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EXAMINING THE RELATIONSHIP BETWEEN IT PROJECT RISK MANAGEMENT AND BENEFITS REALIZED FROM IT PROJECT IMPLEMENTATION WITHIN THE PUBLIC SECTOR

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ABSTRACT

Information technology (IT) has become increasingly critical in today's digital world, supporting, sustaining, and driving growth in public organizations. The board of directors and senior management have traditionally delegated, disregarded, or avoided IT decisions. The majority of public sector organizations have realized that such a mindset is outdated and must be avoided. Being a foundation for effective enterprise governance, the IT risk management domain seeks to guarantee that a structure exists for identifying, analyzing, mitigating, monitoring and communicating an organization's IT risk to ensure successful IT project implementation. This research, therefore, sought to examine the relationship between risk management of IT projects and the hypothesized benefits from IT investments, namely Return on Investments (ROI), number of customers served and the level of customer service delivery. A total of 309 out of 517 public sector organizations in Kenya were sampled, and data were collected from heads of departments, including IT, Finance, HR, Audit, and Technical among others, through an online research tool. The correlation results revealed that IT risk management and ROI had a weak and negative correlation. The correlation between the management of IT risk and the number of customers served was equally found to be weak and negative. However, the correlation between IT risk management and customer service delivery was positive and significant. Results from the multivariate regression test revealed that risk management of IT projects significantly improved customer service delivery but had no significant effect on both ROI and number of customers. The study concluded that there was a significant effect of IT risk management on the customer service delivery. Therefore, senior management had a responsibility to ensure that IT risk management was incorporated in all major IT projects to ensure that improved customer service delivery benefit was realized.

Keywords: *Customer Service Delivery, IT Benefits Realised, IT Risk Management, Number of Customers, Return on Investments.*

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1. Introduction

Information Technology (IT) has become a central part of many public organizations today. While most public entities are reliant on technology for managing their operations, the ability to harness and derive business value from the IT investments remains a major challenge (ISACA, 2018). Today, IT governance theory and practice have taken a strategic role in private organizations (Adonu, 2016). The research and implementation of governance of enterprise IT (EGIT) within public organizations has received little attention. This has resulted in a gap in the theoretical literature (Albayrak, 2012). Digitalization of new business models and efficient procedures creates value for stakeholders through maximizing benefits while minimizing risk. IT has become an increasingly significant means of achieving growth and success in most organizations (Ndlovu & Kyobe, 2016). Many public sector IT projects continue to experience failures due to various reasons (Rajala & Aaltonen, 2021).

Management of IT risks encompasses the enactment of plans and strategies to mitigate risks associated with systems through continuous risk assessment aimed at reducing vulnerabilities and ensuring resilience and effective recovery capabilities of IT systems (Gurtu & Johny, 2021). It therefore aims at increasing the possibilities of an IT project rollout through improving the positive risk impact and reducing the negative risk effect to ensure management of cost overruns, mitigation of delays in project delivery and prevention of reputational loss (Fridgeirsson *et al.,* 2023).

Cost, schedule, and performance are the three most prevalent forms of hazards that exist regardless of the project type and pose the risks that affect the budget, leading to over expenditure on an IT project; unplanned schedule conflicts, including scope creep, may lead to project delays, thus generating project outcomes that are not consistent with the project specifications (Emerson & Manns, 2024). One of the key areas to address in an IT project implementation plan was identified as IT project risk management. This was because IT projects were characterized by a series of interconnected processes and thus the most effective methodology of performing risk management for IT projects was through imitation modeling (Rishnyak *et al.,* 2020).

IT governance in practice guarantees that IT investments provide the anticipated benefits in accordance with the plan when project risks are proactively managed. It also focuses on resource optimization across the project life cycle from the initial IT investment through to the final benefits realized (Joshi *et al.,* 2022). The experience of users on public digital platforms is an important element that impacts user perception, user satisfaction, customer service delivery, and the ultimate success of the government digital platforms. Customer experience is a significant topic since it influences adoption and usage of the government's digital platforms, ensuring effective and efficient customer service delivery to citizens (Husni & Abdullah, 2025).

Being a foundation for effective enterprise governance, the IT risk management domain seeks to guarantee that the structure exists for identifying, analyzing, mitigating, monitoring and communicating the organization's IT risk (Plant *et al.,* 2022). There needs to be a more disciplined approach to how IT measures, acknowledges and manages risks, including reporting on the IT risk management initiatives (Gibson & Igonor, 2020). The IT risk dimensions in the research included risk identification, risk levels, namely very high, high, moderate and low, risk maturity, overall risk impact, as well as the level of incorporation of risk management in IT projects.

Information technology (IT) benefits include generating value for the organization, conserving and extending the value acquired from present IT investments, phasing out IT programs and assets that do not deliver sufficient worth. The Project Management Institute (PMI) defines IT benefits in terms of the advantages gained by the organization and other beneficiaries from the program's results (Ozguler, 2020). Customer perception of service delivery is a significant factor for all public sector organizations and can be used as a

measurement of customer satisfaction with the services offered to the citizens. Consumer perception is formed by many factors, including both indirect and direct interactions with the public offices across government entities (Abd Aziz *et al.,* 2022). The IT project implementation benefits identified for public sector organizations included customer service delivery, growth in the number of customers, and the financial return on IT investments (ROI).

The main objective of this research was therefore to investigate the relationship between IT project risk management and the benefits realized from IT project implementation, namely customer service delivery, number of customers and ROI. The main hypothesis tested stated that;

H_{01}: There is no significant relationship between risk management of IT projects and dimensions of benefits realized from IT projects.

The following three sub-hypotheses were tested to address the main hypothesis;

H_{010}: There is no significant relationship between risk management of IT projects and return on investment (ROI)

H_{011}: There is no significant relationship between the risk management of IT projects and the number of customers

H_{012}: There is no significant relationship between risk management of IT projects and customer service delivery

2. Literature Review

Public organizations, whether commercial or not, have value creation as a governance objective because they exist to create value for the citizens. In order to create value, a public entity must produce advantages while utilizing resources efficiently and mitigating risk to the greatest extent possible.

