

PROJECT SCOPE MANAGEMENT PROCESSES AND PERFORMANCE OF DIGITAL HUB PROGRAMMES IN SELECTED COUNTIES IN KENYA

¹ Mailu Linda & ² Dr. Nyangáu Samson Paul

¹ MSc. Scholar, Project Management at Jomo Kenyatta University of Agriculture and Technology, Kenya

² Lecturer, Jomo Kenyatta University of Agriculture and Technology, Kenya

ABSTRACT

Digital infrastructure projects play a critical role in enhancing digital access and supporting socio-economic development. However, many such projects, particularly government-led initiatives such as Digital Hub Programmes, continue to experience poor performance outcomes, including cost overruns, implementation delays, scope creep, underutilization, and failure to achieve intended objectives. These challenges are widely associated with weaknesses in project scope management processes. Despite the centrality of scope management to project success, there remains limited empirical evidence that systematically examines how its core components, scope definition and scope control, affect the performance of Digital Hub Programmes at the county level in Kenya. This study sought to assess the effectiveness of project scope management processes on the performance of Digital Hub Programmes in selected counties in Kenya, namely Nairobi, Uasin Gishu, Kisumu, and Kiambu. The study focused on key scope management variables: scope definition and scope control, and examines their relationship with programme performance measured in terms of time, cost, and quality. The study was anchored on Goal-Setting Theory and Control Theory, which collectively explain how clear objectives, structured task decomposition, and effective monitoring mechanisms contribute to improved project outcomes. An explanatory research design was adopted to establish the relationships between the study variables. The unit of analysis was Digital Hub Programmes implemented within the four selected counties, while the unit of observation comprised project-level personnel directly involved in programme implementation. A census approach was employed at the programme level, covering 42 Digital Hub Programmes, with three respondents per programme (project manager, M&E/ICT officer, and technical officer), resulting in a total of 126 respondents. Data was collected using a structured questionnaire with a five-point Likert scale. A pilot study involving approximately 10% of the sample (13 respondents) was conducted in Nakuru County. Findings showed that; there is a strong significant correlation between scope definition and performance of Digital Hub Programmes ($r = 0.573$, $p = 0.000$), a strong significant correlation between scope control and performance of Digital Hub Programmes ($r = 0.820$, $p = 0.000$). The recommendations are; project managers should institutionalize a strong and participatory scope definition process during the initiation of each Digital Hub Program, and develop and strictly implement a formal scope change control process.

Key Words: Project Scope Management Processes, Performance, Digital Hub Programmes, Scope Definition, Scope Control

Background of the Study

The global shift toward digital economies has accelerated investments in digital infrastructure and ICT-driven projects, such as digital hubs, smart cities, cloud computing platforms, and innovation ecosystems. These projects are considered pivotal for economic growth, technological advancement, and enhancing societal resilience (Ghanbaripour, Tumpa, & Skitmore, 2025). According to Akeiber (2025), digital initiatives form the backbone of many countries' development agendas, offering opportunities to reduce the digital divide and improve service delivery. Yet, despite these investments, digital and ICT infrastructure projects often face significant implementation challenges leading to high failure rates globally.

Several studies attribute these failures to weak project management processes, particularly inadequate project scope management (Volner, Čamaj, & Palková, 2025). Poorly defined project objectives, shifting priorities, lack of change control mechanisms, and weak stakeholder engagement result in persistent issues like budget overruns, delayed completion, and unsatisfactory project outcomes (Omowole, Nzeako, & Famoti, 2025). Ghanbaripour et al. (2025) emphasize that in complex digital projects, unclear scope definitions open doors to scope creep, where unplanned activities and deliverables distort the original project goals, draining resources and reducing overall impact.

Further complicating digital projects is the fast-changing technology environment, requiring adaptive and responsive project management models. Omowole et al. (2025) highlight the significance of agile project management frameworks that allow iterative development, rapid adjustments, and improved stakeholder alignment, especially for energy and infrastructure projects. However, even agile approaches demand a firm foundation in scope definition and continuous monitoring to achieve desired outcomes. Moreover, emerging technologies such as Artificial Intelligence (AI) and predictive analytics are increasingly used to strengthen project oversight. As Akeiber (2025) points out, AI-powered decision-making enhances risk prediction, improves monitoring accuracy, and increases the resilience of digital transformation initiatives. These technologies enable project managers to anticipate deviations early, manage complexities, and safeguard performance metrics such as cost, quality, and time. With the growing scale and complexity of digital infrastructure projects, understanding structured project management practices, particularly those governing project boundaries, objectives, and deliverables dynamics has become more critical than ever. This study, therefore, seeks to study the relationship between process and performance of digital hub programmes.

Statement of the Problem

Digital Hub Programmes are expected to enhance digital access, promote digital skills development, support innovation, and contribute to socio-economic growth by delivering ICT infrastructure that meets predefined time, cost, quality, and functionality targets. In Kenya, these programmes form a central pillar of the national digital transformation agenda and are implemented through initiatives such as Ajira Centres, Jitume Labs, and Constituency Innovation Hubs across counties. Ideally, effective performance of such programmes should be demonstrated through: timely completion within planned schedules, cost control within approved budgets, delivery of fit-for-purpose digital infrastructure that meets required service standards, and sustained utilisation by intended beneficiaries. In practical terms, well-performing digital hubs should achieve high operational functionality and consistent public use, particularly within rural and underserved communities that are targeted by public digital inclusion programmes (Communications Authority of Kenya [CA], 2023; GSMA, 2024).

Despite these expectations, evidence indicates that the performance of digital infrastructure projects in Kenya remains persistently weak when assessed against these performance thresholds. For instance, while public ICT projects are expected to achieve completion within

planned timelines and avoid prolonged implementation slippages, national monitoring reports indicate that over 40% of government-funded ICT projects exceed planned schedules by more than six months, and 28% experience delays exceeding one-year, undermining time performance (CA, 2023). Similarly, ICT projects are expected to deliver infrastructure within approved budgets and avoid material deviations in project costs; however, approximately 31% of ICT projects record budget overruns exceeding 20% of approved costs, suggesting significant inefficiencies in cost performance (Kenya ICT Market Report, 2024). Performance gaps are also evident in quality and utilisation outcomes. Whereas digital hubs are expected to remain functional and actively utilised after completion, only 1.1% of rural households have access to functional ICT infrastructure, and nearly 37% of completed digital hubs are reportedly underutilised or partially operational, implying that completion does not translate into effective service delivery (CA, 2023; GSMA, 2024).

Project-level evidence further corroborates these performance gaps. Akhwaba (2020) established that 62% of fiber-optic projects in Kenya failed to meet time and cost targets, while Moenga and Moronge (2021) reported that the National Optic Fibre Backbone Infrastructure (NOFBI) achieved less than 55% utilisation of installed capacity several years after completion. Similar performance failures have been documented at county level (Mwitia, 2024) and in non-state ICT projects, where recurrent delays, rework, and project abandonment are common (Okong'o, 2022; Wekesa, 2023).

