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Pipeline Integrity Management and Logistics Performance at Kenya Pipeline Company, Nairobi City County

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Abstract: *This study examined the effect of pipeline integrity management on logistics performance at Kenya Pipeline Company, guided by Reliability Theory. A descriptive research design was employed, targeting 495 staff from key operational departments including supply logistics, maintenance, quality control, project construction, and safety & health environment. A sample of 221 respondents was selected using stratified random sampling, and primary data were collected through structured questionnaires. Analysis was conducted using SPSS version 25, applying both descriptive and inferential statistics. The findings revealed widespread concerns about inefficiencies in pipeline operations, with respondents highlighting gaps in inspection regularity, maintenance scheduling, and risk management. Despite these challenges, correlation analysis showed a strong and statistically significant relationship between pipeline integrity management and logistics performance ($r = 0.976$, $p < 0.001$). Regression analysis further revealed that pipeline integrity management accounted for 57.3% ($R^2 = 0.573$) of the variation in logistics performance. The study concludes that effective pipeline integrity management significantly enhances logistics efficiency, reliability, and safety. It recommends the implementation of structured maintenance schedules, investment in real-time monitoring systems, and development of proactive risk assessment frameworks. Future studies should explore the impact of digital technologies like IoT and predictive maintenance tools, and conduct comparative research across regions or firms for broader insights.*

. **Keywords:**, Logistics Performance, Pipeline integrity, Waste management,

I. INTRODUCTION

The growing global emphasis on environmental sustainability has spurred a widespread transformation in how industries manage operational waste and logistics systems. In response to environmental degradation and rising regulatory demands, organizations are increasingly integrating structured waste management practices into logistical operations to enhance efficiency, reduce costs, and uphold environmental integrity (Antwi et al., 2022). Waste management, involving the systematic collection, transportation, processing, recycling, and disposal of waste, has become essential not only for mitigating environmental impact but also for improving supply chain performance. Logistics performance, which encompasses the reliability, efficiency, and sustainability of the supply chain, plays a vital role in driving economic growth, minimizing operational costs, and ensuring the seamless movement of goods and services (Amare, & Birhan,2022).

In pipeline distribution companies, waste management is particularly significant due to the hazardous and voluminous nature of petroleum-related waste, including oil residues, pipeline debris, and maintenance waste. Integrating waste reduction, recycling, and compliant disposal mechanisms within logistical frameworks enhances storage efficiency, reduces transportation costs, and ensures alignment with environmental policies (Ali et al., 2021). The need for such practices is magnified by regulatory frameworks such as Kenya's Petroleum Act of 2019, which mandates sustainable environmental compliance across upstream and downstream petroleum operations (NEMA, 2022). Globally, advanced economies like the United States and regions such as the European Union have successfully embedded sustainable logistics through policy frameworks and technologies that support green logistics, including real-time tracking, waste segregation, and carbon emission reduction (EPA, 2020; European Commission, 2020). In Asia, countries like China and India have adopted smart logistics and waste management technologies to support rapid industrial growth while maintaining environmental sustainability (Kumar et al., 2020).

Across Africa, countries including South Africa, Nigeria, and Botswana have demonstrated that integrating waste management into logistical planning enhances operational efficiency and cost-effectiveness (Samuels et al., 2024;

Mwakipesile & Juma, 2019; Obiora et al., 2024). In Kenya, counties such as Nairobi, Kisumu, and Nakuru have shown improvements in logistics operations due to enhanced waste handling and regulatory compliance (Bagwasi et al., 2022; MEF, 2022). These localized efforts reflect a growing recognition of the role sustainable waste practices play in improving logistics performance and protecting the environment. At the national level, the Kenya Pipeline Company (KPC) has a mandate to manage petroleum logistics across the country, making it a key player in the application of waste and integrity management in logistics systems (NEMA, 2022).

A critical element of waste management and logistical success in the petroleum industry is pipeline integrity management. Pipelines are the backbone of oil and gas transportation, valued for their cost-effectiveness and efficiency over long distances. However, they are prone to structural failures caused by factors such as corrosion, cracking, and mechanical stress (Iftikhar et al., 2019). Pipeline integrity management programs aim to prevent such failures through systematic defect detection, prediction of defect development, and risk-based inspections. These initiatives ensure safety, minimize environmental risk, and support uninterrupted logistical operations (Xie & Tian, 2019). At KPC, failure to implement robust integrity management can lead to significant environmental hazards and logistical delays, whereas effective implementation enhances supply chain resilience, reduces costs, and maintains regulatory compliance.

