



Moderating Effect of Environmental Factors on the Correlation Between Project Scope Management Practices and the Integration of Technology Integration in Public High Schools in Kenya

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Abstract: This study focused on investigating Project Scope Management practices and adoption of Technology Integration in Kenyan Public High Schools. Data for the study was gathered from 189 out of the 373 public high schools located in Kiambu and Nairobi counties. A cross-sectional descriptive research design was used, incorporating both quantitative and qualitative methods for data gathering, scrutiny, and presentation. The process of selecting schools actively incorporating Technology Integration into their educational practices was carried out using stratified sampling. The study employed a combination of closed and free-response questions in the questionnaires directed to the managers and tutors responsible for technology integration, as well as interviews conducted with the administrators of the schools. The collected data was analyzed using Jamovi, an advanced version of SPSS, for both descriptive and inferential statistics. Correlation analysis was applied to assess the Relationships between quantitative variables. Pearson Correlation and regression techniques were employed for inferential analysis. The parameters of the regression model were used to ascertain the predictive role of the independent variables in the study. The findings led to the conclusion that there was indeed a significant correlation between Project Scope Management practices and Adoption of Technology in public high schools with moderation of the environmental factors. Educational policymakers and school administrators ought not only focus on improving project management practices but also create conducive environments that facilitate technology integration efforts. Environmental factors index has no significant moderation effect on relationship between Scope Management Practices and Technology integration in Public High Schools in Kenya ($H_0: \beta \times 2m = 0$) was rejected ($\beta^2 = -0.122$, $t = -2.12$, $p\text{-value} = 0.036$). By recognizing and addressing the influence of environmental factors, Kenyan public high schools can more effectively address the challenges and seize the opportunities linked to technology adoption in the educational process, ultimately elevating the quality of education for students in the digital era.

Keywords: Project Scope Management practices, Technology integration, Implementation Environmental factors, Public High Schools

1. Introduction

1.1 Background of the Study

Integration and implementation of technology in educational institutions, particularly in public high schools, is indispensable in preparing students for the demands of the modern world. Project scope management practices impact a critical role in ensuring the efficacious implementation of technology integration initiatives. However, the impression of these practices can be affected by numerous environmental factors in the educational context.

This study aims to investigate the moderating effect of environmental factors on the relationship between project scope management practices and technology integration in Kenyan public high schools. This study seeks to explore how environmental factors moderate the connection between project scope management practices and the integration of technology in Kenyan public high schools

1.2 Research Objective

To examine the moderating effect of environmental factors on the relationship between Project Scope Management Practices and Technology integration in Kenyan Public High School

Hypothesis

H01: There is no significant moderating effect of environmental factors on the relationship between project Scope management practices and implementation of technology integration in Public high schools in Kenya

1.3 Statement of the Problem

In today's rapidly evolving business landscape, organizations across various industries are increasingly relying on technology integration as a means to achieve competitive advantage and enhance operational efficiency. The successful implementation of technology integration projects is contingent upon a variety of factors, including the initial project scope.

According to the 2017 Global Project Management Survey by KPMG, 31% of projects were successfully conveyed within the designated time and budget, while 59% of projects encountered scope creep, denoting the uncontrolled expansion of project objectives beyond their original targets. In PMI's Pulse of the Profession 2020 report, it was highlighted that 48% of project professionals attributed project failure primarily to alterations in project scope. Furthermore, the Standish Group's Chaos Report in 2018 reported that only 54% of technology projects were completed as planned, meeting deadlines, budget constraints, and the stipulated features and functions.

Hence, giving due attention to project scope is vital for achieving the desired outcomes of a project, and project managers should emphasize effective scope management throughout the project's entire lifecycle. With clear project goals, effective communication, and ongoing scope management, project managers can minimize risks and increase the chances of project success. Most studies have primarily focused on the internal project management aspects while largely neglecting the influence of external environmental factors. (Jones 2020; Smith 2021).

Others that have been conducted explored the environmental elements that affect the execution of eLearning such as inadequate infrastructure, lack of computer laboratories, and unreliable internet connectivity indicating that they were significant obstacles to the successful implementation of e-learning in Indonesian schools. Juniata (2019). In the context of Kenya, the survey on the moderating effect of environmental factors on the relationship between project scope and technology integration holds particular relevance. Kenya has been experiencing a significant digital transformation in recent years, with the government and businesses alike recognizing the importance of technology integration for economic development, improved service delivery, and enhanced competitiveness. Therefore, comprehending the factors that impact the achievement of technology integration ventures in Kenya is crucial for the country's growth and development. the relationship between project scope and technology integration outcomes may not be uniform and can be affected by a range of different environmental factors. The objective of this study is to examine how environmental factors can moderate the relationship between project scope management practices and technology integration achievement.