Although several empirical studies have examined the performance of ICT and digital infrastructure projects in Kenya, most have focused on isolated project management factors or single project contexts. Existing research has shown that poor scope definition, and inadequate scope documentation contribute to delays, cost overruns, and low utilisation of ICT projects (Akhwaba, 2020; Mwitia, 2024; Moenga & Moronge, 2021; Wekesa, 2023). However, these studies have not systematically examined how the core project scope management processes, scope definition, and scope control, jointly influence the performance of Digital Hub Programmes, particularly at the county level where most hubs are implemented. This gap limits the availability of integrated and evidence-based guidance for improving digital hub performance. Therefore, this study sought to address the identified research gap by empirically examining the effect of project scope management processes on the performance of Digital Hub Programmes in selected counties in Kenya.

Objectives of the Study

The general objective of this study was to examine the effect of project scope management processes on the performance of Digital Hub Programmes in selected counties in Kenya.

The study was guided by the following specific objectives;

- i. To determine the effect of scope definition on the performance of Digital Hub Programmes in Selected Counties in Kenya.
- ii. To examine the effect of scope control on the performance of Digital Hub Programmes in Selected Counties in Kenya.

LITERATURE REVIEW

Theoretical Review

Goal Setting Theory

Goal Setting Theory, originally developed by Edwin Locke (1968) and later refined with Gary Latham, posits that human performance improves significantly when individuals or teams are guided by clear, specific, and challenging goals. At its core, the theory argues that individuals are more likely to succeed when they know what is expected of them and are committed to achieving well-defined outcomes (Locke & Latham, 2002). The theory emphasizes five key

principles: clarity, challenge, commitment, feedback, and task complexity , all of which are essential during the scope definition phase of a project.

In project management, scope definition involves articulating the goals, boundaries, deliverables, and constraints of a project before execution begins. Goal Setting Theory supports this process by providing a framework for transforming stakeholder needs into actionable objectives. According to Locke and Latham (2007), when stakeholders are engaged in defining specific and meaningful goals, it increases their sense of ownership and commitment. This is particularly important in public sector digital infrastructure projects, such as the Digital Hub Programmes in Kenya, where success depends on translating diverse stakeholder expectations into clearly structured project scopes.

Furthermore, the principle of feedback embedded within Goal Setting Theory supports iterative refinement of project scope. Early and continuous consultation with stakeholders helps ensure that scope remains relevant, aligned with community needs, and adaptable to contextual realities. This mitigates the risk of scope creep or misaligned deliverables, both of which are common challenges in multi-stakeholder initiatives (Kerzner, 2017).

While Goal Setting Theory offers a robust framework for planning and defining project scope, it is not without critique. Some scholars argue that its emphasis on specificity and measurability can lead to an over-reliance on quantitative metrics, potentially sidelining qualitative dimensions of success (Ordóñez et al., 2009). Additionally, overly rigid goal structures can create “tunnel vision,” where broader systemic or emergent issues are ignored in favor of narrowly defined outputs. Despite these concerns, the theory remains highly applicable in structured project environments where well-defined goals are crucial for resource alignment, performance tracking, and stakeholder coordination.

In this study, scope definition is anchored in Goal Setting Theory. The theory informs how project managers and stakeholders collaboratively articulate deliverables and performance criteria during the planning phase. For the Kenya’s Digital Hub Programmes, this means engaging county officials, community representatives, development partners, and technical teams to co-create a shared scope that reflects both infrastructural feasibility and social impact. By grounding scope definition in the principles of Goal Setting Theory, project teams can improve focus, accountability, and the likelihood of sustainable success.

Control Theory

Control Theory originates from engineering and cybernetics but has been widely adapted into organizational behavior and project management (Carver & Scheier, 1982). The theory posits that behavior is regulated through a continuous feedback loop, where actual performance is measured against predefined standards or goals. When discrepancies are detected, corrective actions are taken to realign performance with objectives. This iterative process of monitoring, comparing, and adjusting is fundamental in ensuring systems or projects remain on course. At its core, Control Theory explains that individuals or systems naturally seek to minimize deviations from desired outcomes. In project management, this translates into regular measurement of project progress against the scope baseline. If deviations such as scope creep, budget overruns, or schedule slippages occur, project managers must implement corrective measures. The theory also emphasizes the importance of clear standards or baselines, continuous monitoring, and timely feedback for effective control (Scheier & Carver, 2018).

Despite its relevance, Control Theory is not without criticism. Critics argue that the theory may oversimplify human behavior and decision-making in complex, dynamic project environments. It assumes a linear process of detection and correction, which may not always apply in multi-stakeholder projects where change requests are frequent and sometimes strategic (Bryde,

2005). Additionally, excessive focus on control mechanisms can stifle creativity and innovation, especially in technology-driven projects where flexibility is essential. However, the strengths of Control Theory are significant in project environments that demand discipline and adherence to scope, cost, and time constraints. It provides a clear framework for integrating monitoring and evaluation mechanisms, helping project managers detect risks early and make data-driven decisions. The feedback loop principle also enhances accountability and transparency, essential in public projects like digital infrastructure development. In this study, Scope Control is best explained through the lens of Control Theory. Digital Hub Programmes in Kenya involve complex activities prone to scope changes due to emerging community needs or technological adjustments. Applying Control Theory allows project managers to monitor scope changes actively, compare ongoing activities with the original scope baseline, and implement necessary adjustments.

Conceptual Framework

A conceptual framework illustrates the expected relationship between study variables by identifying the key concepts to be examined and the presumed relationships among them. It serves as a logical structure that guides the research process by linking the study objectives, variables, and anticipated outcomes into a coherent model that can be empirically tested (Maxwell, 2023). Conceptual frameworks are usually developed from the reviewed theoretical and empirical literature and provide a clear explanation of how independent variables are expected to influence the dependent variable (Swaen & George, 2024). In this study, the conceptual framework presents the relationship between project scope management processes; scope control, and scope definition as the independent variables, and the performance of Digital Hub Programmes in selected counties in Kenya as the dependent variable.

