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Arimbi J. Murori, Daniel Otanga & Jasper M. Ondulo
Masinde Muliro University of Science and Technology, Kenya

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Abstract
The core problem this research addresses is the puzzling underperformance of Mobile Virtual Network Operators (MVNOs) in Kenya. Despite a thriving mobile industry and an increase in the number of registered MVNOs, their collective market share has paradoxically declined from 4% to about 2% over the past decade. To investigate this, the study employed a robust statistical method known as Structural Equation Modelling and Confirmatory Factor Analysis (SEM-CFA) to pinpoint the key factors driving or hindering MVNO growth. The key findings revealed a clear divide: factors such as public perception, MVNO-specific strategies, and collaborative value chains positively influence growth, while barriers created by established Mobile Network Operators (MNOs) and regulatory limitations from Government Agencies hold it back. Crucially, the discussion highlights that the sector's poor performance is primarily due to factors unique to the Kenyan market. In conclusion, this research provides a practical framework for launching and developing MVNOs by identifying these specific influences. The main recommendation is that for the Kenyan MVNO sector to thrive, stakeholders must directly address the 44% of growth factors that are unique to the local context, as solving these specific issues is the key to alleviating the sector's long-standing problems.

Introduction

The advent of 5G Fixed Wireless Access (FWA) networks presents a transformative opportunity for niche markets in rural and remote areas, offering a viable alternative to fibre optic technology (Smith, 2020). Within this evolving technological landscape, the Mobile Virtual Network Operator (MVNO) model has gained global acceptance, operating in a highly competitive market with over 300 commercial 5G networks and 1.5 million 5G connections projected globally by 2024 (GSMA Intelligence, 2023). The global MVNO market is, however, markedly uneven. Europe boasts the largest MVNO market, followed by North America, while the Asia-Pacific region, with prominent markets in Hong Kong and Singapore, achieving market shares of 10% to 50%, ranks third (Chen, 2022). In stark contrast, Africa's MVNO market share remains below 1%, a marginal figure despite the continent's vibrant and growing mobile industry (Abebe, 2021).

This disparity highlights the significant challenges MVNOs face in establishing a foothold in developing economies. Research suggests that the success of MVNOs is heavily influenced by a complex interplay of regulatory frameworks, market competition, and strategic positioning (Johnson, 2019). In many African nations, MVNOs struggle with stringent regulations, high wholesale costs

imposed by incumbent Mobile Network Operators (MNOs), and limited access to essential infrastructure (Moyo & Adebayo, 2020). Despite these hurdles, there have been successful MVNO launches in countries such as Kenya, Senegal, Cameroon, South Africa, Madagascar, and Nigeria (Abebe, 2021). Kenya presents a particularly interesting case study. The country is a regional leader in mobile connectivity and a global pioneer in mobile financial services (MFS), with its mobile money ecosystem profoundly impacting both the formal financial sector and previously unbanked populations (Odhiambo & Njoroge, 2018). This success story, however, has not extended to the MVNO sector. The Kenyan MVNO market is embryonic and underperforming. Of the nine registered MVNOs, only two are operational and known to the public, with the status of the others remaining uncertain (Communications Authority of Kenya, 2023). Paradoxically, the sector's market share has declined from 4% to about 2% over the past decade, even as the number of registered entities increased. This study, therefore, seeks to investigate this paradox by identifying and analysing the key factors influencing MVNO growth in Kenya. While previous studies have explored MVNO challenges in other contexts, there is a scarcity of empirical research focusing on the unique market dynamics of Kenya. This paper aims to fill this gap by employing a Structural Equation Modelling (SEM) and Confirmatory Factor Analysis (CFA) approach to develop and test a comprehensive model of MVNO growth determinants. The subsequent sections present the methodology and derivation of study factors, the evaluation and analysis of the identified factors, a discussion of the findings, and the conclusions drawn from the research.

Literature Review

The global discourse on MVNOs extensively documents their role in enhancing market competition and innovation, particularly within mature telecommunications markets in Europe and North America, where supportive regulations and competitive wholesale markets have spurred their success (Chen, 2022; Johnson, 2019). In contrast, the African MVNO landscape is characterised by significant potential stifled by formidable barriers. Scholars attribute this underperformance to a triad of challenges: stringent regulatory environments, the market dominance of incumbent MNOs who control essential infrastructure, and the high wholesale costs they impose (Moyo & Adebayo, 2020; Abebe, 2021). Kenya presents a compelling paradox within this African context. Despite being a celebrated pioneer in mobile financial services and having a vibrant mobile sector (Odhiambo & Njoroge, 2018), its MVNO market has consistently underperformed, with market share declining even as registrations increase (Communications Authority of Kenya, 2023). While existing research provides a high-level understanding of pan-African challenges, there is a critical scarcity of empirical, context-specific studies that dissect the unique operational, regulatory, and consumer-centric factors at play in Kenya. This gap is significant, as the factors influencing MVNO growth in developed markets or even other African nations may not directly translate to the unique socio-economic and regulatory fabric of Kenya. Therefore, this study seeks to address this gap by moving beyond generic challenges to develop and empirically test a comprehensive model that identifies the specific, measurable factors—including the mediating role of value chains—that determine MVNO success or failure in the Kenyan market.

