

Research Article

Strategic Foresight and Corporate Efficiency of Agricultural Research Institutions in Kenya: Mediating Influence of Leadership Commitment

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Abstract

In today's volatile, uncertain, complex, and ambiguous organizational landscape, effective leadership and management are pivotal for navigating challenges and seizing opportunities. This is especially crucial in agricultural research institutions in Kenya, tasked with enhancing productivity, sustainability, and food security. These institutions must innovate to address climate change, resource scarcity, and evolving consumer demands, yet face challenges in maintaining corporate efficiency. With global population growth and increasing food demand, there is urgency for these institutions to enhance strategic foresight and corporate efficiency. However, the impact of strategic foresight and leadership commitment on efficiency remains underexplored in Kenya's agricultural research sector. This study aimed to investigate the influence of strategic foresight on corporate efficiency and to explore how leadership commitment mediates this relationship. Utilizing a mixed methods approach—cross-sectional surveys for quantitative data and interpretive phenomenological analysis for qualitative insights—data were gathered from key segments of Kenyan agricultural research institutions. Statistical analyses, including regression and mediation analysis, were employed to test hypotheses and uncover relationships among strategic foresight, leadership commitment, and corporate efficiency. Results showed that the study achieved a robust response rate, ensuring reliable findings with strong internal consistency. Leadership in agricultural research institutes skewed male, revealing gender disparities. Age significantly influenced corporate efficiency, emphasizing strategic foresight's role. Concerns arose over short leader tenures and institutional memory loss. Supervisory roles correlated positively with corporate efficiency, consistent with prior research. Pearson's correlations showed significant relationships among corporate efficiency, strategic foresight, and leadership commitment. Structural equation modeling confirmed significant relationships, with leadership commitment partially mediating the relationship between strategic foresight and corporate efficiency. Management boards were pivotal in strategic activities and policy coordination. Despite policy alignment challenges in organizations, government support for policy enactment received positive feedback. The study recommended expansions into resource mobilization, patenting, and policy revisions aligning with digital agriculture trends. Effective governance, supportive policies, and strategic implementation were crucial for advancing agricultural research and development.

Keywords

Mediation, Strategic Foresight, Corporate Efficiency, Leadership Commitment, Agricultural Research Institutions, Direct Effect, Total Effect

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Received: 24 June 2024; **Accepted:** 12 July 2024; **Published:** 23 July 2024



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1. Introduction

In an era characterized by unprecedented volatility, uncertainty, complexity, and ambiguity in leadership and management of organizations, several organizations, including those tasked with coordinating agricultural research for development have been confronted with myriad challenges and opportunities, necessitating adaptive strategies and innovative approaches to enable them stay afloat in dynamic environments, and to enhance their efficiency in delivery of their core mandate. Agricultural Research institutions play a crucial role in promoting agricultural productivity, sustainability, and food security in Kenya. As the agricultural sector faces various challenges, including volatile climate change, uncertain resource scarcity, complex consumer demands, and ambiguous policies, agricultural research institutions must adapt and innovate to address emerging issues effectively.

Strategic foresight, defined as the systematic exploration of possible futures to inform decision-making, offers a valuable framework for anticipating and responding to future challenges and opportunities. Additionally, the commitment of organizational leadership is essential for translating strategic visions into actionable plans and fostering a culture of innovation and efficiency. However, the interplay between strategic foresight, leadership commitment, and organizational efficiency within these institutions remains underexplored. This study aims to address this gap by examining the relationships between strategic foresight, corporate efficiency, and leadership commitment in the context of agricultural research institutions in Kenya.

In seeking to deal with these volatility, uncertainty, complexity, and ambiguity challenges, strategic foresight has emerged and is increasingly being embraced as a strategic necessity for organizations seeking to adapt to evolving market dynamics [1, 2]. It has emanated as a strategic instrument for aiding organizations to enhance achievement of their mandate and resilience. Studies by ISDC [3], Argote et al. [4] and Meyer et al. [5] have shown that anticipation of future trends and disruptions have enabled organizations to identify strategic opportunities and threats, thereby enabling them to proactively adjust their strategies and operations to maximize efficiency and sustain long-term success. This capability is very valuable in preparing the management and leadership of these organizations to tackle issues hindering efficient delivery of their mandate, ensure sustainable agricultural research for development as well as increase food and nutrition security.