2. Theoretical Background

2.1 Technological, Pedagogical, Content Knowledge Framework (TPACK) Theory

Technological, Pedagogical, Content Knowledge Framework was developed by Mishra and Koehler in 2006 that enables teachers to gain insight into and characterize the types of knowledge essential for an operational academic training in a technology-enhanced learning setting. These are; content knowledge, pedagogical knowledge, and technology knowledge. Technology knowledge (TK) is about to familiarity about several technologies, stretching from traditional, simple tools like pencils and paper to modern digital resources such as the Internet, digital video, interactive whiteboards, and software programs. Content knowledge (CK) which concerns the definite subject matter that tutors ought to as they instruct students and Pedagogical knowledge (PK) which is the Knowledge about the approaches and procedures of instruction such as classroom management, assessment, lesson plan preparation and student education.

These three domains need to be synchronized for enhanced subject comprehension by the pupils, hence achieved delivery of the curriculum, Koehler (2011). According to Kisirkoi (2019), a teacher who is able to negotiate the connections exemplifies a form of proficiency different and larger than the familiarity of a professional in a discipline. The inseparable association between the three form a valuable organizational configuration for defining what it is that teachers require to know to integrate technology excellently. Teachers need knowledge and skill to apply technology, subject content knowledge and pedagogic knowledge as they incorporate technology into education.

This study explored the level of teacher competence, content availability and delivery and pedagogical expertise as well as level of technological competence for optimum output in curriculum delivery, all of which are related to dimension of scope.

3. Conceptual Framework

The conceptual framework in Figure 1 depicts the relationship between Project Scope management practices and implementation of technology Integration with the moderation effect of environmental factors.

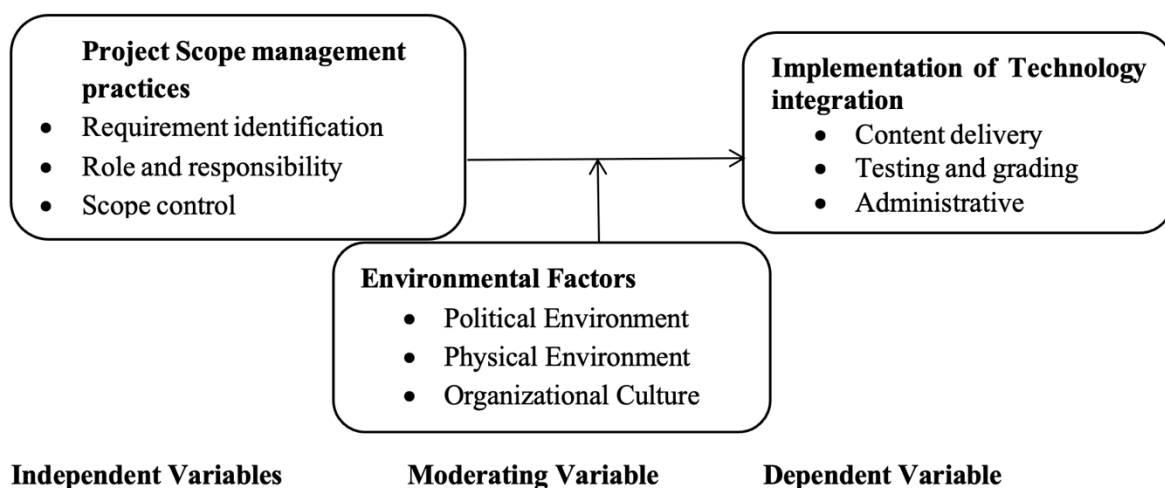


Figure 1: Conceptual framework

4. Empirical Literature

4.1 Scope Management

In project Scope management, the work required to successfully deliver a project or service is calculated. Project failure is as a result of inadequate pre-project planning and poor project definition of project elements Muhammad (2013). For technology integration, the scope is a very noteworthy element whose inputs, outputs and tools have to be carefully selected and analyzed for project success.

This procedure encompasses authenticating stakeholders' needs with the specified intent of meeting the project's purposes. When executed systematically and appropriately, this process significantly lessens the possibility of unpleasant surprises as the project moves toward completion. According to Kester, (2021), a needs valuation is a methodology commonly used by instructional designers to recognize and rank requirements for educational programs. This process involves collecting data from assorted stakeholders, comprising students, tutors, and managers, and scrutinizing it to define the most pressing needs and goals. The resulting insights are then used to direct the progress and execution of operative learning solutions. In the context of project management, needs valuation can be useful to warrant that project scope is aligned with stakeholder needs and to lessen the risk of scope creep. By incorporating needs valuation into the project planning process, project managers can ensure that the project meets the needs of stakeholders and remains focused on its original goals.

Each stakeholder in a technology integration project has diverse requirements. These requirements can either be essentials or yearnings in the form of inputs and outputs. The effective integration of technology into a school's prospectus is intensely inclined by the role played by a school principal, as submitted by Wang (2020). Further affirmation is that administrators who offer resources such as mentoring tutors who are themselves experts in technology besides the time required to integrate the technology as basic support to fresh teachers may stimulate advanced heights of technology integration. They need to perfect usage of technology, have a vision and validate to the staff how imperative and valuable the tools being integrated are.