2.1 Empirical Literature

Kim and Kim (2020) carried out research on the implementation of IT projects and their related impact on the public institutions in the context of an IT-driven solution for cross-border risk management within the customs department. They developed a general hypothetical model describing how IT innovation was realized within the public entities and proposed a dynamic IT model that accounted for the flexibility and resilience of systems that enhanced justifiable development and addressed both the current and envisaged future risks. Their findings revealed that public entities' capacity to serve cross-border customers improved substantially and the clearance time for cargo reduced significantly. In addition, drug captures within the borders significantly improved after the implementation of the IT system, resulting in a reduction of the huge risks associated with cross-border drug trafficking.

Blaskovics *et al.* (2023) investigated an experimental framework on the failure and success rates of both public and private sector projects within Hungary using the Mann-Whitney test. They found a correlation between the IT Project management knowledge gaps and the IT risk management skills required in managing IT projects. The research further revealed that the private sector IT projects performed much better on IT project risk management than the public sector IT projects. Further, they discovered that customer satisfaction was significantly considered within the private sector as compared to the public sector. This research anchored risk management of IT projects as a variable for incorporation in project management, as well as the low emphasis on customer satisfaction within the public sector and thus the need to focus on customer service delivery and feedback assessment.

Fridgeirsson *et al.* (2023) examined the effect of artificial intelligence (AI) on IT-based projects in relation to IT project cost, IT project risk and project schedule built around PMBOK-PMI's expert and knowledge domain. Their research revealed that AI had the strongest effect on risk management for IT projects, cost estimation, and project scheduling through the

alignment of complex analytics and the delivery of results without human intervention. They in addition found that AI was entirely reliant on learning from previous data and would be limited in performance in the absence of such data.

Laila *et al.* (2016) developed a multi-agent IT risk, compliance and governance (IT GRC) framework with four major layers: The strategic layer was based on the COBIT framework, and the decision layer for making decisions at each level of the layer. The processing layer is made up of several systems, each of which was dependent on a certain IT framework for managing IT operations provided by the strategy layer and finally, the communication layer, which was in charge of all communications between the IT GRC platform's tiers. However, their work focused mainly on the risk and compliance pillar of the IT governance framework, further recommending validation of the architecture as an area for future research.

Vahid (2020) examined benefit realization parameters from the perspective of portfolio, program, project and maturity management models. They examined how benefits were realized in relation to portfolio, program and maturity of projects. Several maturity management project frameworks were evaluated: Using the OPM3 model, which was developed by PMI, organizations could assess their current level of maturity in project management best practices. This model did not, however, address the key parameters aligned to benefits realization, including ROI and customer service delivery.

Deshmukh *et al.* (2020) investigated the management of IT risks within the public customer relationship (CRM) management of related projects. They examined how IT project risks within CRM implementations impacted the final delivery, as well as how the adopted risk management approach by the IT project team impacted the final delivery of the project. The study revealed that IT project risk impacted cost, time, and technical performance while the risk management process impacted customer service delivery, project planning and senior leadership support. This research did not, however, address the key parameter aligned to benefits realization, namely, ROI.

Hazée *et al.* (2020) evaluated the design of risk management for service delivery systems using the customer-focused approach. They came up with an integrated conceptual framework that revealed both the infrastructural and structural design options that customers expected public entities to adopt for mitigating risks, which resulted in improved customer service delivery. However, the framework did not address other aspects of IT benefits realization, including ROI and the number of customers.

Xu and Gumban (2023) examined the risk factors and IT project ROI amongst public IT institutions in China. Their findings revealed that IT firms performed poorly on ROI for IT project investments. They further recommended a static index for measurement of ROI for IT project investments with clear, understandable and calculatable results. However, the study did not address customer service delivery as a benefits realization measurement.

2.2 Theoretical Background

Markowitz (1952) was credited with developing modern portfolio theory (MPT). The theory was built around two variables: risk and return on investments. MTP is an investment theory that aims to explain why investors optimize return while minimizing risk. It emphasized that an investor was more concerned with the value expected from the overall investment as well as the value expected from the individual stocks. An investor would prefer to invest in a security with the highest projected return to maximize the expected value of a portfolio. According to the theory, investors were concerned about the returns and risk, which could be ascertained from the entire investment range. MPT was thus concerned with optimizing the advantages of investments while taking both risk and return into account. The theory indicated that Information systems investments could be handled as an investment portfolio, which combined both risk and return on investment to maximize the benefits of IT investment while selecting the best. Both the two dimensions of this theory, namely risk management and return on

investments (ROI), were adopted in coming up with a conceptual model for the research. In addition, both the number of customers and customer service delivery were adopted as benefits measurement parameters and incorporated in the conceptual framework.