Independent Variables

Dependent Variables

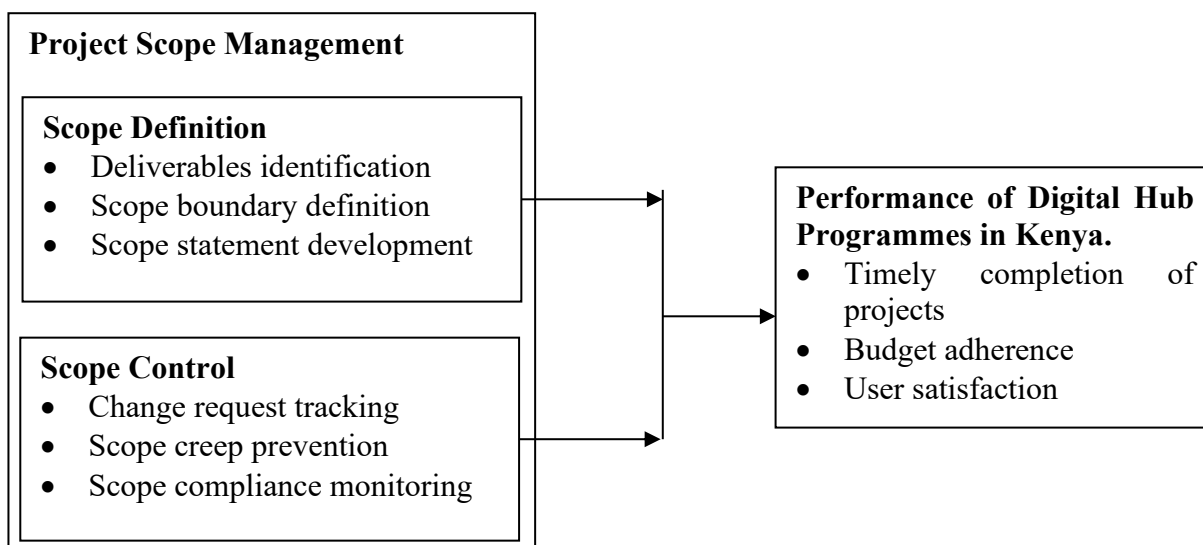


Figure 2. 1: Conceptual Framework

Scope Definition

Scope definition is a foundational element of project scope management that focuses on clearly articulating the boundaries, deliverables, and exclusions of a project before execution begins. According to the Project Management Institute (PMI, 2021), scope definition is essential for translating stakeholder needs into actionable objectives, enabling the project team to understand exactly what is to be delivered, how success will be measured, and what falls outside the project’s remit.

Recent literature emphasizes that well-structured scope definition not only facilitates internal alignment but also acts as a communication tool for managing expectations across diverse stakeholders (Svejvig & Grex, 2020). In digital infrastructure projects, like the Digital Hub Programmes in Kenya, scope definition helps clarify whether the intended outputs include hardware installations, digital literacy training, connectivity solutions, or a combination thereof. This upfront clarity reduces ambiguity and limits the risk of scope creep or conflicting assumptions later in the project lifecycle.

From a behavioral and strategic standpoint, scope definition is increasingly viewed through the lens of goal formulation. Researchers such as Adzroe et al. (2023) argue that early-stage definition of deliverables, co-developed with stakeholder input, leads to higher levels of commitment and more successful implementation outcomes. This aligns with Goal Setting Theory, which posits that specific and collaboratively agreed-upon objectives result in improved performance and stakeholder buy-in (Locke & Latham, 2002; Latham & Sejts, 2021). The definition phase thus acts as a social contract that aligns interests, allocates responsibilities, and frames project success in measurable terms.

Modern tools are also reshaping how scope definition is conducted. For instance, Ko et al. (2023) note that Natural Language Processing (NLP) is increasingly used to cross-check scope statements, identify ambiguities, and ensure consistency between project charters and deliverable breakdowns. These technologies support project teams in complex environments by enabling real-time alignment between technical specifications and stakeholder narratives. Moreover, scope definition plays a crucial risk-mitigation role. Projects that begin with vague or incomplete scopes are more susceptible to delays, cost overruns, and disputes (Mithileni, 2022). This is particularly true in public-sector projects with political visibility, such as county-level digital initiatives, where stakeholder expectations may evolve throughout the project. By embedding flexibility within a well-defined framework, scope definition helps project teams remain responsive while staying within agreed boundaries.

In the context of the Digital Hub Programmes in Kenya, scope definition ensures that the hubs are designed with purpose-driven clarity, whether to promote digital entrepreneurship, enhance e-government services, or build youth employability. By involving local communities, government officials, and development partners during this phase, project leaders can translate broad ambitions into precise, attainable outcomes. This increases the likelihood that final deliverables will be both functionally effective and socially accepted. Ultimately, scope definition is not merely a technical planning task but a strategic process that underpins the success of complex, stakeholder-driven projects. When done rigorously and inclusively, it becomes a cornerstone of performance, guiding execution, ensuring accountability, and anchoring the entire project lifecycle on shared goals.

Scope Control

Scope control is a systematic process that monitors the project's status, tracks changes, and ensures that the project remains aligned with its original scope baseline. According to Khasawneh and Dweiri (2024), effective scope control helps project managers avoid scope creep by rigorously assessing the impact of change requests before approval. In digital infrastructure projects, where requirements may evolve due to technological advances, scope control serves as the safeguard that ensures changes enhance rather than derail project objectives. Jenkins (2024) highlights that digital leadership and project management certification enhance the application of scope control, particularly when projects utilize Business Intelligence (BI) systems to track scope, cost, and quality indicators. By using these digital tools, project managers gain real-time oversight, improving their ability to detect and correct scope deviations early.

Change management remains a cornerstone of scope control, especially in projects involving multiple stakeholders with shifting interests. Jaafar et al. (2023) argue that predictive progress models based on digital infrastructure projects show the need for structured change approval systems. These systems help filter out unnecessary changes and ensure that only beneficial modifications are incorporated. Without this rigor, projects face risks of overspending, delays, and compromised quality, issues frequently encountered in government-led digital programs.

Moreover, scope control enhances accountability in public infrastructure projects by ensuring transparency in scope changes and resource use. Eaves and Rao (2024) suggest that digital infrastructure projects benefit from adopting public digital infrastructure (PDI) frameworks that explicitly incorporate scope control indicators such as stakeholder validations, change logs, and impact assessments. These measures not only protect public resources but also build community trust in digital transformation programs. Interestingly, Orieno et al. (2024) found that integrating sustainability considerations into scope control improves project resilience and long-term impact. Their study argues that monitoring environmental and social indicators as part of scope control helps avoid costly reworks and reputational risks, especially in digital infrastructure projects targeting sustainable development goals. This perspective broadens the traditional view of scope control beyond technical deliverables to encompass societal and environmental dimensions.

In the context of Digital Hub Programmes in Kenya, robust scope control is indispensable to manage complex stakeholder dynamics and rapidly changing technology demands. The application of modern project management software, predictive models, and sustainability filters ensures that the digital hubs are delivered on time, within budget, and aligned with intended socio-economic objectives. Without strong scope control, these projects risk becoming outdated, misaligned with community needs, or financially unsustainable.

Performance of Digital Hub Programmes

Programme performance in digital infrastructure projects refers to the degree to which project outcomes align with predefined goals concerning time, cost, quality, and stakeholder satisfaction. According to Khoo et al. (2024), performance in digital infrastructure is multidimensional, encompassing technical, economic, environmental, and social aspects. Performance measurement goes beyond deliverable completion, capturing efficiency, sustainability, and the long-term utility of the digital infrastructure established. Scholars agree that key performance indicators (KPIs) for digital infrastructure projects typically include time adherence, cost control, quality of deliverables, sustainability impact, and user satisfaction. Naji et al. (2024) emphasize that incorporating digital key performance indicators (d-KPIs), such as system uptime, connectivity quality, and user adoption rates, is crucial in measuring the real impact of digital projects. These indicators provide a more holistic view, capturing both tangible outputs and operational functionality over time.

With the increasing complexity of digital infrastructure, performance measurement frameworks are integrating advanced technologies like 5D Building Information Modeling (BIM) and data-driven dashboards. Sun et al. (2024) argue that integrating 5D BIM allows for real-time monitoring of cost, schedule, and quality dimensions, enhancing predictive performance measurement. Such tools ensure that projects remain on course while facilitating early detection of potential underperformance. Moreover, digital transformation projects face unique risks, including technological obsolescence and rapidly changing stakeholder expectations. Akomea-Frimpong et al. (2022) stress that traditional performance measures like time and cost alone are insufficient. They recommend incorporating adaptability and digital

literacy growth among beneficiaries as performance dimensions, especially for publicly funded projects aimed at promoting socio-economic development.

