

MODERATING EFFECT OF REGULATORY FRAMEWORK ON THE RELATIONSHIP BETWEEN INFORMATION COMMUNICATION TECHNOLOGY DYNAMICS AND PERFORMANCE OF E-GOVERNMENT SYSTEMS

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Abstract: Kenya has heavily spent considerably in e-government systems with the aim of ensuring an efficient, transparent and accessible public services for full realization of vision 2030. Nevertheless, the performance of e-government systems has always been facing several challenges. Therefore, the study evaluated the moderating role of regulatory framework on the relationship between ICT dynamics and e-government performance within the Ministry of Education. The Unified Theory of Acceptance and Use of Technology (UTAUT) was used to guide the study. A sum of 14 e-government systems used by the Ministry of Education were evaluated applying descriptive and explanatory research designs. The census approach comprised principal ICT officers, senior ICT officers, ICT officers 1 and 2, assistant ICT officers, and the individuals using e-government systems. A semi-structured questionnaire was used in gathering primary data, whereas quantitative data assessments included used of descriptive (mean and standard deviation) and inferential measurements (correlation and regression). The regulatory framework contributed to significant moderating effect on relationship between ICT Dynamics and performance of e-government systems. The study finds that regulations assist the Ministry of Education in evaluating the effects of electronic systems on educational outcomes and service provision. The study suggests that the Ministry establish a policy framework defining objectives, scope, and operational guidelines for e-government systems in education. This framework should incorporate the dynamism of data privacy measures, security protocols, and access controls.

Keywords: ICT Dynamics, Regulatory framework, Performance.

1. INTRODUCTION

Electronic governance, also called e-governance, encompasses utilizing contemporary IT resources, including computers, computer applications, and software, by governmental entities. The principal aim of e-governance is delivering users of these systems with high-quality services (Irgashevich, 2020). The effectiveness of electronic government systems is vital for governments to deliver high-quality services and is highly significant in realizing Vision 2030. Due in large part to their many advantages, several nations have effectively implemented electronic government (e-government) systems and built enough ICT infrastructure. The advantages include lower governance costs and corruption, more accountability and transparency, the removal of bureaucratic processes, fair information availability, and improved service delivery efficiency (Irgashevich, 2020).

The regulatory framework guides the implementation and direction of rules, policies, principles, or laws (Masharsky, 2014; Abdallah, 2015). In 2013, the ICT Act established the ICT Authority (ICTA) to oversee interconnections, regulate charges, and uphold practical standards for electronic communications equipment, ultimately enhancing online government service delivery. Legal Notice No. 183 of 2013 formalized the ICTA's role in modernizing and harmonizing government ICT management while advising officials on sectoral development, system implementation, and investment strategies (Giri & Shrestha, 2018). To design and evaluate electronic system performance of e-government systems, governments must consider user rights, regulations, and economic factors. This makes the regulatory framework crucial for overseeing ICT dynamics and e-government systems in the Ministry of Education (Glyptis et al., 2020). Cyber Security and Protection Act of 2016 enabled the government to secure tools, policies, security measures, and best practices, strengthening ICT infrastructure management and enhancing employee proficiency.

Statement of the Problem

Education is fundamental for a nation's improvement goals. Vision 2030's education structure purposes to raise Kenya to middle-income position (RoK, 2017). Identifying the gains of e-government, the Ministry of Education (MoE) is improving delivery of services to the public (Corbitt & Oyaro Gekara, 2019). Session Paper No. 1 of 2005 seeks for achieving universal education by 2015, concentrating on convenience, fairness, and value (MOEST, 2005). Kenya's National ICT Strategy purposes to advance e-government and delivery of services. Nevertheless, its execution within the ministry has confronted difficulties like technical matters, lack of enough capacity, digital disparities, and opposition to transformations. Management of these difficulties is critical for successful use of e-government schemes to attain the policy's aims within education. Even though the strategy intends to nurture economic progression and maintainable expansion over technology, numerous electronic government schemes within the Ministry of Education are facing diverse achievement in attaining their objectives (Ministry of ICT, 2019).

The NEMIS system handles student data and educational records, helps in selecting those joining form ones, and assigns resources to schools (MOE 2016). To employ and equip the teachers with the required ICT skills, the objective was to guarantee smoother changeover for other teachers and students through NEMIS system, arming them with expertise in accessing KICD Cloud materials. Nevertheless, the approach did not meet the expectations (Riany, 2021). It was projected that giving laptops and accessories could allow registration of learners using NEMIS and KNEC-ERS at schools rather than using cyber cafes. Regrettably, teachers could not have the capability of using digital learning devices for teaching, resulting to them being put away in storage, underlining the necessity for additional examination into the matter.

