baron in history. Despite its historic significance, the oil sector is not immune to operational inefficiencies (Sijaona, 2020).

In 2019, the American National Petroleum Council reported a 7.7% decline in the industry due to procurement inefficiencies. Similarly, in Kenya, the oil and natural gas sector experienced significant losses in 2021, estimated at Kes 29.2 million, attributed to payment system inefficiencies in the procurement of oil and natural gas (Energy and Petroleum Regulatory Authority, 2022). Such losses underscore the urgent need for innovative solutions in managing inventory and procurement processes.

Total Kenya, a prominent player in the country's oil industry, has taken steps towards addressing these challenges through the implementation of electronic systems. The Station Integrated System (SIS) and the newly introduced One Ambition for Station Information System (OASIS) have revolutionized inventory management, marking a significant leap towards operational efficiency (Energy and Petroleum Regulatory Authority, 2022).

Beyond the borders of Kenya, the adoption of electronic procurement systems is gaining momentum across Africa, particularly in the public sector. Countries like Tanzania have embraced electronic procurement to enhance transparency and accountability, digitizing all aspects of public procurement processes (Sijaona, 2020). In Kenya, the government has also committed to complete digitization, mandating the use of online platforms for the procurement of public commodities, works, and services (Quesada, 2021).

This article explores the impact of electronic payment systems on the oil and gas procurement sector in Kenya, shedding light on the benefits of efficiency and transparency while addressing the challenges faced by the industry. Through a comprehensive analysis, we aim to provide valuable insights into the potential of electronic payment systems to transform not only the oil and gas sector in Kenya but also serve as a model for other industries and nations seeking to enhance their procurement processes.

1.1 Statement of the Problem

The oil sector has long been a cornerstone of global economies, contributing significantly to the growth and development of nations. In Kenya, as in many other countries, the demand for oil and petroleum products is expected to surge, with projections indicating a substantial increase from 4.5 to 12 million metric tonnes by 2030 (National Oil, 2022). However, the recent trends in the procurement and payment systems within the oil industry in Kenya raise concerns about its efficiency and financial stability.

In 2022, the volume of petroleum products procured into Kenya saw a dramatic increase, rising from 3,976.3 thousand tonnes in 2021 to 6,114.4 thousand tonnes (Energy and Petroleum Regulatory Authority, 2022). Despite this growth, inefficiencies in procurement and payment processes have cast a shadow over the industry's financial performance. The American National Petroleum Council reported that in 2019, procurement inefficiencies led to a substantial 7.7% decline in profits in the oil sector globally.

The situation in Kenya is no less alarming, as the National Petroleum Council of Kenya (2022) estimates a loss of Kes 29.2 million attributed to unclear payment systems in the procurement of oil and natural gas. Even as revenues from the oil sector showed a promising growth of 16.3%, a negative variance of Kes. 10,424 million was recorded due to payment system challenges (Kenya Revenue Authority, 2019). These financial setbacks have forced the industry to implement cost-cutting measures, including reducing the workforce and shifts, ultimately impacting the livelihoods of many.

According to a study by the National Association of Automotive Vehicles (2019), despite efforts to provide petroleum services, the industry still faces difficulties with regard to ordering oil and natural gas. The relationship between electronic procurement systems and business performance in the oil sector remains a subject of debate. While some studies, such as that by Omanyi et al. (2018), have shown a significant positive correlation, others, like Thai (2017), have suggested a negative influence. Therefore, a comprehensive examination of procurement efficiency, specifically focusing on the impact of electronic payment systems, is imperative to shed light on the underlying issues affecting the oil industry in Kenya.

Against this backdrop, this study aims to investigate and establish the influence of electronic payment systems on business efficiency in petrol stations within the Nyanza region of Kenya. By addressing the existing gaps in understanding the role of electronic payments in the oil sector, this research endeavors to provide insights and recommendations that can help enhance the industry's financial stability and overall performance.

1.2 Objectives of the Study

To establish electronic payment influence on business efficiency in Petrol Stations in Nyanza region, Kenya

1.3 Research Hypothesis

H₀₁: Electronic payment does not significantly influence business efficiency in Petrol Stations in Nyanza region, Kenya.