In public sector digital infrastructure projects, transparency and accountability are also critical performance indicators. Almarri and Boussabaine (2025) found that in smart city infrastructure, citizen satisfaction, service delivery efficiency, and public engagement levels are reliable performance measures. For digital hubs, this translates to measuring how well the infrastructure enables e-services, entrepreneurship, and digital literacy improvements within the target community. Finally, the sustainability of digital infrastructure is increasingly viewed as a performance dimension. Jayesena et al. (2024) advocate for integrating environmental, social, and governance (ESG) indicators in measuring the success of infrastructure projects. For digital hubs, this means assessing not just immediate outputs but also their ability to remain functional, inclusive, and impactful in the long run.

Empirical Review

Scope Definition and Program Performance

Rehman, Fogat, and Aika (2025) examined the migration of a multinational Exploration and Production (E&P) operator's IT systems to a cloud-based architecture. The study was presented at the International Petroleum Technology Conference and employed a case-based methodology integrating project performance metrics, technical architecture reviews, and stakeholder interviews. The authors specifically investigated how scope definition activities conducted before project execution affected system integration, delivery timelines, and resource management. Their findings revealed that formal scope definition reduced rework cycles by 24% and led to faster alignment between IT operations teams and cloud infrastructure vendors. Importantly, the study quantified the financial and temporal savings associated with centralized planning of scope, thereby demonstrating the strategic value of scope definition beyond mere documentation. For large-scale ICT transformations, like those seen in Digital Hub Programme, these insights underscore the importance of thoroughly scoping both technical and human system interfaces prior to launch.

A complementary study by Zhou et al. (2024) focused on the role of scope definition in the operations and maintenance (O&M) phases of digital built asset projects. Published in a collected volume on Digital Built Asset Management by Edward Elgar Publishing, the study analyzed multiple infrastructure programs across Asia and Europe. Employing a cross-case comparison and stakeholder mapping technique, Zhou and colleagues found that clearly defined O&M scope documents were directly correlated with higher reliability indices, reduced transition lags between project phases, and improved asset lifecycle outcomes. The study emphasized the importance of collaborative scope definition, particularly between contractors, public agencies, and facility managers, during the early planning phase. This ensured that digital tools and Building Information Modeling (BIM) platforms were aligned with long-term operational realities. The authors argued that consistent definitions across the planning and handover phases enhanced not only technical performance but also stakeholder trust and system usability.

In the North American context, Ricker (2024) investigated scope definition as part of a real-time control (RTC) strategy employed by the Region of Peel to enhance wastewater infrastructure performance. The study was presented at the Collection Systems and Stormwater Conference and analyzed how formalized project scoping influenced system responsiveness, data integration, and return on infrastructure investments. Using a blend of systems engineering simulation and project performance benchmarking, Ricker demonstrated that the integration of scope definition into the RTC framework led to optimized scheduling, fewer system failures,

and better stakeholder coordination. This is particularly relevant for municipal ICT projects, where system interoperability and budget predictability are critical. The study concluded that scope definition serves as a technical and governance tool that maximizes the efficiency of real-time digital systems in public infrastructure.

From a systems design and engineering perspective, De Filippi Tedeschi (2024) offered a rigorous investigation into how scope definition impacts technical performance and cost-efficiency in advanced 5G infrastructure projects. Based on doctoral research at the University of Pavia, the study focused on the design and deployment of low-noise amplifiers and phase shifters within silicon-germanium BiCMOS platforms. Though technical in nature, the thesis included a chapter on scope management and system requirement alignment. Through simulation models and laboratory testing, the research showed that when scope parameters, including performance tolerances, testing conditions, and integration constraints, were clearly defined at project inception, there was a marked reduction in mid-cycle design changes and testing failures. The research highlighted how early scoping acts as a buffer against cost overruns and operational delays, particularly in complex, standards-driven digital environments. The implications are clear for public digital initiatives like Kenya's hubs, where emerging technologies intersect with community-facing services.

These findings converge on a central insight: scope definition is not a perfunctory phase but a strategic mechanism that enhances efficiency, aligns stakeholder expectations, and guides successful implementation of digital infrastructure projects. Across diverse domains, from cloud computing and smart utilities to 5G and asset management, scope clarity consistently improves project outcomes and mitigates risks associated with uncertainty and stakeholder misalignment. Importantly, this body of work aligns with Goal Setting Theory, which emphasizes that performance is optimized when individuals and teams operate with clear, specific, and jointly agreed-upon goals (Latham & Seijts, 2021). By embedding well-structured scope definition processes into the project planning lifecycle, digital transformation programs can better manage complexity, foster accountability, and ensure that deliverables are not only produced, but truly valuable.

Scope Control and Program Performance

In the United States, Utomwen (2024) conducted a quantitative study on the impact of project risk management, including scope control, on digital infrastructure project success. Anchored on Contingency Theory, the study adopted a correlational research design targeting 200 project managers in ICT sectors. Data were collected through structured questionnaires and analyzed using multiple regression analysis in SPSS v28. Findings revealed that scope control practices had a statistically significant positive effect on project success ($\beta = 0.498$, $p < 0.01$). The study concluded that proactive scope control minimizes risks related to cost and schedule overruns, recommending automated project tracking tools for better control.

Waqar et al. (2024) studied the role of Building Information Modeling (BIM) in scope control for construction projects in Malaysia. Utilizing Resource-Based Theory, the researchers applied a mixed-methods design with 218 respondents (engineers, architects, contractors) sampled via stratified random sampling. Data collection combined surveys and site observations, with analysis via SEM using SmartPLS. Results showed BIM-enhanced scope control reduced project overruns by 33%. Recommendations included institutionalizing BIM-driven scope control as a performance enhancer, particularly for complex digital infrastructure projects.

In Rwanda, Umubyeyi and Nnamdi (2024) examined the impact of project risk management and scope control in logistics projects involving ICT components. Grounded in Stakeholder

Theory, the descriptive survey involved 244 respondents from logistics companies selected using stratified sampling. Data were gathered via questionnaires and analyzed with SPSS multiple regression. Findings showed that scope control reduced risk occurrences by 28% and improved project delivery timelines. The study recommended routine scope reviews and risk mitigation planning in all ICT-related logistics projects.

Oke et al. (2025) assessed scope control in Nigerian heavy engineering digital projects. Applying Digitalization Theory, the study used SEM and fuzzy-set Qualitative Comparative Analysis (fsQCA). A sample of 210 professionals from engineering firms was selected purposively. Data were collected via structured surveys. Results indicated that integrating digitalization into scope control led to a 22% improvement in project schedule adherence and resource utilization. Recommendations advocated embedding digital platforms in scope control for enhanced performance in public sector projects.

Charo (2024) studied project management capabilities, including scope control, and project performance in Nairobi's commercial banks. Guided by Agency Theory, the descriptive research design sampled 165 projects from 294 project managers using the Krejcie & Morgan formula. Data were collected through structured questionnaires and analyzed via SPSS linear regression. Results showed scope control had a significant influence on project performance ($\beta = 0.317$, $R^2 = 0.579$). Recommendations focused on continuous scope monitoring and documentation to minimize change-related project delays.