The Teachers' Service Commission TMIS portal permits teachers to record, apprise their particulars, and get resources online (Bulimo, 2021). Formerly, this was done in cybercafés. Kabuto (2019) indicates that public sector in Kenya fights with ICT performance owing to higher rate of failing e-government system, stimulating examinations of these infrastructures, ICT security, policy structures, and training conducted. The Ministry of Education (MoE) has introduced several e-government changes to enhance delivery of services within education, comprising NEMIS, SDL, Online Recording and Examination Structures, Development of digital contents, TMIS, SIMS, and EMIS. Still, the correlation between ICT dynamics and system efficiency still stands inconsistent (Riany & Goga, 2021).

Objective of the Study

To determine the moderating effect of the Regulatory framework on the relationship between ICT Dynamics and the performance of electronic government systems in the Ministry of Education in Kenya.

Research Hypothesis

H₀₁: The regulatory framework does not have a significant moderating effect on the relationship between Information Communication Technology Dynamics and the performance of electronic government systems in the Ministry of Education in Kenya

2. LITERATURE REVIEW

Theoretical Review

The main theory was Technology Organization Environment (TOE) Theory; Tornatzky and Fleischer (1990) TOE framework analyzed relationship between IT, organizations, and their environments. Their book, *The Processes of Technological Innovation*, offers a detailed outline of innovation, including user initiation, adoption, and implementation

in the organizational context. Tornatzky and Fleischer (1990) posit that a particular phase within this methodology represents a comprehensive process elucidating how the organizational context effects the reception and execution of novel concepts. Considering current corporate technologies is crucial during the adoption process as they establish a comprehensive framework for the extent and rate at which a firm can implement technological advancements (Nagy et al., 2014). The phenomenon of untapped innovations has a twofold effect on a firm's innovation. Firstly, it establishes the boundaries of what is feasible, thereby delineating the possibilities for advancement. Secondly, it demonstrates how technology can drive companies toward growth (Baker, 2012).

Empirical Review

ICT Dynamics, Regulatory Framework and Performance of E-government Systems

Mensah, Cater & Toleman (2017) did a study on electronic government systems in Kenya, and the insights were grounded on the policies of transparency and responsibility as per Kenyan Law. Consequently, a provision guarantees people the ability to obtain information that the government possesses. Zweeres and Planque (2017) found that the electronic communication and Transactions Act (2016) explains more about guidelines and protocols for electronic communications and businesses. The Act facilitates interactions and transactions through digital signatures, secured communications, digital payments, and personal information protection. In pursuing electronic government development, Rodgers (2018) delved into the profound significance of a propitious legal environment that is meticulously crafted through the implementation of appropriate legal reforms. The study discovered that for the e-government to succeed, it is imperative that the legal solutions implemented possess both the quality of being legally binding and the quality of being sound.

Makulilo and Boshe (2018) revealed that the Kenyan government, through its parliament, had places in motion a series of bills regarding the functioning of e-government systems. Within the legislative undertakings, a group of bills had arisen, each possessing profound allegations for the complex tapestry of societal reality. Kiboi (2018) says that the Cyber Security and Protection Act (2016) functions as a channel for the government to attain various instruments, guidelines, safety models, protections, and greatest practices. These resources are contributory in protecting the complex e-government systems, stimulating their rigidity against prospective threats. Albores (2020) clarified the central obstacles that obstruct the attainment of e-governance through the view of legal discourse.

3. RESEARCH METHODOLOGY

A positivist philosophy was embraced for this research study. The research adopted a combination of descriptive and explanatory research designs. The analysis unit was the 14 e-government systems of Ministry of Education, whereas observation was based on Principal ICTOs, Senior ICTOs, ICT officers, Assistant ICT officers, and system users. A census of 14 e-government systems was adopted. Primary data was obtained using semi-structured questionnaire, while quantitative examination employed descriptive and inferential statistics measurements like correlations and regressions.

The regression model is articulated mathematically by means of the following equation:

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon \dots\dots\dots (i)$$

Y = Performance of e-government system

β_0 = Point of intercept

X_1 = Regulatory Framework

β_1 = Coefficients

ε – Error term

Model for Moderating Effect

Baltagi (2005) is utilized to assess the moderating variable's influence, examining both independent and dependent variables. The focus was examining how regulatory framework determines the connection between ICT Dynamics and e-government efficiency within the Ministry of Education. A regression analysis was employed to evaluate moderation, since it involves regression of ICT Dynamics against the performance of the electronic government system, making it a useful method of evaluating moderation. As part of the study, the equation will be defined as follows:

$$Y = \beta_0 + \beta_1 \text{ICTD} + \beta_2 \text{RF} + \varepsilon \dots\dots\dots (ii)$$

$$Y = \beta_0 + \beta_1 \text{ICTD} + \beta_2 \text{RF} + \beta_3 \text{ICTD} * \text{RF} + \varepsilon \dots (iii)$$

Y = Performance of e-government system

β_0 = Point of intercept

ICTD = ICT Dynamics

RF - Regulatory framework

ICTD*RF = Interaction factor between ICT dynamics (predictor variable) and regulatory framework (moderator variable)

$\beta_1 - \beta_3$ = Coefficients

ε – Error term

Source: Author (2024).