Aligned with strategic foresight is corporate efficiency. Scholars have defined corporate efficiency as the ability of organizations to optimize judicious utilization of resources [6], streamline operational processes [7], and enhance productivity [8] to achieve strategic objectives and sustain competitive advantage. It involves minimization of waste and achievement of strategic objectives, thus becoming a cornerstone of organizational success [2].

The current dynamic agribusiness environment, characterized by rapid technological advancements, globalization, and shifting consumer preferences brought about by limited access to safe and nutritious foods have shown that maintaining efficiency is more critical than ever. Organizations, including agriculture-allied agencies have been called upon to continuously adapt to changing market conditions and to anticipate future challenges to remain competitive, productive, and beneficial to stakeholders.

On the other hand, leadership commitment, characterized by the dedication of organizational leaders to the pursuit of strategic goals and the cultivation of a supportive organizational culture, has played a pivotal role in driving initiatives aimed at enhancing corporate efficiency. It is a crucial factor in driving organizational performance [9-11]. It sets the tone at the top and influences organizational culture, values, and behaviors at relevant lower echelons. Empirical evidence by Schweitzer et al. [12] have shown that leaders who are committed to the pursuit of strategic goals and the cultivation of a supportive organizational culture have a greater propensity to inspire and motivate all levels of personnel to enhance their performance.

Leadership commitment manifests in various forms, including visible support from top management, equitable allocation of resources [13], setting of clear expected results [14] and fostering open communication with external partners [15]. Empirically, researchers such as Ketonen-Oksi [8], Li et al. [16], and Meyer et al. [5] have shown that strong leadership commitment is essential for translating strategic foresight into action, thereby driving corporate efficiency.

Notwithstanding the above empirical evidence, there is a dearth of knowledge on the mediating role of leadership commitment on the relationship between strategic foresight and corporate efficiency in agricultural research institutions.

1.1. Statement of the Problem

Well-coordinated strategic foresight aimed at handling unprecedented volatility, uncertainty, complexity, and ambiguity in leadership and management of agricultural research institutions significantly contributes to corporate efficiency. Notwithstanding the strategic role of these institutions in efficiently coordinating agricultural transformation, concerns linger concerning their efficiency. The projected 27% increase in global population by 2050 [17] poses serious dangers to citizens. This inevitably calls for reliable strategic foresight and corporate efficiency of these institutions to meet this demand.

While the individual contributions of strategic foresight and leadership commitment to organizational performance has been widely studied, their combined influence on corporate efficiency has remained underexplored. Kenya's current average productivity of 9 tons per hectare, despite surpassing

East Africa's 6.8 tons per hectare, and Africa's 7.1 tons per hectare still falls below 9.8 tons per hectare globally [18]. A lapse in achievement of strategic foresight, corporate efficiency, and leadership commitment is a recipe for sustained food and nutrition insecurity. There is scanty evidence on the contribution of leadership commitment as a mediator on the relationship between strategic foresight and corporate efficiency of agricultural research institutions in Kenya.

Despite having 17 national research institutes and over 30 research centres and sub-centres that are relatively well-resourced, several questions remain unanswered, viz: What is the role of strategic foresight in enhancing corporate efficiency of agricultural research institutions in Kenya? To what extent does leadership commitment mediate the relationship between strategic foresight and corporate efficiency of agricultural research institutions in Kenya?

1.2. The Objectives of the Study

The main objective of this study was to determine the effect of strategic foresight and leadership commitment on corporate efficiency of agricultural research institutions in Kenya. The following specific objectives were addressed.

1. To establish the effect of strategic foresight on corporate efficiency of agricultural research institutions in Kenya.
2. To evaluate the mediating effect of leadership commitment on the relationship between strategic foresight on corporate efficiency of agricultural research institutions in Kenya.

Hypotheses of the Study

To address these objectives, the following hypotheses were expressed, all in the null.

1. There is no significant effect of strategic foresight on corporate efficiency of agricultural research institutions in Kenya.
2. There is no significant mediating effect of leadership commitment on the relationship between strategic foresight on corporate efficiency of agricultural research institutions in Kenya.

2. Literature Review

In this study, a comprehensive literature review was conducted. This included theoretical as well as empirical reviews.

2.1. Theoretical Review/Framework

Four theories were put forward to support the study's three variables. The anchor theory, organizational excellence theory, originating from the 1980s by Crosby and Stephens [19], Deming [20], and Juran et al. [21], advocates for continuous improvement and innovation to enhance organizational effectiveness, leadership commitment, and effective foresight, notably through total quality management principles.