II. LITERATURE REVIEW

2.1 Theoretical Framework

This study was founded on the transaction cost theory. The formulation of this idea can be attributed to Ronald Coase in 1937 (Coase, 1939). The idea examines the fees associated with a certain transaction. For example, electronic procurement incurs lower prices for electronic sourcing, electronic supplier, electronic ordering, and electronic payment in comparison to physical transactions. Classical economic theory posits the assumption of symmetric information within the market. Given the assumption of symmetric information between buyers and sellers, the transaction can be

conducted without incurring any costs. In actuality, markets frequently exhibit inefficiencies. To engage in a transaction, customers are required to undertake many tasks, including information search, negotiation of terms, and ongoing process monitoring, with the aim of securing a favorable outcome. This idea holds significance within the realm of electronic procurement efficiency as it aids organizations in achieving optimal performance by maximizing value for money. This idea, however, places greater focus on the electronic payment systems in which transactions occur.

However, the idea faces criticism over the premise that an efficient procurement process is solely defined by numerous elements, including production costs and operational expenses. Consequently, high costs do not necessarily indicate deficiencies in the procurement sector. Nevertheless, there is a prevailing belief that electronic transactions have to be reduced. This hypothesis holds a central position.

2.2. Conceptual Review



Figure 1
Conceptual framework

Electronic payment is commonly referred to as e-payment, and it is usually practiced for business efficiency purposes. It is the dependent variable, and factors like payment security, operating expenses, payment visibility, and electronic invoices serve as measurement tools. Efficiency of Petrol Stations (business) arises from evaluating the input output, delivery of services, and competitive bids.

2.2.1 Electronic Payment

The concept of an e-payment system encompasses the full gamut of monetary transactions. Everything from the end-user issuing a payment instruction through the final settlement of the transaction is subject to a wide range of methods, technological systems, institutions, procedures, rules, and laws. Trading partners, markets, and governments (Electronic Procurement Services development players) in different nations and time periods have established different sorts of rules, regulations, methods, technology, and arrangements to construct a stable infrastructure for monetary exchange. We typically refer to this set-up as a payment system (Bossone & Massimo, 2016). The electronic payment system refers to an internet-based commercial procedure utilized for the transfer of funds through electronic devices such as personal computers and mobile phones. In the banking sector, these instruments are extensively employed whenever financial transactions occur, particularly in relation to payments and other related methods. According to Manav (2017), several means of electronic payment include the debit card payment system, credit card payment system, online electronic cash system, electronic check system, and smart card-based electronic payment system.

2.2.2 Procurement Efficiency

Procurement efficiency encompasses a wide range of factors within the procurement process, including but not limited to the satisfaction and effectiveness of internal users, the performance and qualifications of suppliers, the competency and expertise of procurement staff, the functionality of the purchasing function, the influence of market forces, the impact of government policies, and the outcomes of management decisions. The absence of clearly defined objectives, targets, and measurements is a significant challenge in assessing procurement efficiency (Kakwezi & Nyeko, 2020). Research findings indicate that the manual procurement system poses challenges in achieving cost-effectiveness due to various factors. These include slow transaction processing, a higher chance of handling errors, a lot of paper being produced, trouble speeding up deliveries, complicated procedures, too much government involvement, bureaucratic processes, a lack of central control, too many suppliers, inconsistent products, and buyers with little power (McConnell, 2019).

The advent of electronic procurement solutions has emerged as a transformative measure to tackle the aforementioned difficulties and improve the efficiency of procurement processes. The adoption of electronic

procurement by state enterprises on a global scale has garnered praise for its capacity to deliver value for money. This achievement can be attributed to the fulfillment of the promises associated with electronic procurement (Hsia & Teo, 2015). The aforementioned commitments encompass several aspects, such as the reduction of procurement costs, the enhancement of customer service levels, the improvement of policy compliance, and the decrease of procurement lead time. Consequently, the effectiveness of procurement inside state enterprises experienced significant improvement (Amayi & Ngugi, 2018). One significant advancement in the realm of electronic procurement within public institutions is the advent of standardized electronic procurement procedures, which have supplanted the manual procurement processes employed in government open tendering. This transition has resulted in enhanced efficiency within the procurement system.