Logistics performance at KPC is thus tightly linked to the organization's ability to manage the movement and storage of petroleum products efficiently. Key indicators include timely delivery, operational cost reduction, high customer satisfaction, reduced transit losses, and environmental safety (Getenga, 2022). These metrics not only reflect operational excellence but are also essential for supporting Kenya's broader economic development goals by ensuring a consistent and reliable fuel supply to industries and consumers alike.

Established in 1973 and operational since 1978, the Kenya Pipeline Company is wholly owned by the Government of Kenya and managed by the Ministry of Energy. It operates a vast network of pipelines and storage depots across strategic locations including Mombasa, Nairobi, Nakuru, Eldoret, and Kisumu, which are crucial for the national distribution of petroleum products (KPC, 2024). The company collaborates with the National Oil Corporation of Kenya and receives refined products from both local refineries and international imports. As such, the effectiveness of KPC's logistics system is fundamental to energy security and economic stability in the region.This studyexamines the effect of pipeline integrity management on logistics performance at Kenya Pipeline Company, aiming to establish how robust pipeline health monitoring and maintenance contribute to improved logistics efficiency, cost control, environmental sustainability, and regulatory compliance within Kenya's petroleum sector.

1.1 Statement of the Problem

Globally, the integration of waste management practices into logistical operations has been recognised as a crucial driver for enhancing operational efficiency, cost-effectiveness, and environmental sustainability. Green logistics strategies such as waste reduction, recycling, and sustainable procurementare associated with improved supply chain resilience and reduced environmental footprints (Chen et al., 2020). Despite these benefits, many organisations in developing countries, including Kenya, face persistent challenges in effectively implementing such practices. At the Kenya Pipeline Company (KPC), failure to manage pipeline integrity and waste effectively has resulted in serious operational disruptions and environmental hazards. Notably, in May 2012, a pipeline rupture led to a devastating fire in the Mukuru-Sinai slums of Nairobi, while in June 2019, supplies via Nakuru were suspended due to another pipeline failure (KPC, 2019). These incidents underscore the critical need for robust pipeline integrity management as a component of effective environmental and logistical strategies.

While several studies have explored the impact of green logistics and environmental management on logistics performance, most have focused on developed or rapidly industrialising economies. For instance, Zhang and Zhao (2021) identified a positive relationship between green logistics and operational efficiency in Chinese logistics firms, and Patel and Desai (2020) found that regulatory compliance significantly improved logistics performance in India. However, these findings may not fully capture the unique regulatory, infrastructural, and economic challenges facing logistics operations in developing contexts such as Kenya. There remains a significant knowledge gap in understanding how environmental and waste management strategies, specifically pipeline integrity management, influence logistics performance in such settings.

This study seeks to address this gap by examining how pipeline integrity management as a waste management practice affects logistics performance at Kenya Pipeline Company. By focusing on the Kenyan context, the research provides insights into how context-specific environmental management strategies can enhance supply chain reliability, reduce operational risks, and promote sustainable logistics performance in the petroleum distribution sector.

1.2 Specific Objective

To determine the effect of pipeline integrity management on logistics performance at Kenya Pipeline Company

1.3 Research Hypotheses

H_{01}: Pipeline integrity management has no significant effect on logistics performance at Kenya Pipeline Company.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Reliability Theory

Reliability Theory was developed by Paul Baran and Donald Davies in 1959, initially introduced through engineering journals that focused on communication systems and network resilience. The theory was conceptualized to evaluate the probability that a system or its components would function without failure over a specified period and under defined conditions. It focuses on identifying system functions, determining potential failure modes, and estimating the likelihood of failures to ensure system dependability. Hoyland and Rausand (2023) further explain that the theory is essential for analyzing complex, multi-component systems by assessing how failures may surpass safety limits. While the theory is widely supported for offering a structured and quantitative approach to improving reliability in engineering and logistics, it has been criticized for underestimating the influence of human error, environmental variables, and organizational dynamics.