The tutor is liable for creating the environment for technology integration in class by preparing the learning prospects that support students using the lessons of communication technology, Wang (2021). Teachers regard technology as providing a rich atmosphere for students; providing valuable amenities to support pupil education; supporting pupils to access reliable contemporary data; and making education stimulating owing to student participation. Taking a student-centered approach to project management ensures that the project meets the needs and expectations of all stakeholders.

Teachers' role is to discern and use numerous means to develop the interactivity and participation of pupils not only as passive spectators, but as dynamic partakers in the training process. Students are aggressively involved and are accountable for their personal learning, (Xu, 2021). In managing scope, teachers can also use various teaching methodologies to promote active participation, such as case studies, group discussions, and role-playing, creating a collaborative learning environment. Such methodologies equally apply to project management, where project managers can use various methods, including Agile and Scrum, to promote collaboration and active participation among team members.

This is the final procedure of Project Scope Management. It is important to monitor the project development status along with the supervision of any deviations in the scope. Project control is done throughout the project life cycle and assists in retaining the scope baseline as well as assessing to ensure that what is delivered was the promised deliverable.

According to Mirzaei (2019), scope control encompasses regulating deviations to project scope throughout the lifespan of the project and in Technology projects, scope control is a challenge since it frequently affects the team's capability to meet project schedule and budgets. Any alterations in scope dictate cautious assessment of the costs and paybacks. Scope control can be necessitated by both external events and internal events. By effectively

managing the project scope, technology integration projects in schools can achieve better outcomes, leading to enhanced student learning and improved school performance.

4.2 Implementation of Technology Integration

Technology in learning institutions can have positive effects on academics in learning institutions. It can generate scores of affirmative deliverables and can be in the form of among others; surfing to get varied educational content, downloading accessed content, printing as well as electronic delivery mode of slide presented work by projection. According to Zhao, (2019) technology can remodel the lessons' pace and broaden adequate capacities and abilities. It has made an insightful and historic impression on the qualitative and quantitative teaching facets in educational establishments, (Khan 2021). All these features are what scope management practices keenly handle for the fruition of projects.

Technology has been adopted in different subject categories with varied sentiments propagated regarding subject teachers' usage and positive effects on the subject performance, where teachers appropriated them. ICT made learning geography, science subjects, more fascinating and improved realization and enhanced academic achievement; (Rubaii, 2021); (Nyabwari, 2021); The results show how technology embrace positively augments academic performance. Additionally, Gao, (2020) proposes that in order to advance student success, schools must deliver real opportunities to use the technologies as well as adequate quality of access other than access to it alone. In conclusion, the potential of technology to bring about significant change is being recognized by educators in the face of challenges in education. As identified in the study by Mushi, (2021), increased investment in technology and training for faculty members can improve higher education in Tanzania amidst the impacts of the COVID-19 pandemic.

Technology integration progresses instruction and permits speedier coverage of content from online and dissemination of information among pupils who collaborate through a community of learners (Otianga, 2019). It is paramount therefore that educators possess ICT knowledge; that principals in secondary schools need operative and fast communication and accessibility to information. Correspondence can be via e-mail, the internet as well as crafting websites for school marketing. This saves on time when using a software tool to communicate with parents, teachers, students, fellow school administrators, corporate leaders, suppliers, and the broader community, over time.

A study by Ochieng, (2021) reports that the introduction and integration of technology in schools guarantees a progressive electronic administrative framework, in areas associated with general, financial, personnel and student administrations. Information management systems can be applied for the modeling and organization of administrative procedures. Administratively, technology can be applied in a variety of tasks, including creating student report forms, registering and confirming students for national exams, developing teaching plans and lesson plans, archiving and retrieving past examination papers, and printing results and merit lists. Moreover, they support in generating copies of official documents, are able to cut down on costs, reduce time wastage, enhance job performance and yield job satisfaction.

5. Research Methodology

The research utilized a cross-sectional descriptive design, incorporating both quantitative and qualitative approaches for data gathering, scrutiny and reporting. Stratified sampling was incorporated with a subgroup of 189 Secondary schools selected out of a population of 363 public high schools in Kiambu and Nairobi with homogeneous characteristics based on inclusion and exclusion criteria in relation to implementation of technology integration.

The sample size consisted of 189 derived where;

n = the required sample size

Z = Standard Z-score (standard value of 1.96 for 95% confidence interval)

p = the proportion of the population with the desired characteristic which is the application of ICT in teaching (taken to be 50%)

q = (1 - p) = 0.5

e = margin of error (in this case taken to be 5%)

N=Finite population size.