2.3 Empirical Review

Harland (2021) defines electronic payments as services that employ information and communication technologies (ICT), such as cryptography and telecommunications networks, to facilitate monetary transactions. These services can be further subdivided into cash-like systems like electronic cash, check-like systems like credit cards and debit cards, and hybrid systems like stored-value cards. In order to effectively deploy electronic payment systems, it is imperative to enhance users' awareness, promote their utilization of such systems, and instill confidence in the security and comprehensiveness of the infrastructure. Additionally, it is essential to ensure the availability of high-quality telecommunication facilities to support these systems. The author additionally proposes that, in order to enhance consumer engagement, it would be beneficial to provide them with the option to select the payment method that incurs the least amount of expenses. It is vital for customers to possess the capability to monitor their account balance. Based on the researcher's results, it is recommended that the design of electronic payment systems prioritize key considerations such as efficiency, security, convenience, cost, flexibility or universality, privacy, reliability, consumer interest, and infrastructure. The research revealed that the utilization of electronic payment methods has a notable impact on enhancing the efficiency of procurement processes.

Manav (2017) notes that the term electronic payment refers to the procedure of making a payment to a business while buying goods or services over the Internet. The phenomenon of electronic commerce is experiencing a significant surge in the consumer sector. The payment process in electronic commerce is typically facilitated using an electronic payment system. The prevalence of electronic payments has witnessed a notable surge, facilitated by the proliferation of electronic transfers, debit cards, credit cards, and other similar payment methods. The advent of novel advancements in electronic commerce has the potential to present a plethora of fresh business prospects in the realm of payment for products and services. The interconnection between electronic payment systems and electronic commerce is evident, as online users are required to make payments for the purchase of goods and services. Payment systems encompass various requirements, such as security, acceptability, ease, cost, anonymity, control, and traceability. This has led researchers to focus less on the technical details of various electronic payment systems and more on the characteristics of the data being transferred across the network. After listing the features, benefits, and drawbacks of each type of electronic payment system, they proceed to compare and contrast them. According to the study's findings, using digital payment methods significantly improves the effectiveness of purchasing procedures.

2.4 Research Gap

Existing literature reviews have examined the effects of electronic procurement on organizational performance, but they do not specifically bring out the link between e-procurement practices and procurement efficiency. While Zakari (2018) discusses electronic procurement and the performance of service organizations, the study explains performance measures and not efficiency measures. Quesada (2020) emphasizes the importance of electronic procurement. The study examines the competitive advantage and profitability of the firm, not firm efficiency. A study by Abu-Elsamen et al. (2020) on electronic procurement technologies examined electronic payment, not mentioning electronic sourcing, supplier selection, ordering, or payment. Furthermore, these studies have not examined the petrol station service sector.

III. METHODOLOGY

3.1 Study Area and Design

This study was carried out at all petrol stations actively operating in the Nyanza region of Kenya, namely Kisumu, Siaya, Homabay, and Migori, as of April 1, 2023. This area was chosen on the grounds that the Nyanza region had adopted electronic procurement systems as compared to other regions. This was a descriptive research design.



3.2 Target population

The population is comprised of employees at six brands of petrol stations in the Nyanza region. The target populations were 134 respondents, comprising station managers and accountants, as indicated in Table 1.

Table 1
Target Population

Category of Management Staff	No. of Management Staff
Kisumu	45
Siaya	32
Homabay	18
Migori	39
Total	134

Source: PIEA, Petroleum Insight Manual 1st Quarter 2023

3.3 Sample size

The study adopted a simple random sampling technique since the target population involved all employees in all departments in petrol stations in the Nyanza region. The researcher used Yamane (1967) sampling formulas.

$$n = \frac{N}{1 + Ne^2}$$

N = is the population size

e = is the level of precision (95%; e = 0.05)

$$n = \frac{134}{1 + 134(0.05)^2}$$

$$n = \frac{134}{1.335} \quad n = 100.3=100$$

3.4 Validity and Reliability

The researcher consulted the supervisor for expert opinion, hence the validity of the content. Construct validity based on the factor analysis where variable rotation was undertaken and those with factor loading less than 0.4 were dropped. For reliability, values were above 0.7, thus 0.714 on Cronbach alpha, indicating reliability (Mugenda & Mugenda, 2008).

3.5 Pilot Study

A pilot study was carried out on 10 station managers in Kakamega County Petrol stations to test the tools. This was to avoid using the same respondents who would participate in the final study. This was based on homogeneity in reference to the Kakamega-Nyanza region.