Methodology and Study Factors

Research Design and Setting

This study adopted an explanatory sequential mixed-methods design, conducted in Nairobi and its surrounding areas. The setting was strategically selected to capture a diverse socio-economic and infrastructural context by including one urban (Starehe constituency), one semi-urban (Kasarani Sub County), and one rural area (Ruiru Sub County).

Population, Sampling Strategy, and Sample Size Determination

Respondent Categories

The study targeted four distinct respondent categories to obtain a holistic view of the MVNO ecosystem: General Public: The end-users and potential customers, whose awareness and adoption are ultimate indicators of MVNO success; Mobile Network Operators (MNOs): The incumbent infrastructure owners who provide wholesale access to MVNOs; MVNOs: The focal point of the study, including both operational and non-operational entities; and Government Agencies: The regulators and policymakers who shape the market's regulatory framework.

Sampling Techniques and Justification

A mixed-methods sampling approach was employed, tailored to the characteristics of each group. Cluster Sampling for the General Public: Procedure: The three geographical sub-counties (Starehe, Kasarani, Ruiru) were treated as natural clusters. Within each cluster, a random sample of the general public was selected. This made the logistically challenging task of surveying a dispersed population feasible and cost-effective.

Limitations: This method can introduce cluster sampling error, where the characteristics of individuals within a cluster may be more similar to each other than to the wider population (e.g., Ruiru's rural population might share traits distinct from Starehe's urban populace), potentially reducing the precision of the estimates compared to simple random sampling. Purposive Sampling for MNOs, MVNOs, and Government Agencies: Procedure: This non-probability technique was used to select participants based on their specific expertise and direct involvement in the MVNO sector. All known and accessible entities within these categories in Kenya were targeted. For MNOs and Government Agencies, this meant targeting senior managers in relevant departments. For MVNOs, it included founders, CEOs, or technical managers.

Limitations: The primary limitation is the potential for selection bias, as the sample may not be fully representative of all possible viewpoints. The results are more illustrative of the experiences of the specific, knowledgeable individuals who were accessible, rather than being statistically generalisable to a broader population of such entities.

Sample Size Calculation and Distribution

The target sample size of 350 respondents was determined based on the requirements for conducting Structural Equation Modelling (SEM). A common rule of thumb in SEM is to have a sample size of at least 10-20 observations per estimated parameter. With a complex model involving 32 measured variables, a target of 350 was deemed appropriate to ensure statistical power and model stability. The distribution across the four categories was as follows: General Public: ~300 (Using cluster sampling across the three sub-counties). MNOs: ~20 (Targeting senior managers from the main incumbent operators). MVNOs: ~20 (Targeting executives from all nine registered MVNOs). Government Agencies: ~10 (Targeting officials from regulatory bodies like the Communications Authority of Kenya). The final confirmed sample was 145 respondents, yielding a 44.43% response rate. This rate is acceptable for survey-based research, especially when involving hard-to-reach expert populations like MNO and MVNO executives. The final distribution reflected the challenges of accessing some groups, with the General Public likely forming the bulk of the 145 respondents.

Data Collection Instruments and Procedures

Three primary instruments were used: Questionnaires, administered to the General Public to gather quantitative data on awareness, perception, and the measured variables listed in Table 1 (e.g., GPAF1, MVNOP1). Structured Interviews: Conducted with representatives from MNOs, MVNOs, and

Government Agencies to collect in-depth qualitative data on challenges, strategies, and regulatory perspectives. Observation: Used to corroborate interview data and assess the operational reality of MVNO services in the selected areas.

Data Analysis

Qualitative Data: Thematic and content analysis were used for interview and observational data. Quantitative Data: Data from all sources were merged, coded, and compiled into a single dataset. IBM SPSS v21 was used for descriptive and inferential statistics. The primary analysis used: Covariance-Based SEM (CB-SEM): To test the hypothesised relationships between variables and Confirmatory Factor Analysis (CFA) in AMOS: To validate the measurement model, assess reliability, validity, and model fit.