2.3 Conceptual framework for IT risk management and benefits realization

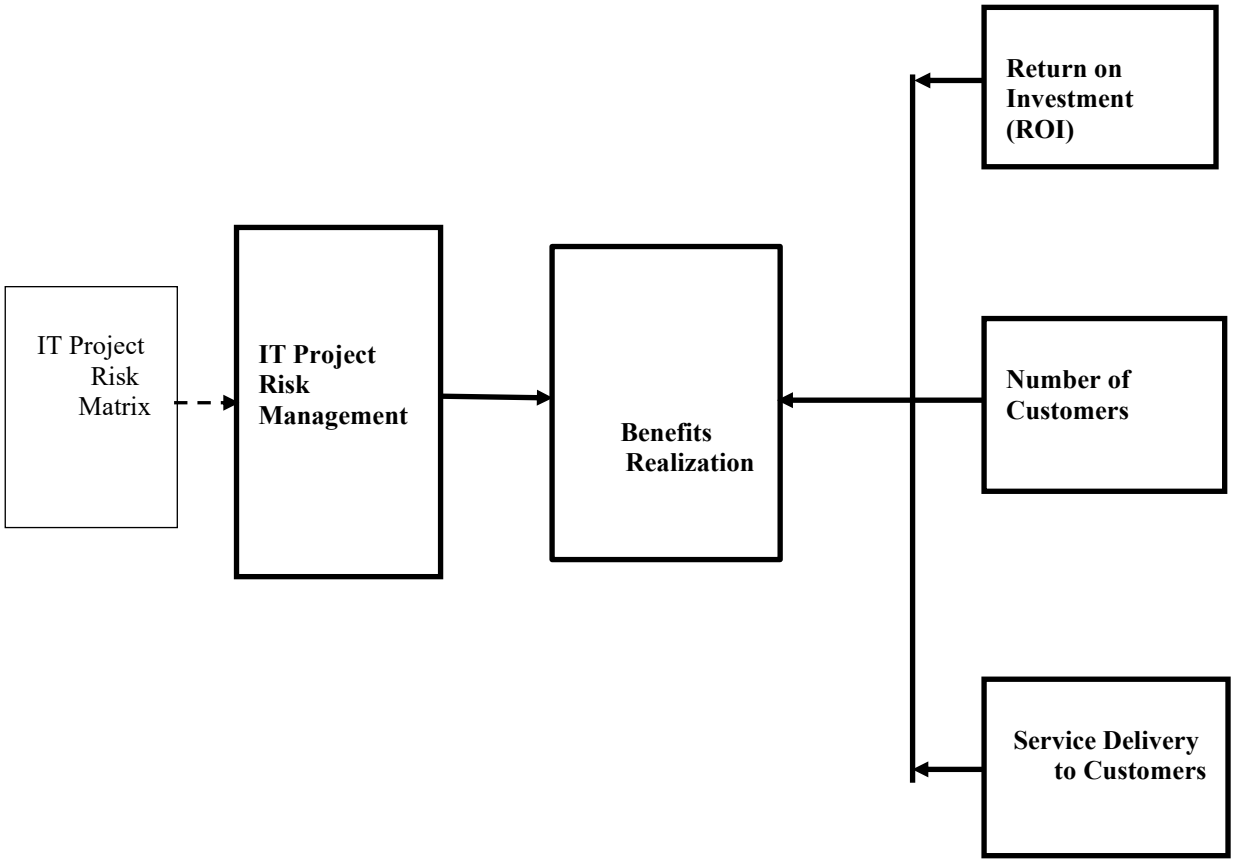

Figure 1. Conceptual framework (Source: Author, based on the modern portfolio theory)

This framework detailed the independent variable risk management for IT projects and the benefits realized from the project implementation. One of the indicators for the dependent variable, benefits realization, was the increase or decrease in customer counts attributable to customer happiness or dissatisfaction with IT-enabled investments. In addition, it also recognized the other two indicators of the dependent variable, benefits realization, including service delivery to customers and the return on investments, which is the ratio of expected profit from the initial IT investment.

3. Research methodology

The methodology adopted for this study was a quantitative approach. The population for the quantitative study was all public sector organizations within the Republic of Kenya.

3.4 Sample method

Data from the National Treasury Annual Consolidated Financial Statements Report (2019) showed that there were 517 public entities in Kenya. Each public entity had at least one IT system running its operations. The size of the sample was arrived at from the formula below;

$$\boldsymbol{n} = \frac{\boldsymbol{Z^2 \times P(1-P)}}{\boldsymbol{d^2}} \quad (1)$$

Where n was the required sample size, Z was the Level of Confidence at 95%, P was the expected level of IT implementation in the public sector at 50% and d was the margin of error or desired precision at 5%.

3.5 Sample size

Based on the above assumptions, the calculated sample size was 221. That notwithstanding and in order to achieve more accurate results, there was an oversampling and the total sample obtained was 350, representing 68% of all the public entities in Kenya. Stratified random sampling was used to achieve representation across the various public entities, namely semi-autonomous government authorities (SAGA's), state corporations, public funds, county governments, universities and other learning institutions, among others.

3.6 Data collection

Primary data was the main data source for the research and the instrument used to collect the primary data, including the perspectives of diverse study participants, was the questionnaire tool. The research instrument was designed perfectly and piloted among eighteen users to elicit feedback from the respondents. Based on the feedback from piloting, the tool was further refined to capture all the gaps identified with regard to both the research objectives and independent and dependent variables. Data from major IT systems implemented by sampled public entities were used in the study. Verification of whether IT Risk management was incorporated in IT Project implementation and the number of extreme and high risks identified from IT project risk assessment reports, as well as evidence of senior management support for IT projects within the public entity, was captured.

3.7 Data analysis

The research adopted both inferential and descriptive data analysis approaches in analyzing the data. Inferential statistics, mainly Pearson's correlation and regression, were used to evaluate the association and draw conclusions among the research constructs. In order to enhance and allow inferential processing of the data collected, the data were converted into composite variables to enable both inferential and hypothesis testing.

$$ROI = \beta_0 + \beta_1 IT\_risk + \beta_2 IT\_risk\_mngt + \varepsilon \quad (2)$$

$$NC = \beta_0 + \beta_1 IT\_risk + \beta_2 IT\_risk\_mngt + \varepsilon \quad (3)$$

$$SD = \beta_0 + \beta_1 IT\_risk + \beta_2 IT\_risk\_mngt + \varepsilon \quad (4)$$

$$Where, ROI = Return\ on\ Investment, NC = Number\ of\ Customers\ \ and$$

$$SD = \ Service\ Delivery \quad (5)$$

ROI = Return on investment

NC = Number of customers

$$IT_{risk} = IT\ risk\ level \quad (6)$$

$$IT_{risk_{mngt}} = Management\ of\ IT\ risks \quad (7)$$

β_0=*Constant and an Intercept*

$\beta_1, \beta_2, \beta_3$ *and* β_4 = *Beta Regression coefficients*

$$\varepsilon = error\ term \quad (8)$$

4. Results and Findings

4.1. Descriptive Research Findings

The descriptive analysis results are depicted in Table 1.