In the context of the current study, Reliability Theory supports the objective to determine the effect of pipeline integrity management on logistics performance at Kenya Pipeline Company. It provides a systematic approach to identifying and addressing potential failure points in pipeline systems, ensuring continued operation and minimizing disruptions to logistics. By applying the theory, the study can evaluate the reliability of critical infrastructure and prioritize maintenance strategies. Furthermore, the theory is relevant to the second objective on spill response planning, as it assesses the preparedness and functional dependability of spill containment mechanisms. In doing so, it strengthens the overall reliability and responsiveness of logistical systems, aligning well with the study's focus on sustainable and efficient waste management practices.

2.3 Empirical review

The key goal of integrity management in pipeline transportation systems is to provide operators and maintainers with the necessary facts with decision-making aids to execute an effective and optimised action plan. This strategy seeks to avert, identify, and alleviate internal as well as external risks which may lead to lack of success. By doing so, it enhances the safety and reliability of operations while ensuring optimal financial returns(Gonzalez-Velazquez, 2024). As stated by Onestopndt.com (2024), pipeline integrity management is an essential procedure that guarantees the safe and dependable functioning of pipelines. It entails a thorough methodology for detecting, evaluating, and mitigating risks related to pipeline operations. The pipeline integrity management process includes tasks like risk evaluation, inspection, maintenance, repair, and monitoring.

Anderson, Williams, and Martinez (2021) examined the influence of pipeline integrity management on logistical performance in the United States. This study, executed in collaboration with Repsol Oil and Gas USA Inc., used a longitudinal methodology to evaluate the implications over a five-year duration. Stratified random sampling was employed to choose all participants. Our data collection included sensor data, maintenance records, and logistical performance parameters, which were evaluated by regression analysis. The results indicated that proficient pipeline integrity management markedly improved logistics performance by diminishing downtime and transportation expenses while enhancing delivery dependability.

Another study by Gonzalez and Alvarez (2022) explored pipeline integrity management's effect on logistics performance in Mexico The research used a cross-sectional design. 80 participants were attained by systematic random sampling. Data were collected via structured interviews with maintenance engineers and logistics managers, supplemented by secondary data from company records. Structural equation modelling analysis revealed a favourable correlation between stringent pipeline integrity management procedures and enhanced logistics efficiency, underscoring decreased leak occurrences and accelerated delivery times.

In their 2023 study, Smith and Brown examined the central duty of pipeline integrity management in promoting logistics performance of Enbridge, Inc. (ENB). Data were meticulously gathered via field inspections, maintenance logs, and performance reports, and subsequently analysed through thematic analysis. The study conclusively demonstrated

that robust pipeline integrity management substantially improves logistics performance, particularly by reducing transportation delays and costs. Using a combination of quantitative analysis and qualitative content analysis, Rossi and Conti (2020) highlighted the critical role of thorough pipeline integrity management in ensuring efficient and cost-effective logistics performance in the pipeline industry. This was evidenced by smoother and more efficient operations throughout the pipeline network.

Mensah and Boateng (2021) explored the influence of pipeline management on logistics performance at Ghana National Petroleum Corporation. This research used an exploratory design. Data were gathered through focus group talks and firsthand observations. The theme analysis indicated that proficient pipeline integrity management procedures substantially enhanced logistical performance. These approaches reduced operational disruptions, guaranteeing a more consistent and dependable flow of goods. Additionally, they enhanced delivery accuracy, leading to more precise and timely deliveries, which in turn improved overall logistics efficiency and reliability.

Mugisha and Nkurunziza (2023) examined pipeline integrity management and logistics performance in Rwanda. Data collection employed structured questionnaires, interviews, and document reviews. This study included statistics, both descriptive and inferential. The results showed a strong positive impact of rigorous pipeline integrity management on logistics performance, evidenced by reduced pipeline failure rates and improved supply chain efficiency.