Ethical Considerations

The study adhered to standard ethical protocols. All participants were fully informed about the study's purpose and provided verbal or written consent; thus, addressing Informed Consent. Further, the identities of all respondents, especially from organisations, were kept confidential. Data was aggregated to prevent the identification of individuals or specific companies; this therefore addressed Anonymity and Confidentiality. Participants were also informed that their involvement was voluntary and that they could withdraw at any time without penalty, thus addressing Voluntary Participation. A summary of study quality factors is shown in Table 1.

Table 1: Summary of study quality factors

	Quality factors
	Exogenous Quality factors
General Public Awareness Factors (GPAFS)	*GPAF1- Awareness of the existence of MVNOs GPAF2 - Awareness of the difference MNO/MVNO *GPAF3- Awareness of MVNOs role in Kenyan market *GPAF4- Awareness of services offered by MVNOs
MNO Sourced Barrier Factors (MNOBFS)	MNOBF1 - Technology Deployment *MNOBF2 - Regulation enforcement *MNOBF3 - Government political will to legislate *MNOBF4 - Sociocultural factors
MVNO-Sourced Limiting Factors (MVNOLFS)	*MVNOLF1 - Inadequate Regulatory Framework *MVNOLF2 - Inadequate MNO network infrastructure MVNOLF3 – MNO Commercial Terms MVNOLF4 - MNO anticompetitive behaviour MVNOLF5 - Untimely policy guidelines
Government Agencies Sourced Limiting Factors (GALFS)	*GALF1 - Lack of Clear Business Strategy *GALF2 - MNO influence and dominance *GALF3 - Geographical region GALF4 - ARPU GALF5 - Challenges of existing MNO GALF6 - CAPEX/OPEX
	Endogenous Quality Factors
MVNO Performance Factors (MVNOPFS)	MVNOP1 – Market share MVNOP2 – Innovative Services MVNOP3 – Niche Markets MVNOP4 – Underserved/untapped markets MVNOP5 – QoE MVNOP6 – Tier of MVNO
	Mediator Quality Factors
Stakeholders Value Chain Factors (SVCFS) & Development Phases Value Chain Factors (DVCFS)	SVCF1 – Good working relations SVCF2 – Level playing ground SVCF3 – Adoption of new technology DVCF1- Managerial skills DVCF2- Technical skills DVCF3 - Content /Service Dev skills DVCF4 - Marketing skills

CFA and SEM Estimates Measurement Models

The CFA estimates measurement model assumed 3-forms associated with the parameters of model modification: unmodified model (Unmodified), modification index modified model (MI modified), and deletion of terms modified model (DoT modified). An unmodified model is not influenced by any modification parameters. MI modified model covaried pairs of error terms with the highest modification index within a construct. MI values of (15-30) were typical for a significant change in the model fit indices (Kline, 2015). The DoT modified model deleted factors with regression weights of < 0.5 from the model.

Results

The unmodified CFA estimates measurement model posted the best model fit indices compared to MI and DoT modified models. The unmodified CFA estimates measurement model diagram is given in Fig 1, while the model fit indices, and model parameters, are shown in Table 2-column 3, and Table 3, respectively