With N = 373, the formula leads to;

$$n = \frac{Z^2 pqN}{e^2(N-1)+Z^2 pq} = \frac{Z^2 pqN}{e^2(N-1)+Z^2 pq} = 189$$

Hence, a total of 189 schools, encompassing all types of public high schools, including National, Extra-County, County, and Sub-county, were selected for this study, as outlined in Table 1.

Table 1: Distribution of sample size

COUNTY	NO. OF SCHOOLS	PROPORTION	NO. OF SCHOOLS SAMPLED
NAIROBI	95	25.47%	48
KIAMBU	278	74.53%	141
TOTAL	373	100.00%	189

Questionnaires were administered to all ICT managers and/ or teachers in charge of the ICT docket. This study was carried out by a combination of the use of structured questionnaires for the managers and interviews for the head teachers of the respective schools

6. Research findings and discussions

6.1 Descriptive Results of Project Scope Management Practices

Constructs under Project Scope Management practices consisted of Requirement identification, Roles Identification and Scope Control. Identification of needs was observed as informed with 51.70% of the respondents strongly agreeing and 39.20% assenting; with mean= 4.41 and sd of 0.820). None of the respondents was of strong conflicting view, (0.00%) and a miniature 1.14% differed. This confirmed that needs assessment was effectively carried out. Deficiency of needs assessment culminates to a condition where the instructors acquired insufficient preparation which is only geared to manufacturing computer cultured but incompetent teachers to practice it, to do research, to replicate and to do demonstration throughout their instructions (Kigwilu, 2020).

The results similarly portray that there was a projection of the end results for technology integration with 55.11% and 35.80% of the participants indicated strong agreement and agreement respectively with a mean score of 4.44 and a standard deviation of 0.824. From the interview outlook, the principals conceded that their vision included positive academic deviation, skill acquisition, diversified mode of content delivery, heightened critical and creative thinking, amongst many others. None of the respondents vehemently challenged the view. This alluded that integration could be effected in leaps and bounds as future targets were laid down and plans were effectively implemented, of course when all other factors were held constant.

These findings suggest that effective scope management practices are vital in the effective integration of technology in high schools. The involvement of all stakeholders and the establishment of a shared vision is essential in managing project scope effectively. By setting realistic project objectives, communicating the project scope and objectives clearly, and using project management tools to monitor and control the project scope, technology integration projects in high schools can achieve better outcomes, such as positive academic deviation, skill acquisition, diversified modes of content delivery, and heightened critical and creative thinking. Therefore, it is essential to prioritize effective scope management practices to ensure that technology integration projects in high schools achieve their objectives and lead to better educational outcomes for students.

Table 2: Project Scope management practices

Item	SA	A	N	D	SD	Mean	Sd
i. Needed inputs/requirements are identified for use	51.70	39.20	7.95%	1.14%	0.00	4.41	0.820
ii. There is vision of anticipated end results	55.11%	35.80%	7.39%	1.14%	0.57%	4.44	0.824
iii. Principal is aware of his role in implementation	46.02%	46.59%	6.82%	0.57%	0.00%	4.38	0.844
iv. Teachers are aware of their roles in integration	40.91%	50.57%	7.95%	0.00%	0.57%	4.31	0.834
v. Students are informed of what is expected of them	53.41%	35.80%	9.66%	0.57%	0.57%	4.41	0.82
vi. Teachers have been provided with the necessary infrastructure	52.84%	32.39%	10.23%	3.41%	1.14%	4.32	0.828
vii. Students are supported in use of technological lessons	51.14%	37.50%	9.66%	1.14%	0.57%	4.38	0.817
viii. Necessary support offered by the administration	44.89%	44.32%	8.52%	1.70%	0.57%	4.31	0.823

KEY: SA= Strongly Agree; A=Agree; N= Neutral; D=Disagree; SD=Strongly Disagree; sd = Standard Deviation
Overall Cronbach Alpha value= 0.845 with 6 items

In concurring disposition was (Orwenjo, 2018) who asserted that teachers solely would not be able to make a reality of the ICT integration in teaching in the absence of a shared vision launched on the actual requirements of the learning institutions and one that embodies all stakeholders.

Principals were conscious of their roles in implementation of technology integration as evidenced by a very high response rate of 46.02% strongly agreeing and 46.59% agreeing respectively. The inference was that their managerial obligations that are administrative, financial and academic are heeded to and undertaken by use of technology. This is an essential aspect of effective scope management since it is necessary to have all stakeholders aware of their roles to ensure that the project scope aligns with the school's objectives and needs. The use of technology can aid in fulfilling the administrative, financial, and academic managerial obligations of the principals, culminating to more efficient and effective implementation of technology integration projects. Therefore, the involvement of principals and their awareness of their roles is crucial in ensuring the success of technology integration projects, further emphasizing the importance of effective scope management practices. Equivalent persuasion was levelled by Ramachandran, (2020) who asserted that as a planning gear, ICT had made school management functions less complex. This involved coordination of teaching and learning exercises, jointly with academic initiatives; monetary, human resources and supporting resources; library and information science, and general management.