Table 1: Decision making criteria for moderation

Parameter	Decision criteria	Interpretation
Beta coefficient (β)	Significant if $\beta \neq 0$	Indicates the strength and direction of the moderating effect
P-value	Significant if $p < 0.05$	Confirms the statistical significance of the moderating effect
Moderating effect	Significant if $p < 0.05$	β
Non-significant	$p \geq 0.05$ or	β

Decision-making criteria for moderation suggest that when coefficient β_1 is statistically significant, the moderating effect is statistically significant.

4. RESEARCH FINDING AND DISCUSSIONS

Descriptive Statistics

The study examined the role of the regulatory framework in shaping the relationship between ICT dynamics and electronic government system performance within Kenya's Ministry of Education. The respondents evaluated their agreement with several statements based on Likert scale, and Table 2 indicate a summary of findings, demonstrating mean values along with standard deviation scores.

Table 2: Regulatory Framework and Performance of E-government Systems

Statements	N	Mean (M)	Standard Deviation (SD)
Government has fostered a reasonable legitimate reason for carrying out a completely practical e-government.	277	4.56	0.649
A standard is in place to guide the purchase of ICT equipment and related accessories.	277	3.80	1.004
In the government, there are set procedures that are followed when managing equipment.	277	3.86	1.011
The strategies set up give protection and information security.	277	3.70	1.164
The strategy accommodates ICT access by approved people as it were.	277	4.58	0.576
The rule in the association gives lawful limitations on the use of ICT.	277	4.50	0.850
Those who break the rules for ICT use are subject to prosecution under the policy.	277	4.42	0.903
The management of electronic evidence in government is governed by policy and practice.	277	4.52	0.745
Aggregate mean and standard deviation score		4.24	0.863

The respondents confirmed the regulatory framework's function in moderating the link of ICT dynamics with e-government system performance within Kenya's Ministry of Education (M=4.24; SD=0.863). The strong agreement, specified by the

higher mean and lower deviation, underlines how a properly structured regulatory environment improves ICT implementation and service provision. These results line up with Makulilo and Boshe (2018), who witnessed that clear governing rules mitigate ICT adoption threats, nurture innovation, and guarantee accountability.

Testing for Moderating Variable

The study intended to evaluate the regulatory framework's impact on relationship between ICT dynamics and e-government system performance of Kenya's Ministry of Education. Tables 3 give an illustration of two regression models: firstly the regulatory framework is treated as predictor, whereas the second integrates it as moderator variable interacting with ICT dynamics to generate an interaction term.

Step One:

Table 3: Model Summary Table for Moderating Effect of Regulatory Framework

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.815 ^a	.664	.609	0.02694		
Model	Sum of Squares		Df	Mean Square	F	Sig.
1	Regression	300.645	2	150.323	208.754	0.002
	Residual	197.306	274	0.7201		
	Total	497.951	276			
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	
	B	Std. Error	Beta			
1	(Constant)	.691	.327		2.113	.003
	Regulatory framework	.793	.223	.0652	3.556	.002
	ICTdynamics	.803	.196	.0518	4.097	.001

The adjusted R value of 0.609 symbolizes a variation of 60.9% of performance due to effect of regulatory framework. The results based on significance level at 0.002 it is a confirmation the model was statistically significant, highlighting the regulatory framework was a significant factor in determining the performance of these systems. The results obtained indicate beta values for ICT dynamics and regulatory framework as 0.0518 and 0.0652 respectively with respective significance values at 0.001 and 0.002. This is an evidence that the two had positively and significantly affected the effectiveness of the e-government system.