Table 1. Response Rate

Questionnaire	Number of Respondents	Percentage Respondents
Filled	309	88.29%
Non-response	41	11.71%
Total	**350**	**100%**

The target respondents for this study were 350, but the actual number of responses received was 309. This represented a total of 88.29% response rate. Mugenda and Mugenda (2003) posit that a response rate of 70 percent was acceptable as a good representation of the sample population. Therefore, a response rate of 88.29% was higher than the recommended threshold of 70%.

Table 2. Years of Experience in the IT Public Sector

	Number of years	%
Working Experience in IT projects within the public sector.	1 - 5 Years	22.3%
	6 - 10 Years	23.9%
	11 - 15 Years	32.7%
	15 Years and Above	21.0%
	Total	**100.0%**

Table 2 showed that the majority of the respondents, at 32.7% had between 11-15 years of experience working within IT in the public sector. Further analysis indicated that many respondents, at 54.1% had more than ten years of experience in the IT, indicating that they had sufficient knowledge and expertise on IT matters within the public sector.

Table 3. Gender of Respondents

Sex	Frequency	Percent
Male	226	73.1%
Female	83	26.9%
Total	309	100%

The gender aspect of the respondents was a consideration in the study. The results showed that 26.9% were female, while the majority, at 73.1% were male.

Table 4. Primary mandate of the public entity

Primary Mandate of Organization	Column N %
Both Service Delivery & Revenue Generation	34.6%
Service Delivery	62.1%
Revenue Generation	3.2%
Total	100.0%

The primary mandate of most of the public sector organizations where the respondents were drawn from was service delivery at 62.1% and a substantial proportion were both service delivery and revenue generation at 34.6%. Those whose mandate was revenue generation alone were a paltry 3.2%.

Table 5. Number of IT projects undertaken by the respondents within the public sector

Range	Frequency	Percent
1 to 2	55	17.8%
3 to 4	90	29.1%
5 to 6	62	20.1%
7 to 8	26	8.4%
9 to 10	14	4.5%
Above 10	62	20.1%
Total	**309**	**100.0%**

Data analysis revealed that most respondents had successfully undertaken between three and four IT projects in the public sector, at 28.8% followed by 20.1% of the respondents indicating that they had undertaken over ten IT projects in the public sector. 20.1% of the respondents had undertaken between five and six IT projects, while 8.4% of the respondents had undertaken between seven and eight IT projects. Cumulatively, 79.9% of respondents had done between three and over ten IT projects in the public sector, making them subject matter experts in public sector IT project implementation.

Table 6. Most recent IT project type implemented

Recent IT Project	Frequency	Percent
Core Business System	30	9.7%
Customer-Service-Management-System	8	2.6%
Data-centre-Implementation/Upgrade-Solution	18	5.8%
Electronic-Document-Management-System-(EDMS)	14	4.5%
Enterprise Resource Planning (ERP) System	132	42.7%
Financial-Management-System	7	2.3%
HR& Payroll-System	2	0.6%
Internet-Solution	8	2.6%
IT-Security-Management-System	21	6.8%
LAN/WAN-Solution	31	10.0%
Office-365/Email-Solution	12	3.9%
Others	17	5.5%
Payment-System	5	1.6%
Printing-Service-Solution	4	1.3%
Total	309	100.0%

A review of data from Table 6 provided insights on the most recent IT project implemented by the respondents, with the Enterprise Resource Planning (ERP) system taking the lead at 42.7% closely followed by both the organization's local area network/wide area network solution (LAN/WAN) at 10.1% and Core Business systems at 9.7%. This was then followed by the IT security management system at 6.8% indicating the degree of focus that the public organizations had put on managing emerging cyber-related threats to government systems.

Table 7. Generation of composite variables for hypothesis testing

Composite Variable Generated	Abbreviated as
Risk management	Risk_mgnt
Service delivery	Service_delivery

To facilitate inferential and hypothesis testing of the collected data, the data were converted into composite variables. This involved the weighting and averaging of the raw data collected for ordinal scale variables for each case study. This generated ratio scale variables, which were used for more complex analysis

Table 8. Descriptive Results: The Risk Exposure and Risk Mitigation

	Low risk	**Medium risk**	**High risk**	**Very High risk**
Cost risk as a result of poor planning, scope and cost estimation.	34.2%	31.5%	25.0%	9.2%
Schedule risk resulting from poor planning is the risk that the project takes longer	23.5%	37.2%	28.6%	10.7%
Performance risk is an indication that the IT project might not achieve the desired results and benefits	31.9%	35.2%	23.6%	9.3%
Operational risk arising from problematic processes of procurement and implementation of the IT project	27.3%	37.4%	28.9%	6.4%
Technology risk, including system failures, security breaches and new technologies	26.0%	33.9%	25.5%	14.6%
Communication risk arises from poor communication and insufficient feedback, leading to project delays.	29.5%	37.9%	24.7%	7.9%
Scope creep risk arising from the ever-evolving project scope compromising delivery timelines	23.8%	34.7%	32.2%	9.4%
Skills resource risk arising from an insufficient project management and execution team	32.8%	36.0%	21.0%	10.2%
Market risk is attributed to competing products and services, as well as unhealthy competition	50.9%	28.6%	16.8%	3.7%
Governance risk arising from inadequate board and senior management support	40.8%	30.8%	20.1%	8.3%
Strategic risk resulting from the selection of an inappropriate IT solution that is not fit for the organization	41.7%	29.4%	21.5%	7.4%
Legal risk arising from legal issues, including litigation and lawsuits filed against the public entity	46.6%	28.8%	17.8%	6.7%
External hazard risks resulting from lack of BCP/DRP, including storms, floods, earthquakes, vandalism, pandemics and other natural disasters	42.6%	31.8%	15.3%	10.2%

This section provides a description of the risks faced by IT projects and the extent to which public institutions managed the risks. It also provides results on the amount of risk exposure and the extent of IT risk management among the public institutions sampled. Table 8 captures the different types of risks that threatened the smooth implementation of IT projects. The results showed that the proportion of institutions with very high risks was relatively low. Some of the common very high and high-risk exposures inherent in IT projects included schedule risks (39.3%), operational risks (35.3%), technology risks (40.1%), and scope creep risk (41.6%). Some of the risks were low in some public entities, such as market risk posed by competition (50.9%), governance risk from inadequate board and senior management support (40.8%), strategic risk (41.7%), legal risk (46.6%) and external risks (42.6%).