The following regression models is applied:

$$\text{Model A..... } Y = \beta_0 + \beta_a X_a + \epsilon \text{..... (i)}$$

Where;

Y = Business Efficiency

X_a = Electronic payment

β₀ = the constant

IV. RESULTS & DISCUSSION

4.1 Response Rate

Out of one hundred (100) questionnaires issued, 81 were filled out and returned, representing an 81% response rate. Table 2 showed that electronic payment influenced business efficiency among petrol stations in the Nyanza region of Kenya. For instance, 31 (38.3%) agreed and 40 (49.4%) strongly agreed that their petrol stations considered electronic payment systems due to the safety of not holding cash. This shows that the electronic payment system was highly recommended as it eliminated cases of corruption and led to more accountability processes, leading to efficiency.

Regarding whether the firm considers an electronic payment system for easy tracking and audit of the payment system, 36 (44.4%) of respondents agreed, and 39 (48.1%) agreed that the Petrol station considers an electronic payment system due to the lower costs attached to transactions compared to bank charges. 39 (48.1%) of respondents agreed that

the company considers electronic payment systems due to their time-saving costs, and 28 (34.6%) strongly agreed that the entity considers electronic payment systems due to their viability as witnessed through instant payment. Furthermore, 28 (34.6%) of respondents agreed that the company considered an electronic payment system due to its invoice system through payment-generated receipts. Lastly, 24 (29.6%) respondents agreed that the organization considers an electronic payment system due to the safety features captured on an online invoice. This study aligns with the findings of Matunga et al. (2018), who conducted an assessment on the impact of electronic payment practices on procurement efficiency.

Table 2*Electronic payment and Business Efficiency*

Description	SD (%)	D (%)	U (%)	A (%)	SA (%)
Our Petrol station considers electronic payment system due to safety of not holding cash	0 (0)	3 (3.7)	7 (8.6)	31 (38.3)	40 (49.4)
The firm considers electronic payment system for easy tracking and audit of payment system.	0 (0)	2 (2.5)	36 (44.4)	36 (44.4)	7 (8.6)
Our Petrol station considers electronic payment system due to less costs attached on transactions compared to bank charges.	0 (0)	0 (0)	16 (9.8)	39 (48.1)	26 (32.1)
The Company considers electronic payment system due to time saving cost	0 (0)	0 (0)	16 (9.8)	39 (48.1)	26 (32.1)
The entity considers electronic payment system due its viability witnessed through instant payment	0 (0)	2 (2.5)	12 (14.8)	39 (48.1)	28 (34.6)
Our organization considers electronic payment system due its viability witnessed through timely payment	7 (8.6)	9 (11.1)	21 (25.9)	28 (34.6)	16 (19.8)
Our company considers electronic payment system due its invoice system through payment generated receipt	14 (17.3)	6 (7.4)	19 (23.5)	23 (28.4)	19 (23.5)
Our organization considers electronic payment system due to its safety features captured on online invoice	14 (17.3)	4 (4.9)	21 (25.9)	24 (29.6)	18 (22.2)

N=81

The study went on to examine the level of business efficiency in petrol stations in the Nyanza region of Kenya. The findings were presented in Table 3.

Table 3*Business Efficiency*

Description	SD (%)	D (%)	U (%)	A (%)	SA (%)
Electronic procurement practices have made our organizations total output to increase	0 (0)	2 (2.5)	27 (33.3)	42 (51.9)	10 (12.3)
Electronic procurement practices have made our organizations total input to increase	0 (0)	2 (2.5)	27 (33.3)	41 (50.6)	11 (13.6)
Electronic procurement practices have led to improved delivery of services	0 (0)	0 (0)	9 (11.1)	41 (50.6)	31 (38.3)
Electronic procurement practices have led to effective delivery of services	0 (0)	3 (3.7)	40 (49.4)	31 (38.3)	7 (8.6)
Electronic procurement practices have led to competitiveness bids within the industry	0 (0)	2 (2.5)	136 (44.4)	36 (44.4)	7 (8.6)
Electronic procurement practices have led effectiveness in the oil sector	0 (0)	0 (0)	16 (19.8)	26 (32.1)	39 (48.1)
Electronic procurement practices have made operations within the sector timely	0 (0)	0 (0)	20 (24.7)	28 (34.6)	33 (40.7)
Electronic procurement practices have made operations within the sector cost effective	0 (0)	2 (2.5)	12 (14.8)	39 (48.1)	28 (34.6)