2.2 Conceptual Framework

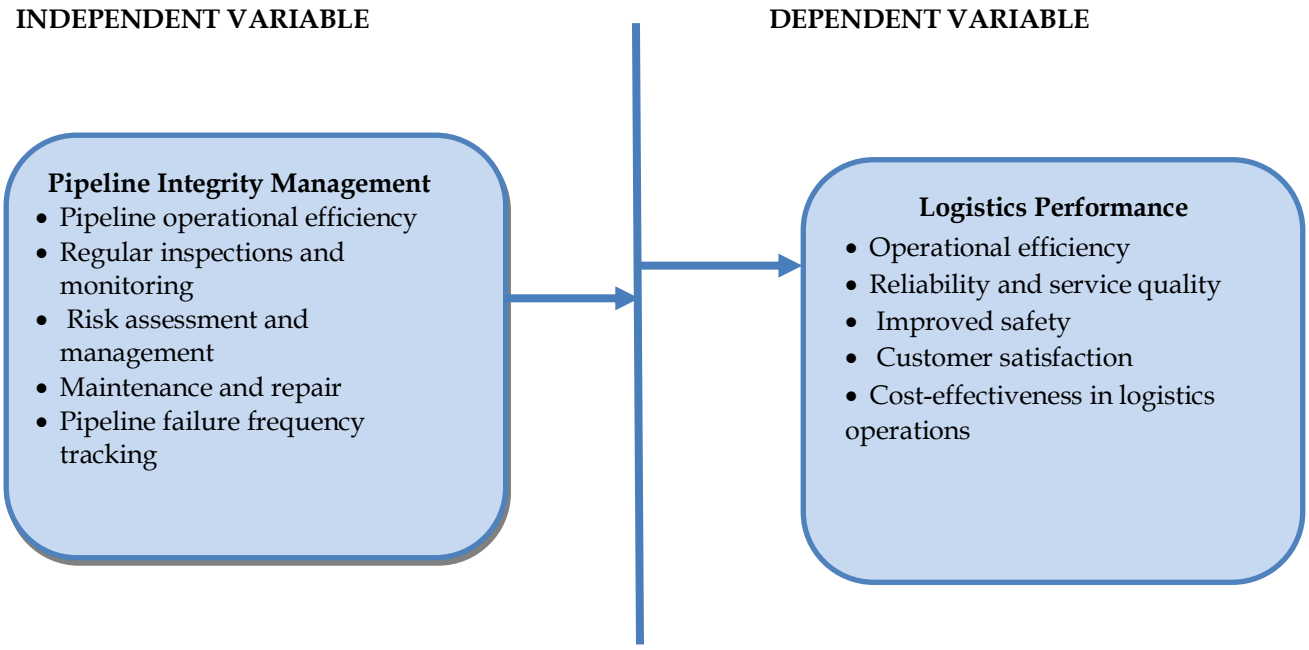

Fig 2.1: Conceptual Framework

III. RESEARCH METHODOLOGY

3.1 Research Design

According to Bistu (2023), a research design is a strategic framework that guides the systematic collection, measurement, and analysis of data to address the research problem.This study adopted a descriptive design to accurately capture and represent real-life phenomena.

3.2Population

Target population includes any persons, events, or objects, whether real or imaginary, to which a researcher intends to generalize the results. (Pandey,2021). This study targeted staff at supply logistics, maintenance, quality control, project construction and safety & health environment departments in Kenya Pipeline Company Headquarters in Nairobi County. The study population was 495 respondents.

3.3 Sampling Frame

In this study, the sampling frame consisted a list of contractors, engineers and project managers, who were the respondents. The motive behind selection of the respondents, was because they were in a better position to provide comprehensive and credible information about the topic under study.

3.4 Sampling size and Sampling technique

To compute the sample size, the study utilized the Yamane formula as illustrated below:

n =N/1+ N(e)2

Where; n = the sample size

N= population size(495)

e = error tolerance (0.05)

n = 495/ 1+495(0.05)2= 221

Sample size = 221 respondents

The respondents were distributed across different departments based on their proportional sizes among the targeted population, using the following formula;

n h =(N h /N) x n

n h = Sample size of stratum h

N h = population size of stratum

N = total population size

n = total sample size

Table 3. 1:Sample Size of Each Category

Department	Target Population	Sample Size
Supply Logistics	15	7
Maintenance	300	134
Quality control	50	22
Projects Construction	30	13
Safety & Health Environment	100	45
Total	**495**	**221**