Upper echelons theory, proposed by Hambrick and Mason

[22], underscores the influence of top executives and leadership commitment on organizational efficiency, but lacks focus on inclusivity of middle managers and lower level [23].

Institutional theory, introduced by DiMaggio and Powell [24], highlights organizational adaptation to, and corporate efficiency in dealing with external institutional environments. In this study, this theory supports how organizations can enhance their corporate efficiency and strategic focus.

Stakeholder theory, advocated by Freeman and Freeman [25], emphasizes ethical considerations and stakeholder relationships in enhancing corporate efficiency and leadership commitment. However, it overlooks political interferences and stakeholder conflicts [26]. These theories have collectively provided a robust foundation for understanding leadership and organizational dynamics, although each has its limitations.

2.2. Empirical Review

2.2.1. Strategic Foresight and Corporate Efficiency

Strategic foresight, involving systematic exploration of potential futures necessary to reliably inform decision-making and strategy development within organizations has received attention among scholars [27]. Empirically, da Silva et al. [28] and ISDC [3] observed that strategic foresight enhances corporate efficiency by enabling organizations to anticipate future trends, disruptions, and opportunities, thereby allowing them to proactively adapt their mission and strategies [29] as well as align their operations to remain competitive and resilient in the crowded ecosystem.

Gattringer and Wiener [30] noted that strategic foresight encompassing activities such as environmental scanning, trend analysis, scenario planning, and horizon scanning. However, there are scarce studies on identification of relationships between strategic foresight and corporate efficiency of agricultural research institutions, thereby enabling corporate leadership to make informed decisions. This dearth of information exposes state-mandated institutions to generally operate sub-optimally.

In this study, the assessment of the linkage between strategic foresight and corporate efficiency was supported by previous scholarly research. It highlighted the crucial role of anticipating future trends and challenges in optimizing operational effectiveness within agricultural research organizations.

2.2.2. Strategic Foresight, Leadership Commitment, and Corporate Efficiency

Prior work by Gordon [31] showed that corporate efficiency, referring to the ability of an organization to achieve its strategic objectives using optimal allocation of cash and in-kind resources significantly contributes to organizational performance. Empirical studies by Haarhaus and Liening [32], Ojo and Fauzi [33], Amro et al. [34], and Wei et al. [35]

showed that corporate efficiency is essential for organizational success as it enables organizations to minimize costs, enhance output and productivity, as well as maintain a competitive edge among competitors and in the market. Studies showed that assorted factors influence corporate efficiency, including streamlined processes [36], effective resource management [37], and strategic alignment with stakeholder dynamics [38] with regards to availed goods, products and services.

As part of strategic foresight of organizations, WRI [39] observed that scenario analysis on long-run food security necessitates strong leadership commitment and interdisciplinary collaboration across various fields and partners. B á n é t al. [40] further noted that addressing unexpected biophysical shocks, shaped by economic responses and successful agricultural development strategies, requires enhancing corporate efficiency and leadership commitment to engage research institutes domestically and internationally. Sarpong and Meissner [7], Hansen et al. [41], and Meyer et al. [5] further observed that climate change projections indicate heightened weather variability and extreme events, underscoring the need for increased research and leadership commitment to develop long-run simulation models.

These models aid in analyzing adaptation strategies, supporting stakeholders in timely decision-making. Andresen et al. [2], Argote et al. [4], Ketonen-Oksi [8], and Li et al. [16] noted that leaders' strategic foresight and leadership commitment have the potential to enhance corporate efficiency if these leaders are capable of advocating for investments in research, infrastructure, and risk management at all organizational levels. Based on the foregoing, strategic foresight enables leaders to bolster corporate efficiency and commitment in addressing biotic stresses like pests and diseases, which may intensify with climate change, adversely affecting agricultural

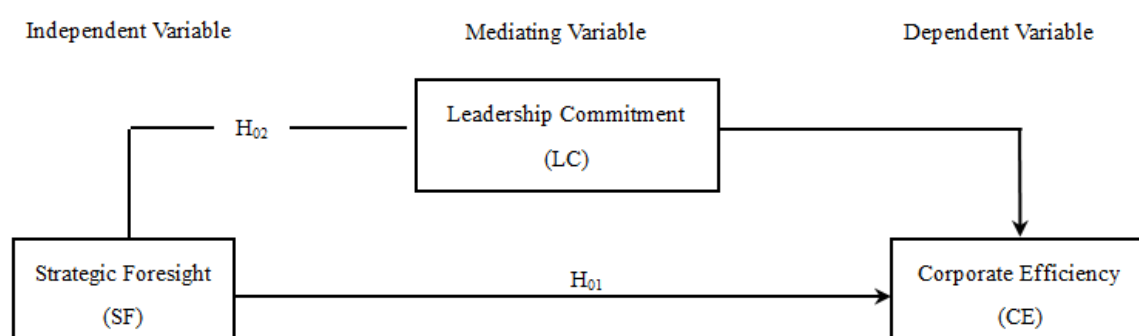
productivity and food security.