In Kenya's irrigation projects, Emmanuel and Kaburu (2024) assessed how scope control affects project performance. The study, rooted in Theory of Constraints, used a descriptive survey design with a sample of 98 project officers selected randomly. Data were collected using structured questionnaires and analyzed with ANOVA and regression. Findings established that projects with strong scope control mechanisms were 45% more likely to achieve cost and time targets. Recommendations emphasized mandatory scope review phases in all government-funded infrastructure projects.

RESEARCH METHODOLOGY

This study adopted an explanatory research design. Explanatory research is designed to examine cause–effect relationships between variables by determining how and why changes in one variable leads to variations in another (Saunders, Lewis, & Thornhill, 2019). For this study, the unit of analysis was Digital Hub Programmes implemented in selected counties in Kenya, specifically Nairobi, Uasin Gishu, Kisumu, and Kiambu. These programmes constitute the entities whose performance is being assessed in relation to project scope management processes. The unit of observation was project-level personnel directly involved in the management and implementation of the Digital Hub Programmes. Based on data from the four selected counties host a total of 42 Digital Hub Programmes, which form the target population for this study. A sample refers to a subset of the target population selected for purposes of data collection and analysis (Wilson, 2010).

Given that the study targets 42 Digital Hub Programmes across the four selected counties, the study adopted a census approach at the programme level, whereby all identified digital hub programmes were included in the study. To enhance data richness and reliability, three respondents were selected from each digital hub programme, resulting in a total of 126 respondents. The study utilized a structured questionnaire as the primary data collection instrument. For this study, the pilot test involved 10% of the total sample size, which translates to approximately 13 respondents drawn from Digital Hub Programmes in Nakuru County. Nakuru County was deliberately selected because it hosts active digital hub programmes but is

not among the counties included in the main study (Nairobi, Uasin Gishu, Kisumu, and Kiambu).

Data obtained from the field was coded, cleaned, and entered into the computer for analysis using the SPSS version 28. The study collected quantitative data. It was analysed using descriptive statistics such as frequency, percentages, mean and standard deviation. Inferential statistical analysis included multiple regression and correlation analysis. The significant of each independent variable was tested at a confidence level of 95%. The multiple regression model that was utilized.

RESEARCH FINDINGS AND DISCUSSIONS

The sample size of study was 126 respondents from 42 Digital Hub Programmes across the four selected counties. The pilot test was carried out with 13 respondents who were not included in the actual study hence 113 questionnaires were administered out of which 98 were answered successfully. The response rate was 86.7%. Kothari (2012) recommended that an adequate response rate is one that is greater than 50%, while an exceptional response rate is typically one that is greater than 70%.

Descriptive Analysis

This section presents the descriptive analysis of the study variables; scope definition, and scope control and project performance. The analysis is based on responses obtained from closed-ended questionnaire items measured using a five-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Mean scores were used to determine the overall level of respondents' agreement with statements relating to each construct. For purposes of interpretation, mean scores ranging from 1.00–1.80 were interpreted as Strongly Disagree, 1.80–2.60 as Disagree, 2.61–3.20 as Neutral, 3.21–4.20 as Agree, and 4.21–5.00 as Strongly Agree. The standard deviation was used to assess the dispersion of responses around the mean, where lower standard deviation values indicate greater consistency in respondents' perceptions, while higher values suggest greater variability of opinions. This descriptive analysis provides an overall understanding of response patterns and serves as a foundation for subsequent inferential analyses.

Scope Definition

The first objective sought to determine the effect of scope definition on the performance of Digital Hub Programmes in Selected Counties in Kenya. Respondents were asked to tick on the extent to which they agree/disagree with statements related to scope definition. Findings are shown in Table 1.

Table 1: Scope Definition

Key: SD=strongly disagree, D=Disagree, N=Neutral, A=Agree, SA= strongly agree, M=Mean, Std. =Standard Deviation

Statements	SD %	D %	N %	A %	SA %	M	Std.
The project scope is clearly defined and documented before implementation begins.	7.1	4.1	4.1	17.3	67.3	4.34	1.09
Stakeholders are actively involved in defining project goals and deliverables.	6.1	4.1	5.1	25.5	59.2	4.28	1.30
There is a formal process for identifying what is included and excluded from the project.	5.1	3.1	6.1	40.8	44.9	4.17	1.03
Project objectives and deliverables are aligned with stakeholder expectations.	5.1	2.0	8.2	21.4	63.3	4.36	1.07
Scope definition is completed before resource allocation and budgeting.	5.1	4.1	7.1	42.9	40.8	4.10	1.05
Key stakeholders sign off on the scope definition document before execution.	6.1	4.1	3.1	33.7	53.1	4.12	1.00
A clear Work Breakdown Structure (WBS) is derived from the defined scope.	4.1	5.1	5.1	45.9	39.8	4.14	1.27
Average						4.22	1.11

N= 98

Findings show that the respondents strongly agreed that; project objectives and deliverables are aligned with stakeholder expectations (M=4.36, Std. =1.07), the project scope is clearly defined and documented before implementation begins (M=4.34, Std. =1.09), and stakeholders are actively involved in defining project goals and deliverables (M=4.28, Std. =1.30). Respondents also agreed that; there is a formal process for identifying what is included and excluded from the project (M=4.17, Std. =1.03), a clear Work Breakdown Structure (WBS) is derived from the defined scope (M=4.14, Std. =1.27), key stakeholders sign off on the scope definition document before execution (M=4.12, Std. =1.00), and scope definition is completed before resource allocation and budgeting (M=4.10, Std. =1.05). The average mean of 4.22 and standard deviation of 1.11 shows that the respondents generally view scope definition as being effectively undertaken in the programs. The respondents had positive opinions towards scope definition practices.

The study shows that respondents are in agreement that project objectives and deliverables are aligned well with stakeholder expectations, and that a clear and documented project scope is established prior to implementation. Respondents also agree that stakeholders are actively engaged in developing project objectives and deliverables and that there is a formal process for identifying what is to be included or excluded from the project. Additionally, respondents agree that a project’s scope is normally defined prior to resource allocation and budgeting, and that the project’s scope document is signed by the key stakeholders prior to execution of the project. There were also positive responses to the definition of a clear Work Breakdown Structure (WBS) from the defined scope. These findings support Goal Setting Theory which states that specific, clear, and well-defined goals will significantly improve performance by helping to provide direction; and thus reducing ambiguity and increasing commitment to a given objective. Therefore, by having effective scope definition, measurable project goals are created and will ultimately provide direction to project implementation reduce scope creep, and improve overall programme performance. Also, the relatively high mean score indicates that when scope is properly defined and aligned with stakeholder expectations it provides a strong foundation for successful delivery of Digital Hub Programmes. Findings are in support of Zhou et al. (2024) that clearly defined O&M scope documents reduced transition lags between project phases, and improved asset lifecycle outcomes. Ricker (2024) demonstrated that the integration of scope definition led to optimized scheduling, fewer system failures, and better

stakeholder coordination. This is particularly relevant for ICT projects, where system interoperability and budget predictability are critical.