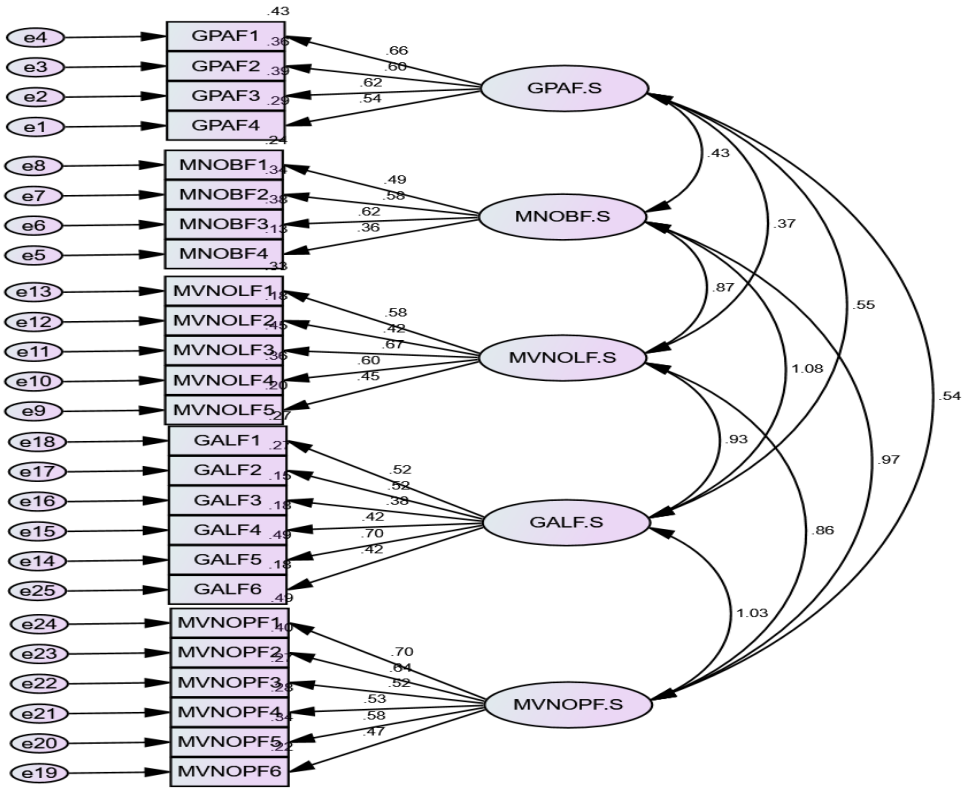

Figure 1: Unmodified CFA estimates measurement model

Table 2: Unmodified CFA and, SEM model fit indices results

Fit Index	Expected N=145	CFA model Measured Value	SEM model measured values	Remarks
Chi-Square	X^2=.05 confidence 1 - 3	326.514/145 1.232	326.514/145 1.232	Passed
SRMR	<0.08	0.062	0.062	Passed
GFI	>0.90	0.836	0.836	Acceptable
AGFI	>0.90	0.799	0.799	Acceptable
NFI	<0.90	0.719	0.719	Passed
TLI	>0.90	0.919	0.919	Passed
CFI	>0.90	0.929	0.929	Passed
RSMEA	>0.08	0.040	0.040	Passed
	CFI is a revised form of NFI and TLI & NFI are interchangeable [13]			

Table 3: Unmodified CFA estimates measurement model parameter results

Factors		**Constructs**	**Estimate**	**S.E.**	**C.V.**	**P**	**Hypo**
MNOBF4	<---	MNOBF.S	1.000				
MNOBF3	<---	MNOBF.S	1.764	.443	3.980	***	Passed
MNOBF2	<---	MNOBF.S	1.705	.437	3.899	***	Passed
MNOBF1	<---	MNOBF.S	1.325	.369	3.588	***	Passed
MVNOLF5	<---	MVNOLF.S	1.000				
MVNOLF4	<---	MVNOLF.S	1.321	.290	4.555	***	Passed
MVNOLF3	<---	MVNOLF.S	1.464	.305	4.792	***	Passed
MVNOLF2	<---	MVNOLF.S	.824	.231	3.568	***	Passed
MVNOLF1	<---	MVNOLF.S	1.082	.242	4.473	***	Passed
GALF6	<---	GALF.S	1.000				
GALF5	<---	GALF.S	1.557	.315	4.948	***	Passed
GALF4	<---	GALF.S	.835	.222	3.768	***	Passed
GALF3	<---	GALF.S	.594	.164	3.627	***	Passed
GALF2	<---	GALF.S	1.237	.285	4.336	***	Passed
	<---	GALF.S	1.121	.256	4.379	***	Passed
GPAF4	<---	GPAF.S	1.000				
GPAF3	<---	GPAF.S	1.390	.292	4.760	***	Passed
GPAF2	<---	GPAF.S	1.184	.254	4.654	***	Passed
GPAF1	<---	GPAF.S	1.218	.250	4.864	***	Passed
MVNOPF6	<---	MVNOPF.S	1.000				
MVNOPF5	<---	MVNOPF.S	1.054	.218	4.823	***	Passed
MVNOPF4	<---	MVNOPF.S	.980	.212	4.614	***	Passed
MVNOPF3	<---	MVNOPF.S	.903	.200	4.510	***	Passed
MVNOPF2	<---	MVNOPF.S	1.083	.214	5.069	***	Passed
MVNOPF1	<---	MVNOPF.S	.975	.184	5.290	***	Passed

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The unmodified CFA model was extended to create the standardised SEM structural estimates measurement model. The SEM model replicated the CFA model parameters values, and model fit indices, a sign of validation of the CFA model. This is because, the characteristics of CFA measurement model used was unmodified. The standardised SEM structural estimates measurement model diagram is given in Fig.2, while the standardised SEM structural model fit indices, and model result parameters is a replica of the CFA model shown in Table 2-column 4, and Table 3 respectively.