Table 9. Risk Management adoption

	Strongly Disagree (1)	**Disagree (2)**	**Neither agree/ disagree (3)**	**Agree (4)**	**Strongly agree (5)**	**Agreed & strongly agreed (6)**
Development of a Risk management framework /policy for the IT project	4.2%	7.1%	14.6%	40.8%	33.3%	74.1%
Identification of risks associated with the IT Project	5.2%	5.2%	9.4%	48.2%	32.0%	80.2%
Integration of Risk management activities into IT project processes	4.9%	8.1%	13.3%	43.0%	30.7%	73.7%
Appointment of risk management champions to manage risk assessment and mitigation	7.1%	8.7%	18.8%	31.7%	33.7%	65.4%
Financial resources are allocated for managing risks associated with IT	8.7%	13.3 %	21.0%	35.3%	21.7%	57.0%
Organizations' senior Management holds risk management meetings to review	6.8%	10.0 %	19.4%	36.9%	26.9%	63.8%
The organization has a Business Continuity & Disaster Recovery Plan (BC&DRS)	4.2%	7.4%	15.5%	34.0%	38.8%	72.8%
Risk mitigation plan and activities are communicated across the organization	6.8%	8.1%	20.4%	35.6%	29.1%	64.7%

The results in Table 9 showed that 74.1% of the institutions had developed a risk management framework and policy for the IT investments (40.8% agreed and 33.3% strongly agreed), 80.2% did risk identification for the IT projects (48.2% agreed and 32.0% strongly agreed) and 73.7% integrated risk management into IT processes. A proportion of 65.4% had appointed risk champions to manage risk assessment and mitigation (31.7% agreed and 33.7% strongly agreed) and 57.0% confirmed they had allocated financial resources to mitigate risks. Some other risk management measures taken to mitigate risk included having regular meetings to review risk exposure of the IT project (63.8%), having Business continuity and disaster recovery plans (72.8%) and communication of the risk plan across the organization (64.7%). The results indicated that most of the agencies had put in place risk mitigation plans for managing IT-related risks.

Table 10. Risk, Risk Mitigation and Organizational Characteristics

Test	Variable	Sub-Options	Risk Level (p-value)	Risk management (p- value)	Inference
Anova	Mandate	•Revenue generation •Service delivery •Both	0.7813	0.9088	The amount of risk and extent of risk management were not significantly different among institutions with various mandates
	IT Team Size	•1-10 •11-20 •21-30 •31-40 •41-50 •Above 50	0.0268	0.3819	Those with a larger IT team size had more risks than those with a smaller IT team.
	Level of management of the ICT head	•Senior manager • Middle Manager •Senior officer	0.0742	0.0000	Those institutions whose head of IT was at a senior management level implemented more risk management measures than those where the head of ICT was not at a senior management level.
	Category of the Institutions	•Ministries, State corporations •Commissions •Counties	0.4355	0.0597	There are no differences in the total risk exposure of IT projects and how risks are managed across different categories of government institutions.
t-test	Whether there was a Risk Component in IT Projects	•Yes •No	0.2441	0.0269	Those institutions that had an IT component in the IT projects implemented more risk management measures than those without.
	Whether there was a Board Committee for IT matters	•Yes •No	0.0742	0.0000	Those with Board Committees on IT implemented more risk management measures than others

The study tested whether there were significant differences in the risk levels and risk management. This was done using one-way ANOVA and a t-test. The decision criterion was that significant differences would be confirmed if the p-value was less than 0.05 ($p<0.05$). The results showed that the amount of risk and the risk management were not different across entities with different mandates ($p>0.05$). In terms of IT team size, the ANOVA post hoc results showed that entities that had a lot of IT human resources had significantly ($p=0.0268$, $p<0.05$) high levels of risks compared to others with smaller ICT personnel. The entities whose head of ICT was at a senior management level had significantly employed better risk management of IT projects compared to others ($p=0.0000$, $p<0.05$). The amount of risk and the extent of risk management were not significantly different across different classifications of public institutions.

The independent t-test results showed that public entities that had a risk component in the IT projects implemented risk management measures significantly more than those that did

not have such a component (p=0.0269, p<0.05). Similarly, entities that had Board committees that handled IT matters implemented more risk management measures than those without. The results show that the existence of the risk components and the Board committee to handle risks related to projects encouraged the implementation of risk mitigation measures.

4.2 Correlation and Multivariate Regression Tests

The main aim of this study was to assess the relationship between the risk management for IT projects and dimensions of benefits realized from IT Project implementation. These dimensions of benefits realized included ROI, the number of customers served and the level of service delivery. This was evaluated using 3 models for each realized benefit and these three hypotheses were tested for each realized benefit.

4.2.1 Correlation Test

In order to establish the strength and direction of the relationship between ROI, number of customers served and customer service delivery against the risk management for ITprojects, a correlation test was carried out. Table 11 captured the Pearson correlation between IT project risk, risk management and ROI.