In this study, leadership commitment is regarded as a critical factor for driving organizational change and performance improvement initiatives. Empirical evidence shows that committed leaders inspire action and engagement [2], mobilize resources [43] and foster a culture of innovation and continuous improvement [4]. Leadership commitment manifests in various forms, including visible support from top management, allocation of resources, setting clear expectations, and fostering open communication and sharing of relevant information. Strong leadership commitment is essential for translating strategic foresight into action and driving organizational efficiency.

3. Conceptual Framework

Building on the theoretical foundations outlined above, this study proposed a conceptual framework that integrated strategic foresight, leadership commitment, and corporate efficiency. At the core of this framework is the hypothesized direct relationship between strategic foresight and corporate efficiency, positing that organizations with robust strategic foresight capabilities are better positioned to anticipate organizational shifts, identify strategic opportunities, and adapt their operations to maximize efficiency.

Additionally, the study proposed that leadership commitment serves as a mediator in the relationship between strategic foresight and corporate efficiency, exerting an indirect influence by shaping the organizational context and facilitating the translation of strategic foresight into action. The study treated strategic foresight as the independent variable, and corporate efficiency as the dependent variable.



Source: Researcher's survey (2024)

Figure 1. Conceptual Framework.

4. Research Methodology

Using concurrent triangulation, as guided in mixed meth-

ods to ensure inductive and deductive thinking, data collection was done via cross-sectional survey for quantitative relationships and interpretive phenomenological analysis for qualitative responses. The study focused on specific segments of agricultural research institutions in Kenya, particularly the

Board of Management, various directorates within the Secretariat, research institutes, and research centers, totaling 75 institutions. These institutions constituted the unit of analysis, from which 248 respondents, including 60 directors and 188 top leaders, were selected as the unit of observation (Table 1).

Given the small target population size, a census was employed to ensure a comprehensive assessment without sampling bias. Primary data collection utilized an online struc-

tured questionnaire and focus group discussions, employing the Likert scale for perception assessment and facilitating open discussion. The questionnaire encompassed 45 items covering strategic foresight, corporate efficiency, and leadership commitment. Prior to the main study, a pilot study involving 16 respondents (6% of the unit of observation) refined the questionnaire.

Table 1. Distribution of Target Population.

Governance Hierarchy	Divisions/Categories	Respondents (Unit of Observation)		
		Directors	Implementers	Total
Board of Management	1	8	-	8
Directorate	1	3	-	3
Secretariat	1	12	5	17
Institutes	17	16	48	64
Centres and Sub-Centres	55	21	151	172
Total	75	60	204	264

Source: Own computation (2024)

Data analysis employed a mixed methods approach, with quantitative data analyzed using SPSS and qualitative data using NVivo. Internal consistency reliability was assessed using Cronbach's alpha, while confirmatory factor analysis, multiple regression analyses, and principal component analyses aided in data reduction and pattern recognition. Mediation analysis utilized Hayes' PROCESS Macro approaches to test the hypothesis concerning transmission of strategic foresight's effect on corporate efficiency, with leadership commitment and corporate efficiency modeled through ordinary least squares regression and structural equation modeling software.

The model for estimating the effect of strategic foresight (SF) on leadership commitment (LC) was assumed to be:

$$LC = i_{LC} + aSF + \epsilon \quad (1)$$

Where i_{LC} refers to the regression constant or intercept for predictor LC

The model for estimating the effect of strategic foresight (SF) and the mediator, leadership commitment (LC) on corporate efficiency (CE) was assumed to be:

$$CE = i_{CE} + c'SF + bLC + \epsilon \quad (2)$$

Where i_{CE} is the regression constant, c' is the direct effect of strategic foresight on corporate efficiency, and b is the regression coefficient of presumed influence of mediator, and

ϵ representing the error in the estimation of the relationship.