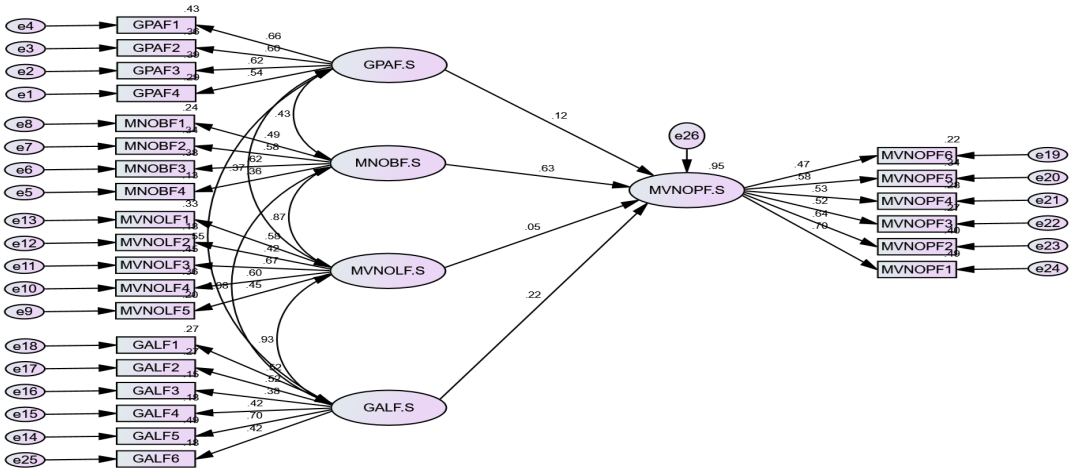

Figure 2: Standardised SEM structural estimates measurement model

The CFA and SEM estimate measurement models produced identical model parameter results in: model fit indices, reliability, validity and hypotheses. Expected threshold values for model fit indices are provided in Table 2 (Kline, 2015), while threshold values for reliability and validity parameters are: Construct Reliability (CR) > 0.6, Composite Reliability (CoR) >0.60), Construct Validity (CV)- acceptable model fit indices, Convergent Validity (CoV) - all terms in the model are statistically significant, Discriminant Validity (DV) - the model is free from redundant terms (Hair et al., 2019). The CFA and SEM estimate measurement models gave the best model fit indices without modification, a sign of strong relationships between the variables and their respective factors. The model fit indices are shown in Table 2: Chi-Square=2.32, SRMR=0.062, GFI=0.836, AGFI=0.799, NFI=0.719, TLI=0.919, CFI=0.929, and RMSEA=0.040. It is noted that Chi-Square, SRMR, TLI, CFI, and RMSEA meet their respective thresholds. CFI is a revised version of NFI. They are exchangeable; therefore, NFI meets its threshold (Kline, 2015). AGFI is an adjusted version of GFI, and the two are exchangeable. The indices are slightly below their thresholds (0.799 and 0.836), respectively, but acceptable. The constructs of the CFA model are therefore uniquely different from one another as well as the indicators representing them, an indication of no redundant terms in the model, and a sign of parameter validation of model Construct Validity (CV) and Discriminant Validity (DV) (Hair et al., 2019). Secondly, all terms in the model are statistically significant (Chi-Sq. <0.05), a validation of model convergent Validity (CoV). Both Construct Reliability (CR) and Composite Reliability (CoR) met their Cronbach Alpha threshold values of (>0.6), an indication that factors of latent variables are internally consistent and measure the true value, as well as the extent to which a set of latent variable factors are shared in the measurement. The parameters are therefore fit to represent the CFA and SEM measurement models. A summary of the model reliability and validity results is shown in Table 4.

Table 4: Summary of reliability and validity test results

Factors	Constructs	Estim	Chi-Sq	AVE	CR	CoR	CV	CoV	DV
GPAF4	<--- GPAF.S	.542	***	.607	.727	.821	Acceptable Model Fit Indices	Terms in the model statistically significant (Chi-sq <0.05)	No redundant items in model Correlation of each pair of Exogenous Construct should be <0.85 The diagonal value (√AVE) of constructs should be higher in rows and columns
GPAF3	<--- GPAF.S	.624	***						
GPAF2	<--- GPAF.S	.597	***						
GPAF1	<--- GPAF.S	.658	***						
MNOBF4	<--- MNOBF.S	.359	***	.479	.616				
MNOBF3	<--- MNOBF.S	.620	***						
MNOBF2	<--- MNOBF.S	.582	***						
MNOBF1	<--- MNOBF.S	.493	***						
MVNOLF5	<--- MVNOLF.S	.452	***	.488	.677				
MVNOLF4	<--- MVNOLF.S	.597	***						
MVNOLF3	<--- MVNOLF.S	670	***						
MVNOLF2	<--- MVNOLF.S	.423	***						
MVNOLF1	<--- MVNOLF.S	.578	***						
GALF6	<--- GALF.S	.421	***	.504	.690				
GALF5	<--- GALF.S	.697	***						
GALF4	<--- GALF.S	.421	***						
GALF3	<--- GALF.S	383	***						
GALF2	<--- GALF.S	.519	***						
GALF1	<--- GALF.S	519	***						
MVNOPF6	<--- MVNOPF.S	.468	***	.578	.737	.737			
MVNOPF5	<--- MVNOPF.S	.581	***						
MVNOPF4	<--- MVNOPF.S	.533	***						
MVNOPF3	<--- MVNOPF.S	.516	***						
MVNOPF2	<--- MVNOPF.S	.636	***						
MVNOPF1	<--- MVNOPF.S	.700	***						