Scope Control

The second objective sought to examine the effect of scope control on the performance of Digital Hub Programmes in Selected Counties in Kenya. Respondents were asked to tick on the extent to which they agree/disagree with statements related to scope control. Findings are shown in Table 2.

Table 2: Scope Control

Key: SD=strongly disagree, D=Disagree, N=Neutral, A=Agree, SA= strongly agree, M=Mean, Std. =Standard Deviation

Statements	SD %	D %	N %	A %	SA %	M	Std.
The project team regularly monitors adherence to the project scope	3.1	5.1	3.1	41.8	46.9	4.24	0.96
Scope changes are managed through a formal change control process	10.2	72.4	4.1	11.2	2.0	2.40	1.12
Project management tools/software are used for effective scope control	4.1	2.0	6.1	48.0	39.8	4.17	0.94
Stakeholders are consulted when scope changes are proposed	7.1	4.1	3.1	44.9	40.8	4.08	1.12
Scope creep is identified and managed to avoid project disruptions	5.1	6.1	4.1	37.8	46.9	4.15	1.10
There are clear procedures for tracking, reviewing, and approving scope changes	21.4	53.1	5.1	11.2	9.2	2.34	1.20
Regular scope reviews ensure alignment with project goals and objectives	6.1	5.1	6.1	35.7	46.9	4.12	1.13
Average						3.64	1.08

N= 98

Findings show that the respondents strongly agreed that the project team regularly monitors adherence to the project scope (M=4.24, Std. =0.96). The respondents also agreed that; project management tools/software are used for effective scope control (M=4.17, Std.=0.94), stakeholders are consulted when scope changes are proposed (M=4.08, Std. =1.12), scope creep is identified and managed to avoid project disruptions (M=4.15, Std. =1.10), and regular scope reviews ensure alignment with project goals and objectives (M=4.12, Std. =1.13). The respondents disagreed that there are clear procedures for tracking, reviewing, and approving scope changes (M=2.34, Std. =1.20), and that the scope changes are managed through a formal change control process (M=2.40, Std. =1.12). The findings show a fairly positive but inconsistent opinions of scope control practices in the digital programs with an overall mean of 3.64 and a standard deviation of 1.08. This mean is lower compared to scope definition, implying that although aspects of scope control are applied the general process is weak and irregularly implemented across the programmes.

The respondents generally agree that the project team frequently monitors compliance to the project scope, project management tools are used effectively in managing scope, and that stakeholders are involved when there is a change request. Additionally, there is moderate agreement that scope creep is identified and controlled to reduce the likelihood for disruptions and that scope is regularly reviewed to ensure it is aligned with project objectives. However, two components of scope change management were rated very low; the use of formalized change control processes to manage scope changes, and clearly documented procedures to support the recording, reviewing, and authorizing of scope changes. These weaknesses generally imply that while monitoring is conducted to some extent, the formal mechanisms for controlling and authorizing deviations from the original scope are poorly defined and

inconsistently adhered to. In the absence of adequate and consistent change control procedures, there is a potential for uncontrolled scope creep, resulting in project delays, cost overruns, and decreased quality of project deliverables.

The results are aligned with Control Theory which emphasizes that organizations need to have feedback loops, establish performance standards, monitor performance against those standards, and take corrective action if any deviation occurs from the established standards. Scope control in project management is a cybernetic control system that works pursuant to: establishing clear standards (the approved scope baseline), regular performance monitoring, timely detection of any variances (scope creep), and implementing a formal process to manage changes (change control). The relatively low mean scores overall, and very low mean scores for the change control process indicate the feedback and correction processes necessary to control per Control Theory have not been sufficiently developed for the Digital Hub Programmes. Therefore, these Programmes are not managing deviations from the original scope in a systematic manner and, therefore, they are not able to maintain focus, deliver what was originally intended (outputs), and achieve what performance levels were originally intended. Findings agree with Emmanuel and Kaburu (2024) that projects with strong scope control mechanisms are more likely to achieve cost and time targets. Orieno et al. (2024) found that integrating sustainability considerations into scope control improves project resilience and long-term impact.

Performance of Digital Hub Programmes

Respondents were asked to tick on the extent to which they agree/disagree with statements related to performance of Digital Hub Programmes. Findings are shown in Table 3.

Table 3: Performance of Digital Hub Programmes

Key: *SD=strongly disagree, D=Disagree, N=Neutral, A=Agree, SA= strongly agree, M=Mean, Std. =Standard Deviation*

Statements	SD %	D %	N %	A %	SA %	M	Std.
The digital hub projects are completed within the scheduled time	29.6	50.0	6.1	8.2	6.1	2.11	1.11
The digital hub projects stay within the planned budget	29.6	49.0	9.2	5.1	7.1	2.11	1.11
The quality of the completed digital hubs meets set standards	6.1	7.1	6.1	53.1	27.6	3.89	1.08
Stakeholder expectations are met upon project completion	5.1	7.1	2.0	46.9	38.8	4.07	1.08
Project objectives and intended benefits are fully realized	9.2	4.1	5.1	15.3	66.3	4.26	1.28
The digital hubs promote access to digital services	4.1	4.1	6.1	40.8	44.9	4.18	1.01
The completed digital hubs are sustainable and functional beyond project completion.	7.1	2.0	5.1	20.4	65.3	4.35	1.15
Average						3.57	1.12

N= 98

Findings show that the respondents strongly agreed that the completed digital hubs are sustainable and functional beyond project completion (M=4.35, Std. =1.15) and the project objectives and intended benefits are fully realized (M=4.26, Std. =1.28). They further agreed that; the quality of the completed digital hubs meets set standards (M=3.89, Std. =1.08), stakeholder expectations are met upon project completion (M=4.07, Std. =1.08), and the digital hubs promote access to digital services (M=4.18, Std. =1.01). Respondents, however, disagreed that the digital hub projects are completed within the scheduled time (M=2.11, Std. =1.11), and that they are delivered within the planned budget (M=2.11, Std. =1.11).

The results show a fairly low level of project performance with an average mean of 3.57 and a standard deviation of 1.12. The moderate mean implies that although some aspects of program performance are perceived positively, remarkable weaknesses exist especially in critical project management dimensions. There was a high consensus among the respondents that; the completed digital hubs are sustainable and that they can be utilized even after the project is complete, the objectives and intended benefits of projects are completely achieved and that the digital hubs facilitate the availability of digital services. It was also agreed that the expectations of the stakeholders are usually achieved at the end of a project and that the quality of the completed digital hubs are in line with the expectations. However, the mean scores of two critical performance indicators were very low: the degree to which the project of digital hubs is completed on time and whether it exceeded the budget. These poor scores indicate that time and cost overruns are still critical issues during implementation of such programmes. The standard deviation of 1.12 is also relatively high thus demonstrating a significant amount of variation in performance among the counties and programmes.

Although some Digital Hub projects seem to deliver good quality, sustainability, and delivery of desired benefits, there are quite a number that face notable challenges in ensuring that the projects are completed on time and within budget constraints. This discrepancy is an indication of unequal project management capabilities and poor establishment of project controls in some counties. The results general show a performance paradox. The programmes are fairly strong in providing quality outputs and long term functionality, which are critical towards community impact. However, the chronic poor time and cost performance compromises the overall efficiency and value-to-money. This trend indicates that although the Digital Hub Programmes are fulfilling some of their development goals, they are missing the basics of project management. Results are in support of CA reports that the performance of digital infrastructure projects in Kenya remains persistently weak whereby 40% of government-funded ICT projects exceed planned schedules by more than six months, and experience delays exceeding one-year.