The model for estimating the effect of strategic foresight (SF) on corporate efficiency (CE) was assumed to be:

$$CE = i_{CE} + cSF + \epsilon \quad (3)$$

Where i_{CE} represents the regression constant for corporate efficiency, c signifies regression weight for the antecedent variable, strategic foresight, and ϵ denotes the error term.

The final estimated values of these models 1, 2 and 3 were denoted by carets (^), as shown in models 4, 5, and 6, and excluded residuals.

The qualitative data analysis in this study employed interpretive phenomenological analysis, focusing on understanding textual, visual, and verbal responses to contextualize quantitative findings. NVivo software facilitated the process by coding and categorizing transcribed data, aiming to uncover connections between emergent themes. Specifically, a deductive coding approach was utilized for responses from Board members, aligning with predetermined categories linked to the research questions. The study explored the roles of the board of management, particularly in strategic activities, policy coordination, and oversight, underscoring their crucial support in achieving the organization's mandate through clear approvals, policy oversight, and resource mobilization.

5. Results and Discussion

The study achieved a response rate of 85.5%, ensuring reliability and validity of the findings, with strong internal consistency indicated by Cronbach's Alpha coefficients. Leadership within agricultural research institutes was predominantly male (67.9%), and leaders' age significantly impacted corporate efficiency, emphasizing role of strategic foresight across age groups. While leadership structure showed moderate balance, concerns arose regarding the short tenure of leaders and potential loss of institutional memory. Supervisory roles exhibited a positive correlation with corporate efficiency, as evidenced by 84.9% of respondents in such roles rating the variable highly, consistent with findings by Pang and Lu [42].

Results also showed that leadership commitment mediates the relationship between strategic foresight and corporate efficiency by influencing employee attitudes and behaviours. The findings support the fact that strategic foresight within agricultural research is pivotal for navigating uncertainties and complexities inherent in the sector, and that organizations are somewhat prepared in anticipating future trends and challenges, as well as using available information to better prepare for emerging issues and capitalize on opportunities for innovation and growth. In few cases, results showed that strategic foresight techniques, such as scenario planning and trend analysis, has enhanced decision-making and resource allocation in agricultural research and development. Similarly, strategic foresight enabled stakeholders to identify potential disruptions and devise proactive strategies to mitigate risks and seize competitive advantages in a rapidly changing environment.

5.1. Demographic Characteristics

The top leadership exhibited a notable male majority at 67.9%, meeting the two-thirds gender rule. The ANOVA results indicated that age group of targeted leaders had a statistically significant effect on organizational performance ($F = 5.518$; $p = .020$). This suggests differences in leadership style, experience, and approaches across different age groups, thus impacting the organization's effectiveness. These organizations are poised to benefit from considering the age group of its leaders in strategic planning and leadership development to optimize performance and harness the strengths of different age groups. Similarly, 62% of leaders were aged 45 or older, revealing a mentoring gap for those under 25, here represented by less than one percent of the respondents (Table 2).

Table 2. Demographics of Respondents.

Profile	Category	Frequency	Percentage
Gender	Male	144	67.92

Profile	Category	Frequency	Percentage
Age	Female	68	32.08
	Below 25	2	.94
	25 – 34	28	13.21
	35 – 44	50	23.58
	45 – 54	68	32.08
	55 and above	64	30.19
Titles	Honourable	1	.47
	Prof/Dr.	86	40.57
	Mr., Mrs., Ms.	125	58.96
Position	Board member	5	2.36
	Director	65	30.66
	Manager	103	48.58
	Officers	39	18.40
Duration of Leadership (Years)	Below 5	96	45.28
	5 – 9	57	26.89
	10 – 14	28	13.21
	15 – 19	18	8.49
Duty Station	20 and above	13	6.13
	Headquarters	72	33.96
	Research Institute	44	20.75
	Research Centre	96	45.28
	None	31	14.62
Number of Staff Supervised	Below 10	77	36.32
	11 – 20	31	14.62
	21 – 50	28	13.21
	51 – 100	24	11.32
	Over 100	21	9.91

Source: Own computation (2024)

5.2. Correlation Analysis of Study Variables

The Pearson's correlation coefficients presented in Table 3 reveal insightful relationships among corporate efficiency, strategic foresight, and leadership commitment within the context studied. Strategic foresight shows a notably strong positive correlation with leadership commitment ($r = 0.662$), indicating that organizations with robust strategic foresight tend to exhibit higher levels of leadership commitment. Additionally, both strategic foresight and leadership commitment show moderate positive correlations with corporate efficiency ($r = 0.364$ and $r = 0.433$, respectively), underscoring their potential roles in contributing to organizational efficiency.