The study conclusion furthermore reported that pupils were guided and enlightened of what was envisioned of them. A gigantic 87.50% of the respondents (53.98+33.52%) agreed on this, with a mean = 4.32 and sd of 0.828 showing variability in the responses and that students had been well assimilated in technology integration ventures. This suggests that students can benefit from such projects, provided that they are well integrated and adequately informed of their roles and responsibilities. In conclusion, technology integration in schools requires effective scope management to ensure that the project is successful and that students benefit from the opportunities that technology can offer.

This perception was in line with Namodi (2022), who suggested that tutors largely made it a precedent to give pupils opportunity to work together. They incorporated them in appraising their work and positioning their objectives. Their view was that intensifying students' notions was a constructive tactic to shape their prospectus; hence they preferred to cluster them in their desks for joint tasks cooperatively, and they also had an inclination to evaluate them informally via observations and discussions. This goes hand in hand with the perspective on students being supported in their technological sessions where 51.14% and 37.50% of the respondents strongly concurred and agreed respectively. However, conflicting views were raised by Kim (2020), who posited that students lacked awareness of internet skills and were unwilling to take responsibility for their own e-learning.

Infrastructural amenities were employed for the realization of anticipated deliverables which can be a product, process or even produce. Teachers acknowledged the fact that these inputs have been made available to them with 52.84% strongly agreeing and 32.39% in agreement. The mean with 4.32 and sd of 0.828 showed divergence of the responses implying average amount of variability or dispersion in a set of values. It was thought -provoking that 10.23% were uncommitted on this declaration. The responses from the school management readily answered this. The principals, through interviews and officers manning technology integration via questionnaires agreed that most of the assets such as desktops, projector, computers and others were there but not adequate for all teachers and for use by students whose population had been accelerating annually as a result of 100% transition of students from primary to high schools.

Support from the administration assertion was with mean = 4.31 and sd of 0.823 revealing variability in responses and 89.32% (44.89% + 44.32%) in endorsement that assistance was accorded. Evidently, 10.79% of the respondents were of contrary opinion. In consent with these responses were conviction from Atyang (2018), positing that only a fraction of the school heads (46%) had put structures in place to authorize educators and pupils who were not taking computer studies as a subject to gain access to ICT amenities such as the labs. The bulk of the school principals (91%) however had computer tutors engaged by either TSC or Board of the school management. Computer teachers come in conveniently in aiding other teachers on technical concerns. Again, the survey reported that pedagogical openings were infrequent as only 18% of the school principals had personally taken some measure to have their instructors coached on the methods of incorporating ICT into their teaching methodologies. This perception had been given weight by Adeyemi (2020) proclaiming that there was a need for consistent and continuous support for tutors to reap worthwhile adoption of ICTs in their professional execution. Instructors who were supported, inspired and coached to integrate ICT extended customized teaching which in turn, helped students realize their full potential by enabling them to connect with their local communities as well as individuals from diverse cultures.

Concurring report by Ombui (2021) designated that the teachers were zealous in accepting ICT lessons, in getting familiar with ICT, and in improving their aptitudes for their convenience, their mentee's interest, and for their overall professional growth. Teachers' favorable attitudes regarding ICT training and their enthusiasm for additional high-quality ICT training opportunities should create the foundation for the development of a carefully structured ICT training program.

Evidently, the mean ranged from 4.31 to 4.44 whereas the standard deviation varied between 0.817 and 0.844. The constricted range shows that the replies associated to technology integration in schools are quite homogeneous and that there is a somewhat uniform consensus amongst the participants concerning the scope management practices on technology integration. This could infer that the schools have well-defined and standardized processes for handling the scope of technology integration projects. This is in respect to implementation of consistent strategies to define, control, and manage the boundaries and deliverables of their technology integration ventures.

6.2 Regression Results for the relationship between Scope Management Practices and Technology Integration

a) Relationship between Scope Management Practices and Technology Integration

Three regression models were fitted hierarchically, that is; Model with scope management practices as the predictor, Model 2 with scope management practices and environmental factors as the predictors and Model 3 with scope management practices and environmental factors and the interaction term as the predictors. The regression output is given in three parts; Model summary, Model comparisons and Model coefficients all presented in Table 2. Model 1 was significant ($F(1,135), 10.71$; $p\text{-value} = <.001$) and therefore, scope management practices was a valid predictor of Technology Integration. The coefficient of determination shows that 7.35 % of technology integration was explained by Scope management practices ($R^2 = 0.0735$). The fitted model was

Model 1: $Y = 4.435 + 0.342X$

Model Summary for The relationship between Scope Management Practices and Technology Integration