Sampling methods in research are statistical techniques utilized to make a choice on a sample which properly reflects the entire population to analyse its characteristics. Sampling techniques are essential instruments for researchers, allowing for the acquisition of significant data and enabling analysis to discern unique characteristics of populations (Bistu, 2023). Stratified random sampling was used to pick respondents, with each department serving as a stratum. A stratified random sample ensures adequate representation of each subgroup within the departments of Kenya Pipeline Company, hence improving the validity together with dependability of outcomes when assessing the influence of waste management strategies on logistical performance

3.4 Data collection instruments

This study employed structured questionnaires for data collection. The questionnaire was picked for its ease of data collection and cost-effectiveness. They provided the researcher with comprehensive data on several subjects.

3.5 Pilot Study

Lancaster, Dodd, and Williamson (2020) define a pilot study as a preliminary investigation conducted to evaluate the effectiveness of research methods, tools, and procedures before the main study. In line with Mugenda and Mugenda's (2019) recommendation that a pilot sample should constitute 10% of the total sample, the pilot study was conducted at Vivo Energy Ltd, where 22 questionnaires were administered.

3.5 Data analysis and presentation.

Data was entered and analysed with SPSS statistical software. The gathered data was quantitative in nature and provided in tables to facilitate comprehension of the information supplied. Both descriptive and inferential statistics were analysed. Means and standard deviations were used to analyse descriptive statistics, while hypothesis testing, correlation and regression analyses were used to investigate inferential statistics. The regression model that was used is as follows:

$Y = \beta 0 + \beta 1X1 + \varepsilon$

Y=Dependent variable and X1 is the independent variables,

Where; Y= Logistics performance

X1= Pipeline integrity management

β0= Constant Term

β1= Regression coefficients of independent variables

ε= Error term

Tables were then employed to present the data.

IV. RESEARCH FINDINGS AND DISCUSSION

4.1 Response Rate

Table 4.1 : Response Rate

Responses	Frequency	Percentage
Expected Responses	221	100
Received Responses	193	87
Un-received Responses	13	13
Total	**221**	**100**

As presented in Table 4.1, a total of 193 questionnaires were successfully returned and utilized for analysis, representing a response rate of 87%. According to Babbie (2012), a response rate of 65% or higher is considered adequate for analysis, while Sataloff and Vontela (2021) affirm that response rates exceeding 50% are generally desirable in social science research. Therefore, the achieved response rate was not only sufficient but also exceeded the recommended thresholds, enhancing the credibility and reliability of the study findings.

4.2 Descriptive Analysis

The study examined the perspectives of contractors, engineers, and project managers on to pipeline integrity management affects the logistics performance at Kenya Pipeline Company. The data was gathered and assessed using a 5-point Likert scale ranging from strongly disagree to strongly agree(SA -SA-Strongly Agree,A-Agree,U-Undecided,D-Disagree,SD-Strongly Disagree). The descriptive statistics used were percentages, means, and standard deviations.

4.2.1 Descriptive Analysis for Pipeline Integrity Management

The results, summarized in Table 9, present participants' levels of agreement with various statements related to pipeline integrity management, along with corresponding mean scores and standard deviations.

Table 4. 2: Pipeline Integrity Management

Statement	n	SA (%)	A (%)	U (%)	D (%)	SD (%)	Mean	Std. Dev
The pipeline operates efficiently.	193	9%	18%	13%	39%	21%	2.564	1.261
Regular inspections and monitoring are conducted.	193	13%	21%	26%	31%	9%	2.968	1.189
Risk assessments and management strategies are effectively in place.	193	9%	10%	16%	41%	23%	2.409	1.217
Maintenance activities are carried out as scheduled.	193	10%	9%	21%	35%	25%	2.445	1.245
Pipeline failure frequency is tracked and minimized.	193	13%	18%	29%	31%	9%	2.943	1.177
Project resource planning influences the performance of road projects in the County.	193	23(24)	30(31)	5(5)	21(22)	18(19)	3.20	1.484

Observing the analysis in Table 4.2, a majority of the respondents (60%) disagreed on the efficiency of pipeline operations while 27% agreed with a (Mean= 2.564; standard deviation= 1.261). This indicates that a majority perceived inefficiency in the pipeline's operation. These findings align with the research of Gonzalez-Velazquez, (2024), who examined pipeline performance in industrial settings and found that pipelines lacking integrated monitoring and control systems often face operational inefficiencies. Their study highlighted that automation in pipeline management, combined with regular staff training, significantly improves operational performance, a gap that may be contributing to the inefficiencies noted by respondents.