Correlation Analysis

Pearson’s correlation analysis was conducted to examine the strength and direction of association between scope definition, scope control and performance of Digital Hub Programmes in Selected Counties in Kenya. A correlation is significant at ≤ 0.05 . A correlation value of 0-1. 0.-0.29 shows weak correlation, 0.3-0.49 moderate correlation while 0.5-0.79 shows strong correlation. Correlation results are presented in Table 4.

Table 4: Coefficient of Correlation

Variables		Program Performance	Scope Definition	Scope Control
Program Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
Scope Definition	Pearson Correlation	.573**	1	
	Sig. (2-tailed)	.000		
Scope Control	Pearson Correlation	.820**	.463**	1
	Sig. (2-tailed)	.000	.000	

Finding show that there is a strong significant correlation between scope definition and performance of Digital Hub Programmes ($r = 0.573, p = 0.000$). These findings indicate that positive changes in scope definition practices have significant positive relationships with the performance of a programme. The strong correlation highlights the importance of clearly documenting project scope, deliverables, and stakeholder expectations in project planning. Findings are in support of Zhou et al. (2024) that clearly defined O&M scope documents were

directly correlated with higher reliability indices, reduced transition lags between project phases, and improved asset lifecycle outcomes.

There is a strong significant correlation between scope control and performance of Digital Hub Programmes ($r = 0.820, p = 0.000$). The findings implies that the ability to track the compliance with the approved scope, handle changes formally, and avoid scope creep has the most significant effect on the performance of Digital Hub Programmes in terms of delivering on time, within the budget, and to the desired quality. Findings are in support of Utomwen (2024) that scope control practices had a statistically significant positive effect on project success.

Regression Analysis

Regression analysis was conducted to understand how a unit change in the independent variable may cause a change in the dependent variable. The coefficient of determination shows how a statistical model is expected to predict future results. Table 5 presents the Model Summary.

Table 5: Model Summary

Model	R	r ²	Adjusted r ²	Std. Error of the Estimate
1	0.896	0.803	0.795	.657

Predictors: (*constant*) scope definition, and scope control,

The results show that R-squared value of 0.803, this means that 80.3% of the variability in performance is explained by the model, leaving 19.7% unexplained. Therefore, 80.3 % changes on performance of Digital Hub Programmes, Kenya are due to the changes in scope definition, and scope control. The remaining percentage in the model summary, often referred to as the unexplained variance, represents the proportion of variability in the performance of Digital Hub Programmes that is not accounted for by the independent variables included in the regression model (scope definition, and scope control). This unexplained variance could be attributed to factors not included in the study.

Table 6: Analysis of Variance

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	163.815	4	40.954	94.972	.000 ^b
	Residual	40.103	93	.431		
	Total	203.918	97			

Predictors: (*constant*) scope definition, and scope control.

Dependent: *Program performance*

F-ratio in the ANOVA table tests whether the overall regression model is a good fit for the data. The table shows that project scope management processes (scope definition, and scope control) statistically significantly predict changes in performance of Digital Hub Programmes, $F(4, 93) = 94.972, p < .0005$ (the regression model is a good fit of the data). The significance value of 0.000 indicates that the regression relationship is highly significant in predicting how project scope management processes would cause changes in performance of Digital Hub Programmes.

Table 7: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Constant/Y Intercept	4.861	421		11.536	.000
Scope definition	.718	.058	.629	7.354	.003
Scope control	.793	.108	.660	12.412	.000

As per the SPSS generated in Table 7,

Program Performance = 4.861 + 0.718 (scope definition,) +0.793 (scope control).

Scope control show a statistically significant positive coefficient ($\beta = .793$, sig = .000), indicating that improvements in scope control result to higher performance of performance of Digital Hub Programmes. Scope control has the greatest effect on project performance at 66% (std Beta = .660). This shows a unit increase in scope control will result to increase in performance of Digital Hub Programmes. Results concur with Umubyeyi and Nnamdi (2024) that scope control reduced risk occurrences and improved project delivery timelines.

Scope definition show a statistically significant positive coefficient ($\beta = .718$, sig = .000), indicating that improvements in scope definition result to higher performance of performance of Digital Hub Programmes. Scope definition has the second greatest effect on project performance at 62.9% (std Beta = .629). This shows a unit increase in scope definition will result to increase in performance of Digital Hub Programmes. Finding is in line with Zhou et al. (2024) that consistent definitions across the planning and handover phases enhanced technical performance of a project.

Conclusion

Scope Definition and Program Performance

The study concludes that there is a strong positive significant effect of scope definition on performance of digital hub programs. Scope enhances program outcomes when it is clearly defined, documented, aligned with stakeholders' anticipations, and officially approved before program implementation. The results are in line with Goal Setting Theory which states that specific and clear goals provide a strong base to the successful delivery of projects. Nevertheless, there is still a degree of variability between counties, so the practices of scope definition are not yet rigorous across the board.

Scope Control and Program Performance

Scope control has a significant effect on performance of Digital Hub Programs. Even though the projects are monitored and stakeholders are as well consulted, the lack of strong formal change control processes and clarity on approval procedures limit the general control system. Supported by the control theory, findings show that effective scope control can only be effective if feedback mechanisms and correction methods are utilized for deviation correction. Based on the relatively low mean score, scope control is very weak compared to any other element within the scope management process, and thus needs significant improvement if scope creep is to be eliminated and programme outcomes improved.

Recommendations

Scope Definition and Program Performance

Project managers should institutionalize a strong and participatory scope definition process during the initiation of each Digital Hub Program. This must include well documented goals,

deliverables, inclusions and exclusions, and stakeholders' involvement in projects. In addition, there should be formal signing-off on the scope document by the main stakeholders before allocating project resources and also before initial project implementation. These actions will make the goals clear, reduce ambiguity and provide a strong foundation for program performance improvement.

Scope Control and Program Performance

The project managers should develop and strictly implement a formal scope change control process with clear procedures of request, evaluation, approval and documentation of any variations to the initial scope. There should be regular scope review meetings involving the stakeholders to identify scope creep and solve it on time. Project teams should also be trained on how to control the scope and the rights tools availed to help them check on compliance to the plan during project implementation.

Areas for Further Research

This study focused on effect of scope management practices on the performance of Digital Hub Programmes in selected Counties in Kenya. Future studies should focus on the influence of scope management practices on performance of other Programmes. Such projects may include infrastructure, health, or agriculture projects to assess whether the observed relationships is similar across other programmes. In addition, the study showed that the scope management practices studied contribute to 80.3% of program performance. Further research should be conducted to examine other factors that contribute to 19.7% changes. The studies may examine the effect of variables such as risk management, stakeholder engagement, resource management, or monitoring and evaluation.