Table 11. Correlation Test between IT Risk Management and IT Realized Benefits

	ROI	ln_Customer Served	ln_service Delivery	ln_Risk_mgnt
ROI	1			
ln_Customer Served	0.1313	1		
ln_service Delivery	0.0555	0.0834	1	
ln_Risk_mgnt	-0.1614	-0.0245	0.3138*	1

**Shows significance at 5% significance level*

From the results in Table 11, the level of IT risk management and the ROI had an insignificant inverse weak relationship (r=-0.1614, p>0.05). Although there was some correlation between the two variables, the values showed it was weak and insignificant, an indicator that it could have occurred by chance. From the relationship between IT risk management and the number of customers served, the results showed an insignificant negative weak relationship (r = -0.0245, p>0.05). This implied that an increase in IT risk management corresponded to a reduction in the number of customers served and vice versa. The correlation was, however, negative and insignificant.

The level of IT risk management and the level of customer service delivery had a significant positive correlation (r = 0.3138, p<0.05). This meant that any increase in the level of risk management had a corresponding increase in the level of service delivery and vice versa. The two variables have a positive correlation.

4.2.2 Multivariate Regression

The set of hypotheses for this study was centered on the relationship between the level of risk management for the IT investments and the realized benefits, specifically ROI, number of customers served and the level of delivery service. The corresponding hypotheses were documented below:

H_{011}: There was no significant relationship between the risk management for IT investment and return on investment (ROI)

H_{012}: There was no significant relationship between risk management for IT investment and the number of customers served

H_{013}: There was no significant relationship between risk management for IT investment and the level of service delivery.

The attendant regression models for testing the above hypotheses are shown in the regression model equations below:

$$ROI = \beta_0 + \beta_{21} IT\_risk\_mngt + \varepsilon \quad (9)$$

$$NC = \beta_0 + \beta_2 IT\_risk\_mngt + \varepsilon \quad (10)$$

$$SD = \beta_0 + \beta_2 IT\_risk\_mngt + \varepsilon \quad (11)$$

$$Where, ROI = Return\ on\ Investment, NC = Number\ of\ Customers\ \ and$$

$$SD = \ Service\ Delivery \quad (12)$$

$$IT_{risk} = IT\ risk\ level \quad (13)$$

$$IT_{risk_{mngt}} = Management\ of\ IT\ risks \quad (14)$$

$$\beta 0 = \text{ Constant and an intercept} \quad (15)$$

$$\beta 21, \beta 22, and\ \beta 23 = \text{ Beta Regression coefficients} \quad (16)$$

$$\varepsilon = error\ term \quad (17)$$

The multivariate regression model results were discussed as follows;

Table 12. Model Summary and F-Statistic for IT Risk Management and IT Benefits

Equation	Obs	Parms	RMSE	R-sq	F	P>F
ln_ROI	309	2	3.875197	0.0368	1.720564	0.1963
ln_Customer served	309	2	1.489545	0.0139	0.635728	0.4294
ln_Service delivery	309	2	0.188719	0.4903	43.29356	0.0000

Table 12 shows the model summary and F-statistics for IT risk management and IT benefits. The value of R-squared for IT risk management and ROI was 0.0368, indicating that IT risk management determined 3.68% of the variation in ROI. The F statistic was given as $F_{1,46}$=1.72, p>0.05, indicating that cost had no significant influence on the ROI of IT projects.

The second part of the table showed the R-squared (R^2) value of the model, indicating that the effect of IT risk management and the number of customers was 0.0139. This implied that management of IT risks accounted for 1.39% of the variation in the number of customers served. The F statistic was given as $F_{1,46}$=0.64, p>0.05), implying that the impact of managing IT risks on the number of customers served was insignificant.

The third sub-model assessed the significance of managing IT project risk on the level of customer service delivery. The resulting R-squared (R^2) was 0.4903. This meant that managing IT risk accounted for 49.03% of the variation in customer delivery. The F statistic was given as $F_{1,46}$=43.29, p<0.05, indicating that management of IT risk had a significant effect on the level of customer delivery.

Table 13. Coefficient Table for IT Risk Management and IT Benefits

	Coefficient	Std. err.	t	P>t	[95% conf. interval]	
ln_ROI						
ln_Risk_mgnt	-2.05061	1.563319	-1.31	0.196	-5.199297	1.098076
_cons	7.718822	2.045567	3.77	0.000	3.598839	11.83881
ln_Customer_served						
ln_Risk_mgnt	.4791188	.6009074	0.80	0.429	-.7311707	1.689408
_cons	4.87379	.7862733	6.20	0.000	3.290154	6.457425
ln_service_delivery						
ln_Risk_mgnt	.5009356	.0761325	6.58	0.000	.3475968	.6542744
_cons	.8043952	.0996176	8.07	0.000	.6037549	1.005035

The results in Table 13 showed that a 1% percentage increase in the level of IT risk management had an insignificant impact on the ROI. Since the effect was statistically insignificant ($p=0.196$, thus $p>0.05$), the research conclusion was that there was no significant effect of IT risk management on the ROI. The first part of the model hypothesis for the research, therefore, failed to reject the null hypothesis that there was no significant effect of the IT risk management on the ROI.

The second part of the model evaluated the impact of managing IT project risks on the number of customers served. The results showed that a unit increase in IT risk management had an insignificant increase in the number of customers by 0.48 percent ($p>0.05$). But since the P value was more than 0.05, the effect was not statistically significant. The research, therefore, adopted the null hypothesis that there was no significant effect of managing IT project risks on the number of customers.

The third part of the model evaluated the aspect of managing IT project risks on customer service delivery. The results revealed that a unit increase in IT risk management led to a significant increase in the quality-of-service delivery by 0.50 units ($p<0.05$). This implied that increasing the extent of risk management for IT projects led to an increase in the level of customer service delivery. The null hypothesis was thus rejected, and the alternative hypothesis adopted that management of IT risks had a significant effect on the level of service delivery to customers.