CR-Construct Reliability (≥0.6)
CoR -Composite Reliability (≥0.6)
AVE –Average Variance Extracted (≥0.5)
CV – Construct Validity (Fitness indices for a construct achieved)
CoV- Convergent Validity (All terms in the model statistically significant (Chi- Sq <0.05)
DV – Discriminant Validity (Model free from redundant terms)
Measurement model validation – Fitness indices for the constructs achieved or Items in the measurement model statistically significant (Chi- Sq <0.05)

The SEM structural estimates model related the Exogenous and Endogenous variables and their factors. The model tested the statistical significance of the stated hypotheses on the measurement model. In essence, it validated the results of the CFA model and the stated study hypotheses of Table 1. The critical value (C.V. >2), and statistical significance value (p) <0.05 for the four direct constructs and 25 indirect factors were met and established as shown in Table 5a, and Table 5b respectively.

Table 5a: Covariance estimation method direct hypotheses results

Constructs			Esti	S.E.	C.V.	P	Label	Hypo
MNOBF.S	<->	MVNOPF.S	.176	.050	3.520	***	par_24	Support
MVNOLF.S	<->	MVNOPF.S	.228	.062	3.688	***	par_27	Support
GALF.S	<->	MVNOPF.S	.228	.061	3.710	***	par_29	Support
GPAF.S	<->	MVNOPF.S	.094	.029	3.292	***	par_30	Support

S.E: Standard Error
C..V: Critical Value (>2)
P: Statistical significance (P-value < 0.05)

Table 5b: SEM structural measurement model indirect hypotheses results

Factors		Constructs	Estimate	S.E.	C.V.	P	Hypo
MNOBF4	<---	MNOBF.S	1.000				
MNOBF3	<---	MNOBF.S	1.764	.443	3.980	***	Passed
MNOBF2	<---	MNOBF.S	1.705	.437	3.899	***	Passed
MNOBF1	<---	MNOBF.S	1.325	.369	3.588	***	Passed
MVNOLF5	<---	MVNOLF.S	1.000				
MVNOLF4	<---	MVNOLF.S	1.321	.290	4.555	***	Passed
MVNOLF3	<---	MVNOLF.S	1.464	.305	4.792	***	Passed
MVNOLF2	<---	MVNOLF.S	.824	.231	3.568	***	Passed
MVNOLF1	<---	MVNOLF.S	1.082	.242	4.473	***	Passed
GALF6	<---	GALF.S	1.000				
GALF5	<---	GALF.S	1.557	.315	4.948	***	Passed
GALF4	<---	GALF.S	.835	.222	3.768	***	Passed
GALF3	<---	GALF.S	.594	.164	3.627	***	Passed
GALF2	<---	GALF.S	1.237	.285	4.336	***	Passed
GALF1	<---	GALF.S	1.121	.256	4.379	***	Passed
GPAF4	<---	GPAF.S	1.000				
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GPAF1	<---	GPAF.S	1.218	.250	4.864	***	Passed
MVNOPF6	<---	MVNOPF.S	1.000				
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MVNOPF4	<---	MVNOPF.S	.980	.212	4.614	***	Passed
MVNOPF3	<---	MVNOPF.S	.903	.200	4.510	***	Passed
MVNOPF2	<---	MVNOPF.S	1.083	.214	5.069	***	Passed
MVNOPF1	<---	MVNOPF.S	.975	.184	5.290	***	Passed

Out of eight mediator hypotheses, four were supported and four rejected. Stakeholders Value Chain Factors (SVCFS) and Development Phases value chain factors (DVCFS) had a significant mediation effect on General public awareness factors (GPAFS) and MVNO limiting factors (MVNOLFS) with respect to MVNO performance factors (MVNOPFS); but recorded an insignificant effect on MNO barrier factors (MNOBFS), and Government Agency limiting factors (GALFS). The mediation effect is complementary, and partial/high-partial for both mediators. Comparatively, the Stakeholders Value Chain factors (SVCFS) contribute more to the indirect effect (0.537) than the Development Phases Value Chain

factors (DVCFS) (0.385). However, the total mediation effect is comparable for both mediators. It can be concluded that General Public awareness factors and MVNO limiting factors are the prime movers of MVNO growth, while MNO barrier factors and Government Agencies limiting factors hinder MVNO growth. SVCFS hypotheses, and (DVCFS) hypotheses test results are shown in Table 6a and Table 6b, respectively.