Model summary						
Model	R	R ²	F	df1	df2	Sif fig
1	0.271	0.0735	10.71	1	135	< .001
2	0.288	0.0831	6.08	2	134	< .001
3	0.325	0.1057	5.24	3	133	< .001
Model Comparisons						
Model	Model	ΔR ²	F	df1	df2	P
1	2	0.00965	1.41	1	134	0.237
Residue	3	0.02260	3.36	1	133	0.069
Predictor	Estimate	SE	T	P		
Model 1						
Y	4.435	0.0320	138.49	< .001		
Scope Management	0.342	0.1046	3.27	0.001		
Model 2						
Y	4.4329	0.0320	138.37	< .001		
Scope Management	0.3256	0.1054	3.09	0.002		
Environmental Factors	-0.0506	0.0426	-1.19	0.237		
Model 3						
Y	4.435	0.0318	139.57	< .001		
Scope Management	0.343	0.1049	3.27	0.001		
Environmental Factors	-0.122	0.0574	-2.12	0.036		
Scope mngt, Environ- mental Factors & inter- action term	0.348	0.1900	1.83	0.069		

Independent variables

Model 1: Scope Management Practices

Model 2: Scope Management Practices, Environmental factors

Model 3: Scope Management Practices, Environmental factors, Scope Management Practices*Environmental factors

Y= Implementation of Technology integration

The hypothesis that Scope Management Practices have no significant impact on Technology Integration in Public High Schools in Kenya ($H_{03}: \beta_4 = 0$) was negated as β_3 had a value of 0.342, with a t-statistic of 3.27, and a p-

value of 0.001. This implies that one-unit increase in Scope Management Practices index leads to 0.342 increase in Technology integration index.

6.3 Discussion of the findings on the Relationship between Scope Management Practices and Technology Integration

Scope management Practices does not have a significant impact on Technology Integration in Public High Schools in Kenya ($H_0: \beta_4 = 0$) was rejected ($\beta_4 = 0.342$, $t = 3.27$, $p\text{-value} = 0.001$). This implies that one-unit increase in Scope Management Practices index leads to 0.342 increase in Technology integration index. Concurring results on significant correlation between scope management practices and technology integration in education in regard to the support from management variable was from study by Peled (2022) where management was found to have a significant effect on the dependent variable ($SE\ beta = 0.40$, $p < 0.05$), with a total effect of 30.6% and standardized indirect effect of 30.6%. This denotes that the encouragement and backing provided by management have a positive influence on teachers' attitudes toward technology adoption. Additionally, the extent of technology utilization post-training significantly impacts these attitudes. In simpler terms, the more teachers use technology after their training, the more favorable their outlook towards technology becomes. In simpler terms, the more a teacher used technology after training, the more favorable their attitude towards technology utilization became.

Additionally, in consensus with the fact of scope management practices has a significant relationship with technology integration in schools was the study Kim (2018) hypothesizing that effective scope management practices, including the identification of project risks, the establishment of a realistic project budget, and the development of a clear project schedule, were important predictors of the success of the laptop program. The study by Kopcha (2020) found that effective scope management practices, including the development of a clear project scope statement, the identification of project risks, and the establishment of a realistic project budget, were important predictors of successful technology integration initiatives, hence prevalence of significant relationship.

Conflicting results were exuded in the study by Chuang (2020) that scrutinized the factors that influence technology integration in the school syllabus in India and reported that scope management practices, such as project planning and monitoring, were not strongly connected with technology integration. Whereas the study did not report an absence of relationship between the two variables, it deduced that other features, such as teacher attitudes and training, were more persuasive in stimulating implementation of technology integration in this context. Nevertheless, the study highlights the prominence of considering multiple dynamics while investigating the relationship between scope management practices and technology integration in schools.

In summary, effective scope management practices are vital to the success of technology integration initiatives in schools. By defining flawless project goals, objectives, and deliverables, and launching genuine project boundaries, schools can ensure that technology integration initiatives are well-defined, properly scoped, and applicably ranked, and that they are finalized as planned, without exceeding the budget, and in accordance with the predetermined quality standards. Garg (2021), In conclusion, association between scope management practices and technology integration in schools may also be context-dependent, and diverse studies might report varying degrees of relationship or no relationship at all subject to the particular context

b) Moderating effect on the Relationship between Scope Management Practices, and Technology Integration

To explore how environmental factors can influence the connection between Scope Management Practices and technology integration, an environmental factors index variable was introduced into Model 1, creating Model 2. It was also determined that Model 2 was statistically significant ($F(2,134) = 6.08$, $p\text{-value} < 0.001$). The squared significantly changed by 0.965. (Change in $R\text{-squared} = 0.00965$, $F(1,134) = 1.41$, $p\text{-value} = 0.033$). The fitted model was;

Model 2: $Y = 4.4329 + 0.3256X_4 - 0.0506M$

The null hypothesis: Scope management Practices has no significant effect on the Technology Integration in Public High Schools in Kenya ($H03: \beta_4 = 0$) when environmental factors are held constant was rejected ($\beta_4 = 0.3256$, $t = 3.09$, $p\text{-value} = 0.002$). This infers that one-unit increase in Scope Management Practices index leads to 0.3256 increase in Technology integration index when environmental factors are controlled.