Also, 40% of respondents disagreed that regular inspections and monitoring are conducted, compared to 34% who agreed with a (Mean=2.968, and standard deviation =1.189), reflecting a moderately divided opinion, but with a slight majority expressing dissatisfaction. Onestopndt.com (2024) conducted a comprehensive study on pipeline maintenance in the oil and gas sector and found that regular, well-documented inspections were critical in preventing leaks and failures. They noted that companies with established inspection schedules experienced fewer operational disruptions, thus reinforcing the need for systematic monitoring, as reflected in the agreement by a portion of respondents.

The results showed that 64% of respondents disagreed that risk assessments and management strategies are effectively in place, whereas 19% agreed with a (Mean= 2.409; standard deviation = 1.217) indicating a predominant concern about risk management practices. The findings are in tandem with those of Anderson et al. (2021) who explored risk management in infrastructure projects and found that effective risk assessment strategies, including hazard identification and mitigation plans, are crucial for operational safety and efficiency. Their research showed that companies that failed to implement these strategies faced frequent incidents, supporting the respondents' negative perceptions about risk management in this analysis.

Additionally, 60% of respondents disagreed that maintenance is carried out as scheduled, while 19% agreed (Mean= 2.445; standard deviation =1.245). This suggests significant issues with the scheduling and implementation of maintenance. Li, Wang, and Zhang (2020) investigated maintenance scheduling in pipeline systems and concluded that adherence to strict maintenance schedules directly correlates with reduced breakdown incidents. Their findings emphasized that unscheduled or inconsistent maintenance often leads to more severe failures, reflecting the concerns noted by respondents in this data.

Finally, 49% of respondents disagreed that pipeline failure frequency is tracked and minimized while 31% agreed with a (Mean=2.943; standard deviation =1.177). Although not an overwhelming majority, there is still a significant portion that perceives tracking efforts as inadequate. O'Neil and Parker (2021) focused on the role of digital tracking systems in pipeline management and found that implementing real-time data analysis tools significantly reduced the frequency of pipeline failures. They argued that companies that invested in advanced tracking technologies experienced fewer incidents, suggesting that improvements in this area could address the concerns raised by respondents in the current data.

4.3 Inferential Statistics Findings

This part documents and discusses the inferential statistics findings analysed from the data collected in respect of the influence of pipeline integrity management on logistics performance at Kenya Pipeline Company.

4.3.1 Correlation between Pipeline integrity management and Logistics performance at Kenya Pipeline Company

The researcher sought to establish the relationship between pipeline integrity management and Logistics performance at Kenya Pipeline Company as shown in Table 4.3.

Table 4. 3: Pearson's Correlation between Pipeline integrity management and Logistics performance at Kenya Pipeline Company

Variable		Logistics Performance
Pipeline Integrity management	Pearson Correlation	.976
	Sig. (2-tailed)	0.000
	N	193

. Correlation is significant at the 0.05 level (2-tailed).

The Pearson correlation analysis conducted to examine the relationship between pipeline integrity management and logistics performance at Kenya Pipeline Company revealed a strong and statistically significant positive correlation ($r = .976$, $p < .001$). This indicates that improvements in pipeline integrity management are closely associated with enhanced logistics performance. The high correlation coefficient suggests that practices such as routine inspections, effective risk management strategies, timely maintenance, and tracking of pipeline failures contribute significantly to the efficiency and reliability of logistics operations.These findings align with Oke and Anyaegbunam (2019), who observed that effective pipeline integrity management enhances logistical efficiency by minimizing disruptions and failures. Similarly, Thompson et al. (2018) emphasized that regular inspections and maintenance are vital for reliable logistics, especially in difficult terrains.