Table 6a: Mediator 1-Stakeholders value chain factors (SVCFS) hypothesis test results

H_6	Construct Relationship	Total Effect	Direct effect	Indirect effect	Bootstrap confidence	Interval *PC/BC	p-value	Mediation type
					L/bound	U/bound		
H_{61}	GPAFS -> SVCFS ->MVNOPFS	0.744	0.333	0.410	0.121	1.075	0.037	Partial
H_{62}	MNOBFS->SVCFS->MVNOPFS	1.477	1.575	-0.099	-1.775	0.366	0.706	No
H_{63}	MVNOLFS->SVCFS>MVNOPFS	0.729	0.601	0.127	0.041	0.223	0.011	High/partial
H_{64}	GALFS -> SVCFS ->MVNOPFS	1.185	1.223	-0.038	-0.905	0.221	0.787	No

**PC – Percentile confidence level (95%)*

Table 6b: Mediator 2 -Development phases value chain factors (DVCFS) hypothesis test results

H_6	Construct Relationship	Total Effect	Direct effect	Indirect effect	Bootstrap Confidence	Interval *PC/BC	p-value	Mediation type
					L/bound	U/bound		
H_{65}	MNOBFS->DVCFS->MVNOPFS	1.432	1.393	0.039	-0.415	0.248	0.860	No
H_{66}	MVNOLFS-> DVCFS >MVNOPFS	0.742	0.636	0.106	0.030	0.179	0.038	High/partial
H_{67}	GALFS -> DVCFS ->MVNOPFS	1.184	1.211	-0.027	-0.274	0.099	0.722	No
H_{68}	GPAFS -> VCFS ->MVNOPFS	0.737	0.458	0.279	0.108	0.682	0.020	Partial

**PC – Percentile confidence level (95%)*

Discussion

This study sought to unravel the paradox of Kenya's underperforming MVNO sector by empirically testing a comprehensive model of growth determinants. The results confirm a complex, dualistic landscape of drivers and barriers, with value chains mediating and offering a critical pathway for intervention.

Interpretation of Key Findings

The validation of the unmodified CFA and SEM models indicates that the hypothesised 32-factor structure across seven constructs is a robust representation of the Kenyan MVNO ecosystem. The finding that General Public Awareness (GPAFS) is a significant positive driver aligns with classic marketing theory, suggesting that market penetration remains low because potential customers are simply unaware of MVNOs or their value proposition. This is further amplified by the strong mediating effect of Stakeholder Value Chain Factors (SVCFS), implying that awareness campaigns are most effective when coupled with collaborative partnerships across the sector. Conversely, the strong negative influence of MNO-sourced Barrier Factors (MNOBFS) and Government Agencies-sourced

Limiting Factors (GALFS) confirms the critical role of the operational and regulatory environment. The data suggests that incumbent MNOs may engage in anticompetitive behaviour, such as imposing high wholesale costs or providing inferior network access, thereby stifling MVNO viability. Similarly, regulatory uncertainty and a lack of clear, supportive policy from government agencies create an unstable foundation for investment and growth. The fact that mediator variables had no significant effect on these barriers is particularly telling; it indicates that these are "hard" structural impediments that cannot be softened merely by better skills or stakeholder relations, but require direct regulatory and policy intervention.

Comparison with Prior Studies

The findings both corroborate and extend existing literature. The challenges posed by MNO barriers and regulatory hurdles are consistent with studies across Africa, such as those by Moyo & Adebayo (2020), who identified similar structural impediments in other Sub-Saharan contexts. Similarly, Johnson's (2019) assertion that MVNO success hinges on a complex interplay of regulation, competition, and strategy is strongly supported by our model. However, this study makes a distinct contribution by quantifying the uniquely local nature of these challenges. The replication of 56% of factors from global studies confirms that specific MVNO challenges are universal. Yet, identifying 44% of factors as unique to Kenya—such as specific "sociocultural factors" under MNO barriers and "geographical region" under government limitations—underscores a critical gap in the literature. It demonstrates that models from Europe or Asia-Pacific cannot be directly transplanted; the Kenyan market, with its unique pioneer status in mobile money yet laggard status in MVNOs, possesses a distinct dynamic that demands localised analysis and tailored strategies.