4.3 Discussion of Results

The primary objective of the study was to examine the relationship between IT project risk management and the hypothesized benefits of IT investments. The study specifically assessed how management of the IT risks affected the ROI, the number of customers served and the level of customer service delivery. The correlation test results revealed that management of IT risks and ROI had a weak negative correlation ($r = -0.1614$). This meant that efforts to manage IT risks corresponded with reduced returns. This could be explained by the fact that IT risk management was relatively costly and could take a huge portion of an organization's returns, leading to reduced ROI. The correlation between management of IT risks and the number of customers served was weak and negative ($r = -0.0245$). The correlation between management of IT risks and the level of service delivery was positive and significant. This meant that any increase in the management of IT risks had a corresponding increase in the level of service delivery. Results from the multivariate regression test showed that management of IT risks had no significant effect on ROI and the number of customers served as the value of p was more than 0.05. Further, the findings revealed that managing IT project risks significantly led to an increase in customer service delivery ($p<0.05$).

Arising from the results, the first part of the model adopted the null hypothesis that there was no significant effect of managing IT project risks on the ROI as a realized benefit for IT investments. These results were consistent with findings by previous researchers. For instance, research by Xu and Gumban (2023) investigated the IT project risk factors and IT project ROI amongst public institutions and found that the public entities performed poorly on

ROI from IT investments. They attributed this to a lack of a static index for measurement of ROI for IT project investments with a clear, understandable and calculatable matrix. Research by Fridgeirsson *et al.* (2023) confirmed that AI had the strongest impact on IT project risk management as compared to cost estimation and project scheduling, while ROI had no significant effect on IT project risk management. In addition, the findings were consistent with previous findings by Blaskovics *et al.* (2023), who investigated an exploratory framework on the success and failure rates of public sector projects and found the existence of a weak correlation between IT risk management and ROI. Therefore, there existed a weak correlation between IT risk management and ROI as a realized benefit in the public sector and no significant relationship existed between IT risk management and ROI.

The research also failed to reject the null hypothesis for the second part of the model, that there was no significant effect of the IT risk management on the number of customers served as a realized benefit of IT project implementation. These results were consistent with prior research findings. For instance, Syamil *et al.* (2021) identified IT risk management as one of the 4 variables impacting customer satisfaction and found that most organizations implemented IT projects without any business need for the project outcomes, resulting in zero impact on the number of customers. Deshmukh *et al*. (2020) investigated Risk Management in public customer relationship (CRM) management IT projects and found that IT project risk management impacted planning and customer service delivery but had no significant effect on the number of customers.

The third part of the model rejected the null hypothesis and adopted the alternative hypothesis that management of IT risks had a significant effect on the level of customer service delivery as a realized benefit from IT investments. Previous studies found the existence of a significant relationship between IT project risk management and the level of service delivery to customers, as well as a significant positive correlation between IT project risk management and service delivery to customers (Kim & Kim, 2020; Hazée*et al*., 2020; Deshmukh *et al*., 2020). For instance, Kim and Kim (2020) investigated IT project implementation and its related impact on public institutions in the context of digital customs and risk management and found that public entities' capacity to serve cross-border customers improved substantially. In addition, they revealed that drug captures at the borders significantly improved after implementation of the new IT system, resulting in a reduction of the high risks associated with cross-border drug trafficking.

A study by Hazée *et al.* (2020), which evaluated service delivery system design for risk management using a customer-oriented approach, confirmed these research findings using an integrated conceptual framework that revealed the structural and infrastructural design choices that customers expected organizations to make for mitigating risks, which resulted in improved customer service delivery. In addition, Deshmukh *et al*. (2020) investigated how project risks in CRM IT implementations impacted the outcome and how the risk management process adopted by the IT project management impacted the outcome of the project. They found that the IT project risk management process impacted both IT project planning and customer service delivery. Therefore, there existed a significant moderate correlation between IT risk management and customer service delivery as a realized benefit in the public sector IT project implementation. In addition, the results of this research proved the existence of a significant relationship between IT risk management and customer service delivery.

Table 4 on descriptive statistics found that 96.7% of public sector organizations were service delivery driven and this explains why service delivery was significantly impacted when IT risk was incorporated in IT project management, while ROI and number of customers were not. The research findings revealed the significance of IT risk management incorporation in IT projects during implementation. This underscored the critical need for having IT risk management embedded in IT project planning to ensure IT risks are continuously assessed and mitigated throughout the project lifecycle. In addition, there was a need to put in place an IT

project risk management policy framework to ensure IT project managers prioritize risk management in all IT projects within the public sector.

5. Conclusion

The following conclusions were drawn based on the findings of this research. The adoption of IT project risk management practices during IT project implementation had a corresponding positive effect on the improvement of customer service delivery to the organization. Therefore, senior management had a responsibility to ensure that risk management was incorporated in all major IT projects to ensure that improved customer service delivery benefit was realized. In addition, the research concluded that IT risk management incorporation during IT project implementation did not have any significant effect on either return on investment and the number of customers. Most public sector organizations (96.7%), having been identified as customer service driven, stood to benefit immensely from these research findings through the adoption of the proposed IT risk management and benefits realization framework.

The study findings revealed the significance of IT risk management incorporation in IT projects during implementation. This underscored the critical need for having IT risk management embedded in IT project planning to ensure IT risks are continuously assessed and mitigated throughout the project lifecycle. In addition, there was a need to put in place an IT project risk management policy framework developed by the relevant government authorities to ensure IT project managers prioritize risk management in all IT projects within the public sector.

The study found that managing IT risks while implementing IT projects substantially reduced delays and streamlined the implementation of IT projects, which led to improved customer service delivery. Therefore, to optimize the benefits of IT investments, the Chief Executive Officers and Boards of directors, as well as Heads of departments within the public sector, needed to ensure risk management components are incorporated in the implementation of all major IT projects.