The null hypothesis: Environmental factors has no significant effect on the Technology Integration in Public High Schools in Kenya ($H05: \beta_m = 0$) when Scope Management Practices are held constant was rejected ($\beta_4 = -0.0506$, $t = -1.19$, $p\text{-value} = 0.237$). This suggests that one-unit increase in Environmental factors index leads to 0.0506 decrease in Technology integration index when Scope Management Practices are controlled. The interaction term (scope management practices * environmental factors) was added to Model 2 to give Model 3 which was found to be statistically significant. ($F(3, 133) = 5.24$, $p\text{-value} < 0.001$).

The R^2 significantly changed by 2.260% (Change in $R\text{-squared} = 0.02260$, $F(1, 133) = 3.36$, $p\text{-value} = 0.820$). The fitted model was;

Model 3: $Y = 4.435 + 0.342X_4 - 0.122M + 0.348X_4 * M$

The null hypothesis: Scope management Practices has no significant effect on the Technology Integration in Public High Schools in Kenya ($H02: \beta_3 = 0$) when environmental factors and interaction term are held constant was rejected. ($\beta_4 = 0.343$, $t = -3.27$, $p\text{-value} = 0.001$). This implies that one-unit increase in Scope Management Practices index leads to 0.343 increase in Technology integration index when environmental factors and interaction term are controlled.

Concerning the interaction term, the R^2 changed by a small margin of 2.260% and the change was not statistically significant (Change in $R\text{-squared} = 0.02260$, 0.000318 , $F(1, 133) = 3.36$, $p\text{-value} = 0.820$). Environmental factors variable has no significant effect on the Technology Integration in Public High Schools in Kenya ($H05: \beta_m = 0$) when Scope Management Practices and interaction term are held constant was rejected ($\beta_m = -0.122$, $t = -2.12$, $p\text{-value} = 0.036$). Therefore, one-unit rise in Environmental factors index leads to 0.122 decline in Technology integration index when Resource Management Practices interaction term are controlled.

The null hypothesis: Environmental factors index has no significant moderation effect on relationship between Scope Management Practices and Technology integration in Public High Schools in Kenya ($H06: \beta_{x_2m} = 0$) was rejected ($\beta_2 = -0.122$, $t = -2.12$, $p\text{-value} = 0.036$). This infers that one-unit increase in the interaction term leads to 0.122 decrease in Technology integration index when the other variables are controlled. See Figure

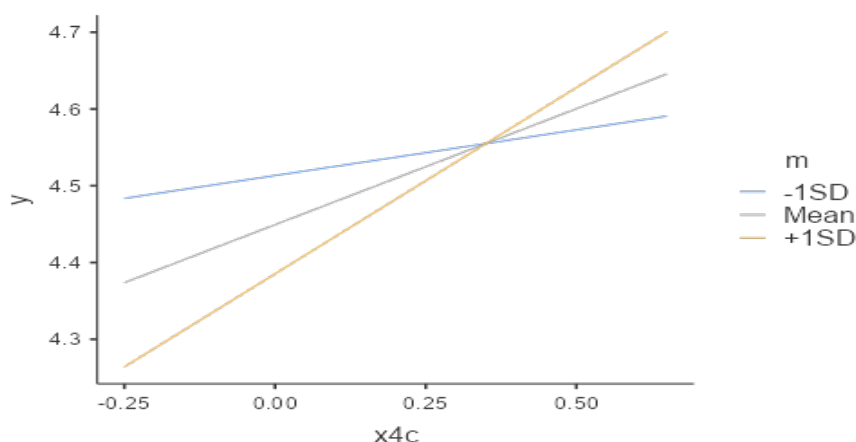


Figure 2: Moderating Effect on the relationship between Scope Management Practices on Technology Integration

Where x_4c = Scope management practices
 m = Moderation Variable

+1SD = Increase in moderation
 -1SD = Decrease in moderation term

y = Technology integration

The graph shows scope management practices' as the predictor variable (x-axis), technology integration as the outcome variable (y-axis), an environmental factor as the moderator, and an interaction term between scope management practices and the environmental factor. It displays two lines, one representing a high level of the environmental factor and the other representing a low level of the environmental factor. The slope of each line symbolizes the association between scope management practices and technology integration at diverse levels of the environmental factor.

The positive slope of both lines indicates that higher levels of scope management practices are associated with higher levels of technology integration. However, the slope of the line for the high level of the environmental factor is steeper than the slope of the line for the low level of the environmental factor, indicating that the effect of scope management practices on technology integration is stronger when the environmental factor is high. The interaction term between scope management practices and the environmental factor submits that the effect of scope management practices on technology integration is not consistent across all levels of the environmental factor. Instead, the impact of scope management practices on technology integration depends on the level of the environmental factor.