Conclusion

This study successfully delineates the core determinants of MVNO growth within the unique context of the Kenyan market, yielding an actionable framework for sectoral revitalisation. The analysis confirms that growth is propelled by a complex interplay of five distinct categories of factors. Significantly, General Public Awareness Factors, MVNO-sourced Limiting Factors, and the critical Mediator Factors (Stakeholder and Development Value Chains) emerge as the primary catalysts for growth. On the other hand, the development of the MVNO sector is critically hampered by MNO-sourced Barrier Factors and Government Agencies-sourced Limiting Factors. A pivotal finding is that 44% of the identified influential factors are unique to Kenya, underscoring the necessity for tailored, localised strategies rather than the direct application of international models. These context-specific factors, highlighted in Table 1, represent the most pressing levers for intervention. This research makes a substantial contribution both theoretically, by empirically validating a comprehensive model of MVNO growth and, more importantly, by uncovering a significant proportion of factors specific to a developing economy like Kenya's; and in a practical context for policymakers and industry stakeholders, these findings provide a clear strategic roadmap. To reverse the sector's underperformance, targeted efforts must focus on mitigating the identified barriers while simultaneously amplifying the positive drivers. Prioritising the resolution of the unique Kenyan factors is not just recommended but essential to unlocking the latent potential of the MVNO sector and fostering greater competition, innovation, and digital inclusion in the Kenyan telecommunications landscape.

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Appendix A: Thematic Framework for MVNO Sector in Kenya –June 2025

Research Question	Themes	Codes (Sub Themes)
What are the available MVNO differentiated services, market segments and their level of utilization? (Data Source: Interviews, Observations & content analysis)	a) General outlook of MVNO sector in Kenya	1. 9-registered MVNOs. 2. 2-MVNOs active, and operational. 3. 3-MVNOs deregistered. 4. 4-MVNOs active but not in the public domain. 5. 2 –MVNOs pending applications. 6. 3-MVNOs unsuccessful applications. 7. MVNO sector embryonic. 8. No regulatory framework for MVNOs (Licensed application under MNO). 9. MVNO competing on the same services, and market segments with MNO/Banks, & Financial institutions. 10. Low business and low market share but sector promising.
	b) Status of MVNOs in Kenya	1. Equitel and Jambopay operational. 2. Equitel, 1st 5G MVNO in Africa. 3. Zioncell, Sema, and Tangaza MVNOs deregistered. 4. Not much is known about Homeland Kenya, sycamobile, Eferio Kenya, and Jambo Telecom but active in the CA register. 5. Eferio Kenya Ltd is first Kenya's proposed MVNE, active but not in public domain. 6. Infura Ltd, and Hidiga Investment are pending applications. 7. Kenya Airways, Nakumatt, and Cooperative Bank - unsuccessful applications. 8. Jamii Telecom (Faiba) started as MVNO but later upgraded to MNO (declined our interview). 9. Telkom Kenya – compliance issues. 10. Safaricom, Airtel, and Equitel are 5G compliant 11. MNO industry generally vibrant
	c) Available Market segments, and Differentiated services	1. Financial Market segment • Mobile Money transfer services • Mobile banking services • Agency banking services • Merchant- pay bill/till/Wallet services 2. Retail market segment • Electronic airtime and data vending 3. Business (Enterprise) market segment • Customized services to organizations • SACCO services • Chama services • Boda -Boda sector services 4. International market segment • Data roaming services for travelers • Bundled services for travelers (data/voice /SMS) 5. Telecom market Segment • Broadband data plans • Voice services • Messaging services 6. Lifestyle Market segment • Healthy living

		• Entrepreneurship • Education and learning 7. Prepay/Post-pay market segment • Prepay auto top-ups • Post-pay bundled services 8. Niche market segment • Mass Approval Services (MAS) • M2M • Eazzy Pay/Loans • Unbanked rural population
	d) Untapped, and underserved market segments	1. Kenya MVNO market is relatively untapped and underserved especially in rural areas. There is a wide range of niche markets and market segments to explore and exploit 2. There are great opportunities for innovative products and value addition services to create.
	e) Level of utilisation of services and market segments	1. Utilisation of services in the financial market segment, and retail market segment good but poor in the other market segments
	f) MVNO constraints	1. MVNO has no regulatory framework of its own 2. Framework formulation only out of need dictated by the regulator (CA) 3. MVNO Inappropriate regulatory frameworks • The Unified Regulatory framework (ULF-2016) • The National Payment Systems (NPS) Regulations 2017 • The National Payment Systems (NPS) Regulations -Mobile Money Interoperability, 2018 4. Limited access to infrastructure • Spectrum • Network coverage • MVNO Small market size 5. Technology adoption and diffusion
	g) Way forward and future MVNOs	1. MVNOs have outgrown ULF licensing framework 2. Separate regulatory framework for MVNOs necessary. 3. 5G networks