4.4 Regression Analysis

4.4.1 Regression Model Summary

The study conducted a regression analysis to find out the strength of the relationship between independent and dependent variables as shown in Table4.4

Table 4. 4:Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change
1	.754a	.573	.577	242.698	0.000

The results in Table 4.4 indicate that the R Square value is 0.573, suggesting that pipeline integrity management explains approximately 57.3% of the variation in logistics performance at Kenya Pipeline Company. This indicates a strong and significant relationship between the two variables. The remaining 42.7% of the variance is attributed to other factors not included in the model. The significance value ($p = 0.000$) indicates that the regression model is statistically significant.

4.4.2 Multi regression Analysis of Pipeline integrity management

The study also conducted a regression analysis to establish the regression coefficients. Table 4.5 shows the results.

Table 4. 5:Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	.521	.044		11.834	.000
	Pipeline Integrity Management	.347	.069	.296	5.043	.000

a. Dependent Variable: Project Performance

This implies Table 4.5 demonstrates that the unstandardized coefficient (B) for pipeline integrity management is 0.347, with a p-value of 0.000, indicating a statistically significant positive relationship. The regression equation derived from the model is:

$Y = 0.521 + 0.347X_1 + \varepsilon$

Where:

Y = Logistics Performance

X_1 = Pipeline Integrity Management

0.521 = Constant (intercept)

0.347 = Coefficient for Pipeline Integrity Management

ε = Error term

This implies that a one-unit increase in pipeline integrity management is associated with a 0.347 unit increase in logistics performance, assuming other factors remain constant. The significance of the t-value (5.043, $p < 0.05$) further confirms that pipeline integrity management has a meaningful influence on logistics performance.Based on the regression results in Table 4.5, the p-value for pipeline integrity management is 0.000, which is less than the significance threshold of 0.05. Therefore, the null hypothesis is rejected, indicating that pipeline integrity management does have a significant effect on logistics performance.

These findings are consistent with studies by Oke and Anyaegbunam (2019), who established that effective pipeline integrity management reduces the likelihood of system failures, thereby enhancing overall logistical efficiency. Similarly, Thompson et al. (2018) emphasized that regular maintenance and monitoring of pipelines are crucial for uninterrupted logistics operations.

V. CONCLUSION

The analysis revealed prevailing concerns among respondents regarding the effectiveness of pipeline integrity management practices at Kenya Pipeline Company. Majority expressed the view that pipeline operations lack efficiency, attributing this to gaps in monitoring systems and inadequate staff capacity. There was notable skepticism about the consistency of inspections and the presence of structured maintenance schedules, which aligns with existing literature emphasizing the importance of systematic oversight in reducing operational failures. Furthermore, the perceived absence of robust risk assessment frameworks and insufficient tracking of pipeline failure events pointed to broader systemic challenges in managing pipeline infrastructure. These findings resonate with prior studies that highlight the critical role of automation, regular inspections, and real-time monitoring in maintaining pipeline performance. Despite these operational concerns, the study established a statistically significant and strong positive correlation between pipeline integrity management and logistics performance, reinforcing the argument that enhancing integrity

management practices is essential for improving organizational efficiency and reliability.

VI. RECOMMENDATIONS

Based on the findings, the study recommends that Kenya Pipeline Company adopt a more rigorous and structured maintenance policy that enforces routine inspections and ensures timely intervention in response to identified issues. Equipping engineering and maintenance teams with adequate resources, including modern monitoring tools and technologies, will enhance the consistency and reliability of pipeline operations. Additionally, the development and implementation of a proactive risk assessment and management framework is essential to detect and address potential vulnerabilities before they escalate into major operational disruptions.

The implications of this study are significant for both practice and policy. The established positive relationship between pipeline integrity management and logistics performance underscores the strategic value of investing in infrastructure reliability to enhance operational efficiency. These findings suggest that organizations in the energy and logistics sectors must prioritize pipeline integrity not only for safety and compliance but also as a driver of performance and service delivery.

For future research, studies could explore the impact of specific technologiesuch as real-time data analytics, predictive maintenance systems, and IoT-based monitoringon pipeline integrity and logistics outcomes. Longitudinal research may also provide deeper insights into how sustained investments in integrity management influence organizational performance over time. Moreover, comparative studies across different regions or pipeline firms could help generalize findings and identify best practices in the sector.

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