These correlations are statistically significant ($p < .001$), suggesting that these relationships are unlikely to be due to chance. However, while these findings provide valuable insights into potential avenues for enhancing organizational effectiveness through strategic planning and leadership focus,

further research is needed to explore causality and to generalize these findings across different organizational contexts. Understanding these dynamics can aid leaders in prioritizing strategic initiatives and fostering environments conducive to improved overall performance and efficiency.

Table 3. Pearson's Correlation Coefficient of Variables.

		Corporate Efficiency	Strategic Foresight	Leadership Commitment
Corporate Efficiency	Pearson's R	—		
	p-value	—		
	N	—		
Strategic Foresight	Pearson's R	0.364***	—	
	p-value	< .001	—	
	N	212	—	
Leadership Commitment	Pearson's R	0.433***	0.662***	—
	p-value	< .001	< .001	—
	N	212	212	—

** Correlation is significant at the 0.01 level (2-tailed).

(Source: Researcher's survey result, 2024)

5.3. Hypothesis Tests

Covariance-based structural equation modeling with factor analysis and linear regression was used to examine relationships among these three variables, including analysis of specific objectives and corresponding hypotheses. Normality, assessed with Kolmogorov-Smirnov statistic, indicated non-significant results for corporate efficiency (0.102), leadership commitment (0.088), and strategic foresight (0.106). The first hypothesis, asserting no significant link between strategic foresight and corporate efficiency, was refuted.

Both Cronbach's Alpha and Cronbach's Alpha Based on Standardized Items yielded a score of 0.740, indicating a reasonably good level of internal consistency reliability for the measured variables. It was observed that all items demonstrated adequate reliability and contributed effectively to the overall consistency of the scale, with scores for leadership commitment at 0.529, strategic foresight at 0.604, and

corporate efficiency at 0.793. No items required refinement as their inclusion did not significantly impact the reliability of the measurement tool. The results of Levene's Test for Equality of Variances showed significance across the variables: leadership commitment ($p = 0.142$), strategic foresight ($p = 0.295$), and corporate efficiency ($p = 0.323$), all with p-values greater than 0.05. This suggests that the variances across groups were equal, indicating no violation of the assumption of homogeneity of variance.

The coefficient value, $R = 0.662$, indicated a robust positive linear relationship between strategic foresight and leadership commitment. This strong correlation implied that higher levels of strategic foresight were linked with increased levels of leadership commitment. Moreover, the R-squared value of .438 demonstrated that approximately 43.83% of the variance in leadership commitment were elucidated by the predictor variable, strategic foresight. Thus, strategic foresight significantly contributed to the variability observed in leadership commitment (Table 4).

Table 4. Model Summary^b.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					DW
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.662 ^a	.438	.436	.3486	.438	163.857	1	210	<.001	2.047

a. Predictors: (Constant), Strategic Foresight

b. Dependent Variable: Leadership Commitment

ANOVA

The ANOVA table presented indicates a significant regression model ($F = 163.857$, $p < .001$), with strategic foresight as a predictor accounting for a substantial portion of variance in leadership commitment ($R^2 = 0.439$). This finding suggests

that strategic foresight significantly predicts leadership commitment among the sample. Additionally, the relatively small residual mean square (0.122) indicates that the model adequately fits the data (Table 5).

Table 5. ANOVA^a.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.910	1	19.910	163.857	<.001 ^b
	Residual	25.516	210	.122		
	Total	45.426	211			

a. Dependent Variable: Leadership Commitment

b. Predictors: (Constant), Strategic Foresight

Coefficients

The coefficient for strategic foresight of 0.585 indicated that for every one-unit increase in strategic foresight, leadership commitment index was expected to increase by 0.585 units. This demonstrates the positive impact of strategic foresight on leadership commitment. The low p-value (<0.001) for strategic foresight indicated that the effect of this variable on leadership commitment was statistically significant, thus

the relationship between them was unlikely to be due to random chance. The lower and upper limits of the confidence interval for strategic foresight (LLCI = 0.495, ULCI = 0.676) provided a significant sense of the precision of the estimated effect. Conversely, the low Mean Squared Error (MSE) of 0.122 signified that the model offers precise predictions of leadership commitment (Table 6).