REFERENCES

- Akeiber, H. J. (2025). Artificial intelligence in engineering management: Revolutionizing decision-making and automation. *Al-Rafidain Journal of Engineering Sciences*, 34(1), 75–89.
- Akhwaba, J. K. (2020). The moderating influence of project scope on leadership skills, stakeholder management, and execution of fibre optic infrastructure projects. *Advances in Civil Engineering*, 2020, 5648394.
- Akomea-Frimpong, I., Jin, X., & Osei-Kyei, R. (2022). Mapping studies on sustainability in the performance measurement of public-private partnership projects: A systematic review. *Sustainability*, 14(12), 7174.
- Almarri, K., & Boussabaine, H. (2025). Critical success factors for public–private partnerships in smart city infrastructure projects. *Construction Innovation*, 25(1), 124-140.
- Bryde, D. J. (2005). Methods for managing different perspectives of project success. *British Journal of Management*, 16(2), 119–131.
- Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality–social, clinical, and health psychology. *Psychological Bulletin*, 92(1), 111–135.
- Communications Authority of Kenya (CA). (2023). *Annual Sector Statistics Report*.
- Eaves, D., & Rao, K. (2024). *Digital public infrastructure: A framework for conceptualisation and measurement*. UCL.
- Emmanuel, W. K., & Kaburu, K. (2024). *Project Control and Project Performance of Irrigation Projects in Embu County, Kenya* (MBA Thesis, Kenyatta University).
- Ghanbaripour, A. N., Tumpa, R. J., & Skitmore, M. (2025). Project delivery success and sustainability: Comparative strategies in the post-pandemic era. *Management Decision*, 63(1), 88–104.

- GSMA. (2024). *Digital Development Report*.
- Jaafar, K., Watfa, M., & Aloran, A. (2023). Framework for a predictive progress model—case of infrastructure projects. *International Journal of Management and Asset Management*, 5(2), 85-101.
- Jayasena, N. S., Chan, D. W. M., & Kumaraswamy, M. M. (2024). Adoption of public-private partnership (PPP) in smart infrastructure development projects in developing nations. *Cities*, 145, 104446.
- Jenkins, L. C. (2024). *Digital Leadership and Business Intelligence Systems Project Success: The Role of Project Management Professional Certification* [Doctoral dissertation, ProQuest Dissertations Publishing].
- Kerzner, H. (2017). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*. Wiley.
- Khasawneh, M. A., & Dweiri, F. (2024). Analyzing the Digital Infrastructure Enabling Project Management Success: A Hybrid FAHP-FTOPSIS Approach. *Applied Sciences*, 14(17), 8080.
- Khoo, T. J., Esa, M., & Mahdiyar, A. (2024). Critical factors driving construction project performance in integrated 5D Building Information Modeling. *Buildings*, 14(9), 2807.
- Ko, T., Jeong, H. D., & Lee, J. H. (2023). NLP-driven similar project determination using project scope statements. *Journal of Management in Engineering*, 39(2), 04023002.
- Latham, G. P., & Seijts, G. H. (2021). Goal setting and performance management in the digital era. *Organizational Dynamics*, 50(3), 100842.
- Locke, E. A. (1968). Toward a theory of task motivation and incentives. *Organizational Behavior and Human Performance*, 3(2), 157–189.
- Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation. *American Psychologist*, 57(9), 705–717.
- Maxwell, J. A. (2023). *Qualitative Research Design: An Interactive Approach* (4th ed.). Sage Publications.
- Mithileni, S. A. (2022). *Exploring the project management monitoring and control process in the Working for Water Programme* (Master's thesis). North-West University, South Africa.
- Moenga, R. O., & Moronge, D. R. M. (2021). Utilization of broadband infrastructure projects in Kenya: A case of National Optic Fibre Backbone Infrastructure Project. *International Journal of Business & Change Management*, 8(1), 101–115.
- Mordor Intelligence. (2024). *Kenya ICT Market - Size & Share Analysis Report*.
- Mwitia, N. M. (2024). Factors influencing implementation of ICT projects in government agencies: A case of Nairobi County, Kenya.
- Naji, K. K., Gunduz, M., & Al-Hababi, H. (2024). Mapping the digital transformation maturity of the building construction industry using structural equation modeling. *Buildings*, 14(9), 2786.
- Oke, A. E., Aliu, J. O., & Jesudaju, O. T. (2025). Building a sustainable future: The role of digitalization in Nigerian heavy engineering projects. *Engineering, Construction and Architectural Management*, 32(1), 102–121.
- Okong'o, O. F. (2022). *Risk management and performance of information technology projects by commercial banks in Kenya*. Kenyatta University Repository.
- Omowole, B. M., Nzeako, G., & Famoti, O. (2025). A practical model for agile project management to streamline engineering delivery in energy projects. *International Journal of Project Management*, 43(2), 215–229.
- Ordóñez, L. D., Schweitzer, M. E., Galinsky, A. D., & Bazerman, M. H. (2009). Goals gone wild: The systematic side effects of overprescribing goal setting. *Academy of Management Perspectives*, 23(1), 6–16.

- Orieno, O. H., Ndubuisi, N. L., & Eyo-Udo, N. L. (2024). Sustainability in project management: A comprehensive review. *Journal of Advanced Research in Sustainability*, 12(1), 34-50.
- Project Management Institute (PMI). (2021). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (7th ed.). Project Management Institute.
- Rehman, M., Fogat, R., & Aika, S. (2025). Cloud-based architecture migration and project scope definition in multinational E&P operators. *International Petroleum Technology Conference Proceedings*.
- Ricker, J. (2024). Real-time control strategy and scope definition in municipal wastewater infrastructure projects. *Collection Systems and Stormwater Conference Proceedings*.
- Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students* (8th ed.). Pearson Education.
- Scheier, M. F., & Carver, C. S. (2018). Self-regulation theory. In M. D. Robinson & M. Eid (Eds.), *The happy mind: Cognitive contributions to well-being* (pp. 9–21). Springer.
- Sun, H., Khoo, T. J., Esa, M., Mahdiyar, A., & Li, J. (2024). Critical factors driving construction project performance in integrated 5D Building Information Modeling. *Buildings*, 14(9), 2807.
- Svejvig, P., & Grex, S. (2020). Scope management in complex projects. *International Journal of Project Organisation and Management*, 12(4), 321–339.
- Swaen, V., & George, B. (2024). Conceptual frameworks in management research. *Journal of Management Studies*, 61(2), 455–470.
- Umubyeyi, G., & Nnamdi, M. (2024). Effect of Project Risk Management on Project Success in Rwandan Logistics Companies. *Journal of Entrepreneurship & Project Management*, 8(2), 150–168.
- Utomwen, M. (2024). *Examining the Impact of Project Risk Management and Project Complexity on Project Success in the United States: A Quantitative Regression Study*. ProQuest Dissertations Publishing.
- Volner, L., Čamaj, J., & Palková, A. (2025). Towards the efficiency of infrastructure building in the Slovak Republic, Methodological apparatus of change management. *Sustainability*, 17(6), 2423.
- Wekesa, P. (2023). *Influence of project management practices on implementation of NGO projects in Kakamega County, Kenya*. Kenyatta University Repository.
- Zhou, Y., et al. (2024). Scope definition and operational management in digital built asset projects. In *Digital Built Asset Management*. Edward Elgar Publishing.