6. Limitations of the research

This research was based on a single country, Kenya. A multiple, cross-country study in this domain would further enrich the findings of this research and broaden the scope with more insightful discoveries. In addition, the study focused on the IT investments in the public sector and revealed insightful and compelling findings grounded in theory and consistent with previous literature on the relationship between IT project risk management and benefits realized. It is worth noting that, as the public sector focuses on service delivery, the private sector is more inclined to ROI and profitability. Therefore, to have a study that can generalize IT project risk management and its effect on benefits realized, there is a need for further research to be done on the private sector entities. A comparative analysis of the private and public sector results could then be used to provide more valuable insights into the IT benefits realization.

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Author Contribution

Author1 wrote the introduction, literature review, methodology, collected and analysed data for the research and produced the first draft. Author 2 reviewed both the methodology and statistical analysis and produced the second draft. Author 3 supervised the entire article writing and produced the final draft. All three Authors made significant contributions towards the development of this article.

Conflict of Interest

The authors have no conflicts of interest to declare.

References

Abd Aziz, W. A. A. W., Radiah Shariff, S. S., & Wan Mohamed, W. M. (2022). Measuring customer perception towards road transport department branches based on content analysis. *Malaysian Journal of Computing (MJoC)*, *7*(1), 1056-1066

Adonu, G., (2016). Corporate Governance in Small and Medium Scale Enterprises Journal. *(http://dx.doi.org/10.2139/ssrn.2839684)*

Albayrak, C.A. and Gadatsch, A., (2012). IT governance model for small and medium sized enterprise. *In the proceedings of European, Mediterranean & Middle Eastern Conference on Information Systems*. 7-8 June, pp.380–390, Munich, Germany

Blaskovics, B., Maró, Z. M., Klimkó, G., Papp-Horváth, V., & Csiszárik-Kocsir, Á. (2023). Differences between public-sector and private-sector project management Practices in hungary from a competency point of view. *Sustainability*, *15*(14), 11236

Deshmukh, G. K., Mukerjee, H. S., & Prasad, U. D. (2020). Risk management in global CRM IT projects. *Business Perspectives and Research*, *8*(2), 156-172.

Emerson, J., & Manns, T. (2024). Risk-taking and performance in marathon running: do pace setters matter?. *Economics Bulletin*, *44*(3), 771-780.

Fridgeirsson, T. V., Ingason, H. T., Jonasson, H. I., & Gunnarsdottir, H. (2023). A qualitative study on artificial intelligence and its impact on the project schedule, cost and risk management knowledge areas as presented in PMBOK®. *Applied Sciences*, *13*(19), 11081.

Gibson, D., & Igonor, A. (2020). *Managing risk in information systems*. Jones & Bartlett Learning.

Gurtu, A., & Johny, J. (2021). Supply chain risk management: Literature review. *Risks*, *9*(1), 16

Hazée, S., Van Vaerenbergh, Y., Delcourt, C., & Kabadayi, S. (2020). Service delivery system design for risk management in sharing-based product service systems: a customer-oriented approach. *International Journal of Operations & Production Management*, *40*(4), 459-479.

Husni, N.M, & Abdullah, N. A. S. (2025). Localization module in user experience questionnaire for cross-cultural website design. *Malaysian Journal of Computing (MJoC)*, *10*(1), 2026-2037.

ISACA, (2018). Certified in Governance of Enterprise IT Review Manual (GEIT), 7th Edition, pp.2-15

Joshi, A., Benitez, J., Huygh, T., Ruiz, L., & De Haes, S. (2022). Impact of IT governance process capability on business performance: Theory and empirical evidence. *Decision Support Systems*, *153*, 113668.

Kim, S. B., & Kim, D. (2020). ICT implementation and its effect on public organizations: The case of digital customs and risk management in Korea. *Sustainability*, *12*(8), 3421.

Laila, M., Soukaina, E., Hajar, I., Hicham, M. (2016). A multi-agent architecture for communication workflow management system integrated within an IT GRC Platform using sharing information mode, *An IEEE (EAS- LISER) Systems Architecture Team ENSEM, Hassan II University BP.8118, Oasis Casablanca.*

Markowitz, H. (1952). Modern portfolio theory. *Journal of Finance*, *7*(11), 77-91.

Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Quantitative & qualitative approaches* (Vol. 2, No. 2). Nairobi: Acts Press.

Ndlovu, S. L., & Kyobe, M. E. (2016). Challenges of COBIT 5 IT governance framework migration.

Ozguler, I. (2020). HOW TO DEVELOP END-TO-END BENEFITS REALIZATION PROCESS THROUGH INTEGRATING PORTFOLIO MANAGEMENT WITH PROGRAM AND PROJECT MANAGEMENT. *Project Management Development-Practice & Perspectives*.

Plant, O. H., van Hillegersberg, J., & Aldea, A. (2022). Rethinking IT governance: Designing a framework for mitigating risk and fostering internal control in a DevOps environment. *International journal of accounting information systems*, *45*, 100560.

Rajala, T. and Aaltonen, H., 2021. Reasons for the failure of information technology projects in the public sector. *The Palgrave handbook of the public servant*, pp.1075-1093.

Rishnyak, I., Veres, O., Lytvyn, V., Bublyk, M., Karpov, I., Vysotska, V., & Panasyuk, V. (2020). Implementation Models Application for IT Project Risk Management. In *CITRisk* (pp. 102-117).

Syamil, A., Samosir, J. M., & Heriyati, P. (2021). The impact of project performance on customer satisfaction. *Turkish Journal of Computer and Mathematics Education*, *12*(3), 5658-5668.

Vahid D., M. B. A. (2020). The characteristics of benefits realization in the context of portfolio/program/project management maturity models

Xu, K., & Gumban, G. G. (2023). Managers' assessment of the risk factors and project Return on Investment (ROI) among Information Technology (IT) companies in Zhoukou City, China. *Central Philippine University Multidisciplinary Research Journal*, *3*(2), 107-113