Table 6. Coefficients^a.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% CI for B	
	B	Std. Error				LLCI	ULCI
1	(Constant)	1.340	.194	6.915	<.001	.958	1.723
	Strategic Foresight	.585	.046	.662	12.801	<.001	.495 .676

a. Dependent Variable: Leadership Commitment

The fitted model estimating the effect of strategic foresight (SF) on leadership commitment (LC) is represented as:

$$\widehat{LC} = 1.3404 + 0.585*SF \quad (4)$$

The second hypothesis, showing no significant mediating effect of leadership commitment on the relationship between strategic foresight on corporate efficiency of agricultural research institutions in Kenya, was refuted, thus indicating a partial mediation effect. The value, $R = 0.445$ indicated a moderate positive linear relationship between strategic foresight, leadership commitment, and corporate efficiency. This

suggested that both strategic foresight and leadership commitment were positively associated with corporate efficiency. Similarly, $R\text{-squared} = 0.198$ showed that approximately 19.83% of the variance in corporate efficiency was explained by the predictor variables strategic foresight and leadership commitment. While this was moderate, it still represented a substantial portion of the variability in corporate efficiency (Table 7).

Table 7. Model Summary^b.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					DW
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.445 ^a	.198	.191	.400	.198	25.856	2	209	<.0001	1.976

a. Predictors: (Constant), Leadership Commitment, Strategic Foresight

b. Dependent Variable: Corporate Efficiency

ANOVA

The results of the ANOVA for the regression model predicting corporate efficiency are presented in Table 5. The model was statistically significant ($F = 25.855$, $p < .001$), indicating that the predictors (leadership commitment and strategic foresight) collectively explained a significant proportion of the variance in corporate efficiency. The regression model accounted for a substantial portion of the variance, with an $R\text{-squared}$ value that would typically accompany such a high $F\text{-statistic}$. Specifically, the predictors, when considered together, explained approximately 19.8% (adjusted $R\text{-squared}$)

of the variance in corporate efficiency, suggesting a moderately strong relationship. Both leadership commitment and strategic foresight were significant predictors of corporate efficiency individually, as indicated by their respective coefficients in the regression equation. Thus, the findings suggest that both leadership commitment and strategic foresight played important roles in determining corporate efficiency, highlighting their significance in organizational effectiveness and performance. The $MSE = 0.160$ represented the mean squared error for corporate efficiency, an indication of the accuracy of the model's predictions of this variable (Table 8).

Table 8. ANOVA^a.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.282	2	4.141	25.855	<.001 ^b
	Residual	33.474	209	.160		
	Total	41.757	211			

a. Dependent Variable: Corporate Efficiency

b. Predictors: (Constant), Leadership Commitment, Strategic Foresight

The coefficient for strategic foresight of 0.117 suggested that for every one-unit increase in strategic foresight index, corporate efficiency was expected to increase by 0.117 units. Although the $p\text{-value}$ ($p = 0.097$) for strategic foresight was not significant at the conventional level of $p < 0.05$, it still provided valuable information about the potential impact of strategic foresight on corporate efficiency. The coefficient for

leadership commitment was 0.328, with a significant $p\text{-value}$ ($p < 0.0001$).

This indicated that leadership commitment had a statistically significant positive effect on corporate efficiency, suggesting that higher levels of leadership commitment were associated with higher levels of corporate efficiency. It further showed that corporate efficiency differed by 0.328 for a unit

change of leadership commitment index. The confidence intervals for strategic foresight (LLCI = -0.021, ULCI = 0.255) and leadership commitment (LLCI = 0.172, ULCI =

0.484) provided significant sense of the precision of the estimated effects (Table 9).

Table 9. Coefficients^a.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% CI for B	
		B	SE	Beta			LLCI	ULCI
	(Constant)	2.485	.247		10.077	<.0001	1.999	2.971
1	Strategic Foresight	.117	.070	.138	1.669	.097	-.021	.255
	Leadership Commitment	.328	.079	.342	4.137	<.0001	.172	.484

a. Dependent Variable: Corporate Efficiency

The fitted model estimating the effect of strategic foresight (SF) and the mediator, leadership commitment (LC) on corporate efficiency (CE) was represented as:

$$\widehat{CE} = 2.4848 + 0.1169*SF + 0.3278*LC. \quad (5)$$

This model confirmed the significant relationship between the predictor variables (strategic foresight and leadership commitment) and the outcome variable (corporate efficiency), considering the error term (ϵ) to account for unexplained

variance.