N=81

The study, as shown in Table 3, established that petrol station efficiency was guaranteed through electronic procurement systems. It emerged that electronic procurement practices have made our organization's total output increase, as agreed by 42 (51.9%); furthermore, 41 (50.6%) agreed that electronic procurement practices have led to improved delivery of services. Regarding whether electronic procurement practices had made the organization's total input increase, 41 (50.6%) agreed, and 31 (38.1%) agreed that electronic procurement practices had led to effective delivery of services. 36 (44.4%) of respondents agreed that electronic procurement practices had led to competitiveness



bids within the industry; 39 (48.1%) agreed that electronic procurement practices had led effectiveness in the oil sector; 33 (40.7%) agreed that electronic procurement practices had made operations within the sector timely; and 39 (48.1%) agreed that electronic procurement practices had made operations within the sector cost-effective. This implies that business efficiency was dependent on electronic procurement.

Table 4
Pearson Correlation

		Electronic payment	Business efficiency
Electronic payment	Pearson Correlation	1	.755**
	Sig. (2-tailed)		.000
Business efficiency	Pearson Correlation	.755**	1
	Sig. (2-tailed)	.000	

N=81

Lastly, the results showed that at the 0.05 level of significance, electronic payment was a significant predictor of business efficiency ($r = 0.755$, $p\text{-value} = 0.000 < 0.05$). The study agrees with Harland (2021), who found electronic payment significant. Further agrees with Austin and Laurence (2021), who found electronic payment to be significant for business efficiency. I disagree with Manav (2017), who views electronic payments as insignificant to procurement performance.

H₀₁: Electronic payment does not significantly influence business efficiency in Petrol Stations in Nyanza region, Kenya.

Table 5
Electronic Payment

Model Summary^b										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.755 ^a	.570	.565	.23666	.570	104.718	1	79	.000	1.340
a. Predictors: (Constant), Electronic payment, b. Dependent Variable: Business efficiency										
ANOVA^b										
Model			Sum of Squares	Df	Mean Square	F			Sig.	
1	Regression		5.865	1	5.865	104.718			.000 ^a	
	Residual		4.425	79	.056					
	Total		10.290	80						
a. Predictors: (Constant), Electronic payment, b. Dependent Variable: Business efficiency										
Coefficients^a										
Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.			
		B	Std. Error	Beta						
1	(Constant)	1.930	.189			10.209	.000			
	Electronic payment	.516	.050	.755		10.233	.000			
a. Dependent Variable: Business efficiency										

Results in Table 5 indicated that R-square was 0.570, indicating that electronic payment could account for a variation of 57.0% in business efficiency among Petrol Station employees. Electronic payment was important in predicting business efficiency among petrol stations ($p = 0.000 < 0.05$). Electronic ordering significantly influenced business efficiency among Petrol Stations ($t\text{-statistic} = 10.233$, $p\text{-value} = 0.000 < 0.05$). The null hypothesis was rejected, and the alternative hypothesis -electronic payment had a significant impact on business efficiency - was accepted. Therefore, we conclude that electronic payments do affect business efficiency. For every unit increase in electronic

payment, there was a corresponding increase in business efficiency among petrol stations by 0.516. The regression model equation is:

$$Y=1.930+0.516X4$$

The study agrees with Harland (2021), who found electronic payment to be significant. Further agrees with Ambe and Weiss (2022), who found electronic payment significant for business efficiency. I disagree with Manav (2017), who views electronic payments as insignificant to procurement performance.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

Electronic payment systems have revolutionized efficiency at petrol stations by ensuring secure and convenient transactions. They enhance safety by reducing cash handling risks, cut operational costs through streamlined processes, provide transparency in payment tracking, and offer electronic invoices for accurate record-keeping and financial management, ultimately optimizing the overall business performance.

5.2 Recommendations

The study recommends that petrol stations adopt electronic payment practices to de-congest queues for physical payment. Furthermore, electronic payment eases audits and minimizes cases of corruption.

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