Overall, the graph suggests that the influence of scope management practices on technology integration is moderated by the environmental factor, and that the strength of this relationship depends on the level of the environmental factor. This highlights the significance of considering the role of environmental factors when executing scope management practices to progress technology integration.

7. Discussions on the Findings

The results suggested that executing effective scope management practices in public high schools in Kenya could positively impress the integration of technology. That, effective scope management practices are linked to technology integration in schools with supportive environmental features but may have a weaker or non-existent relationship in schools with less supportive environmental factors. It is therefore important for educational institutions to pay close attention to these environmental dynamics to effectively integrate technology into their scope management practices. Overall, the findings highlight the importance of considering environmental factors when implementing technology integration initiatives in educational institutions.

Effective grasp on scope management practices related to identification of requirement, roles and responsibilities as well as scope control did have an effect on technology integration. By having well-defined roles, everybody involved knows what is expected of them and can contribute effectively to the integration process. This clarity helps avoid confusion, duplication of efforts, and potential conflicts, ultimately leading to smoother technology integration.

When environmental factors are present, schools are more likely to successfully implement scope management practices that enhance technology integration as limited studies negate on this fact. The statistical significance of Model 2 indicates that there is a need for schools to consider environmental factors when planning and implementing Scope Management Practices and technology integration. The change in R-squared further shows that the inclusion of the environmental factors index variable improved the explanatory power of the model, making it more reliable for predicting future outcomes. It can be settled that environmental factors play a significant role in easing the integration of technology in schools. Other results where different Environmental Factors were considered showed that environmental factors such as classroom size, internet access, and availability of technical support significantly influenced teachers' integration of technology. Eddoumi, (2021). Therefore, it was worthwhile to invest in infrastructure, provide technical support and professional development, and ensure access to reliable internet services for successful technology integration in classrooms.

The positive moderation effect of environmental factors on the relationship between Scope management practices and technology integration goes hand in hand with findings in the studies by Ghaffari, (2020) and Fu, (2021) particularizing that environmental factors, such as infrastructure, funding, and administrative support, moderated the relationship between scope management practices and technology integration. Precisely, effective scope management practices were certainly connected with technology integration in schools with supportive environmental features, but had a weaker or non-existent relationship in schools with less supportive environmental factors.

In consensus with these findings is Ng'ang'a (2021) theorizing that stakeholder participation, government policies, and infrastructure considerably moderate the relationship between scope management practices and technology integration in Kenyan universities. The authors suggest that universities must pay thoughtfulness to these environmental dynamics to effectively integrate technology into their scope management practices. The discoveries of Al-Rawahi's (2018) survey submit in concurrence to this study's findings that the accessibility of technology assets and support from school management have a momentous positive influence on the association between scope management practices and technology integration in Omani schools. However, Heinrichs (2021) submitted that environmental factors may not always serve as effective moderators of this relationship indicating that stakeholder involvement was positively associated to the fruition of scope management practices and that it did not expressively moderate the association between these practices and technology integration. The study found that teacher technology integration was positively associated with supportive environmental factors such as administrative support, availability of resources, and access to professional development, but was negatively associated with barriers such as limited funding, time constraints, and inadequate infrastructure. These findings suggest the importance of creating an environment that supports teacher technology integration and highlights the significant role of environmental factors in the success of technology integration initiatives in education.

Conclusively, when environmental factors are present, schools are more likely to successfully implement scope management practices that enhance technology integration as limited studies negate on this fact. It can be inferred that environmental factors play an important role in facilitating the integration of technology in schools.

8. Recommendations

This study emphasizes the importance for schools to prioritize requirement identification, roles and responsibilities, and scope control in their efforts to integrate technology and enhance teaching and learning experiences. To achieve this, schools must first identify their specific technological needs, goals, and expectations, and ensure that the technology integration initiative is well-defined and aligned with their overall objectives. However, the lack of initial scope management plans in schools highlights the need for a project manager who can facilitate stakeholder engagement and apply necessary tools, skills, and techniques to ensure the expected outcomes are achieved.

8.1 Recommendations for Further Research

This research focuses on requirement identification, role and responsibility, and scope control as key constructs in project scope management practices in the context of technology integration in schools. However, further studies can explore other pertinent constructs and their impact on the relationship between technology integration and teaching and learning outcomes, either as moderators or independent variables. For instance, prevalence of work breakdown structure, scope verification, reporting, and acceptance are essential components worth exploring. Distinct emphasis on these constructs can provide valuable insights to support effective technology integration projects in school

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Conflict of Interest

This research paper does not comprise any conflicting interests. We followed ethical principles cautiously, took measures to prevent plagiarism, and made sure that we obtained informed consent in a dedicated manner.

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