Step Two:

Table 4: Model Summary Table Testing for Moderating Effect of Regulatory Framework

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.911 ^a	.829	.798	0.0063		
Model	Sum of Squares		Df	Mean Square	F	Sig.
1	Regression	296.264	2	148.132	196.731	0.003
	Residual	206.313	274	0.753		
	Total	502.577	276			
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	
	B	Std. Error	Beta			
1	(Constant)	0.597	0.297		2.010	0.004
	Regulatory framework	0.804	0.266	0.0652	3.023	0.003
	Regulatory framework *ICTdynamics	0.712	0.301	0.126	2.365	0.004

The result indicates a 0.798 as the value of adjusted R-squared which is an indication of significant share of the modification within performance of e-government systems was associated to regulatory framework. The ANOVA table has a significance value (0.003), ratifying model's significance in predicting performance of e-government systems and underlines the vital function of regulatory policies in improving the proficiency and effectiveness of electronic systems. This is evidenced by p-value of .004 which is less than 0.05, confirming that a statistical significant relationship. Thus, the null hypothesis was

rejected, confirming that the regulatory framework moderates the relationship between ICT dynamics and the performance of Kenya's Ministry of Education's electronic government systems. This aligns with Sassetti's (2019) perspective that a well-structured regulatory environment, in sync with ICT dynamics, can significantly boost e-government system efficiency. Thus, this proposes that policy interventions and developments within regulatory environment are greatly effective drivers for progressing ICT infrastructure and performance of e-government systems.

5. CONCLUSIONS

The ICT regulations supported the Ministry of Education in assessing the influence of electronic systems on educational outcomes and service delivery. Regular assessments assisted in the identification of obstacles and chances for growth, guaranteeing that e-government initiatives continue responsive to the evolving requirements of the education sector. The study also conclude that the regulatory framework statistically predicted the ICT dynamics. There was a quantifiable enhancement in ICT dynamics and performance of e-government systems with the presence of regulatory frameworks.

6. RECOMMENDATIONS

The study recommends that the Ministry ought to adopt a policy framework which effectively defines its objectives, scope, and operational procedures for e-government systems in education. The policymakers and stakeholders should prioritize the augmentation of the regulatory framework to additionally motivate ICT dynamics and optimize performance of e-government systems. The ministry should create and execute a stronger policy that offer clearer guidelines for ICT processes, guaranteeing a stable environment for technological development, distribute resources toward revolutionizing legal and institutional frameworks to keep stride with the ever fast growing ICT advancements and conduct frequent audits of the regulatory environment to make sure that it rests a driver of performance e-government systems.

REFERENCES

- [1] Abdallah, S., & Fan, I. S. (2012). Framework for e-government assessment in developing countries: case study from Sudan. *Electronic Government, an International Journal*, 9(2), 158. <https://doi.org/10.1504/eg.2012.046267/>
- [2] Dahiya, D. and Mathew, S. K. (2015). Effect of ict infrastructure capability on e-governance performance: proposing an analytical framework. *Advances in Intelligent Systems and Computing*, 603-610. https://doi.org/10.1007/978-3-319-13728-5_68/
- [3] Giri, D. S. (2018). Reform of Civil Service of Nepal with E-Government Practice. *Journal of Personnel Training Academy*.https://www.academia.edu/41880968/Reform_of_Civil_Service_of_Nepal_with_E_Government_Practice/
- [4] Kashorda, M., & Waema, T. (2014). Kenet e-readiness survey report 2013 citation e-readiness 2013 survey of Kenyan universities a study funded by the Kenya education network. https://www.kenet.or.ke/sites/default/files/E-readiness%202013%20Survey%20of%20Kenyan%20Universities_FINAL.pdf/
- [5] Moya, M., Nabafu, R., Maiga, D. G., & Mayoka, K. (2016). Attitude and Behavioral Intention as Mediators in Adoption of E-Tax Services in URA, Uganda. *Operations Research Society of Eastern Africa*, 6(1), 157–189. <https://orseajournal.udsm.ac.tz/index.php/orsea/article/view/49/>
- [6] Republic of Kenya. (2004). E-Government Strategy: The Strategic Framework, Administrative Structure, Training Requirements and Standardization Framework. Repository.kippra.or.ke. <https://repository.kippra.or.ke/xmlui/handle/123456789/1368/>
- [7] Riany, G., K., Were, S., Kihara, A. (2018). Influence of e-Government Strategy Implementation on the Performance of Public Service Delivery in Kenya. *International Journal of Strategic Management*. Vol. 7 (2) pp 32 – 49
- [8] Rogers, E. M. (2010). *Diffusion of Innovations*, 4th Edition. Free Press
- [9] Tarus, J. K., Gichoya, D., & Muumbo, A. (2015). Challenges of implementing e-learning in Kenya: A case of Kenyan public universities. *The international review of research in open and distributed learning*, 16(1).
- [10] Twizeyimana, J. D., Larsson, H., & Grönlund, Å. (2018). E-government in Rwanda: Implementation, challenges and reflections. *Electronic Journal of e-Government*, 16(1), pp19-31
- [11] Williams, M. D., Rana, N. P., & Dwivedi, Y. K. (2015). The unified theory of acceptance and use of technology (UTAUT): a literature review. *Journal of enterprise information management*, 28(3), 443-488.