The value, $R = 0.364$ indicated a moderate positive linear relationship between strategic foresight and corporate efficiency, hence suggesting that strategic foresight had a moderate impact on corporate efficiency. Similarly, the total effect model for corporate efficiency showed an R-squared value of 0.1327, suggesting that the predictors collectively accounted for 13.27% of the variance in the variable. While not high, this still represents a significant portion of the variability in corporate efficiency (Table 10).

Table 10. Model Summary^b.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					DW
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.364 ^a	.1327	.129	.415	.1327	32.128	1	210	<.0001	2.023

a. Predictors: (Constant), Strategic Foresight

b. Dependent Variable: Corporate Efficiency

ANOVA

The ANOVA results presented in Table 11 showed the statistical analysis for predicting corporate efficiency using strategic foresight as the sole predictor. The regression model was highly significant ($F = 32.128$, $p < .0001$), indicating that strategic foresight explained a significant amount of variance in corporate efficiency.

The regression model accounted for approximately 11.7%

(adjusted R-squared) of the variance in corporate efficiency, suggesting a moderate relationship between strategic foresight and organizational efficiency. The coefficient for strategic foresight in the regression equation was significant ($p < .0001$), indicating that as strategic foresight index increased, corporate efficiency tended to increase as well. This suggests that organizations with a stronger emphasis on strategic foresight are likely to exhibit higher levels of corporate efficiency.

Table 11. ANOVA^a.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.541	1	5.541	32.128	<.0001 ^b
	Residual	36.216	210	.172		
	Total	41.757	211			

a. Dependent Variable: Corporate Efficiency

b. Predictors: (Constant), Strategic Foresight

This study disclosed that organizations endowed with robust strategic foresight exhibited elevated levels of corporate efficiency. By actively scanning the external environment and engaging in scenario planning, these organizations adeptly allocated resources, anticipated market shifts, and made informed strategic decisions. Some of the investigated organizations noted that they had utilized scenario planning to navigate economic uncertainties and technological disruptions effectively. Such foresight not only prepared these organizations for potential challenges but also cultivated a culture of continuous learning and adaptation, thereby optimizing efficiency and sustaining competitive advantage.

Table 12 provides the coefficients from the regression analysis predicting corporate efficiency based on strategic foresight. The intercept (Constant) of 2.924 indicated the estimated corporate efficiency when the strategic foresight

score was zero. The coefficient for strategic foresight was 0.309, indicating that for every one unit increase in strategic foresight index, corporate efficiency increased by 0.309 units. This suggests that this variable had a substantial impact on corporate efficiency in the total effect model.

The standardized coefficient (Beta) for strategic foresight was 0.364, suggesting that a one standard deviation increase in strategic foresight was associated with a 0.364 standard deviation increase in corporate efficiency. The t-statistic for strategic foresight was 5.668 ($p < .0001$), indicated that strategic foresight significantly predicted corporate efficiency. The 95% confidence interval for the coefficient of strategic foresight ranged from 0.201 to 0.416 (LLCI to ULICI). This interval indicates the range within which there was 95% confidence that the true population coefficient fell in that range.

Table 12. Coefficients^a.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% CI for B	
	B	Std. Error	Beta			LLCI	ULCI
1	(Constant)	2.924	.231	12.663	<.0001	2.469	3.379
	Strategic Foresight	.309	.055	.364	5.668	<.0001	.201 .416

a. Dependent Variable: Corporate Efficiency

The fitted model estimating the effect of strategic foresight (SF) on corporate efficiency (CE) is represented as:

$$\widehat{CE} = 2.924 + 0.309 \cdot SF \quad (6)$$

The coefficient 2.924 represented the intercept (constant) of the model and estimated corporate efficiency when strategic foresight was zero.

5.4. Total, Direct, and Indirect Effects of Strategic Foresight on Corporate Efficiency

Results showed that the total effect of strategic foresight on corporate efficiency was 0.309 ($t = 5.668$, $p < 0.001$), indicating a statistically significant positive relationship between strategic foresight and corporate efficiency. In this case, the total effect suggests that for every one unit increase in strategic foresight index strategic foresight, strategic foresight increased by 0.309 units on average.

Results showed that the direct effect of strategic foresight

on strategic foresight was 0.117 ($t = 1.669$, $p = 0.097$). While this effect was positive, indicating that there was a direct relationship between strategic foresight and strategic foresight, it was not statistically significant at the conventional alpha level of 0.05 ($p > 0.05$), meaning that there was insufficient evidence to conclude that the relationship between strategic foresight and strategic foresight existed solely due to the direct effect observed in the data. The confidence interval for the direct effect (LLCI = -0.021, ULCI = 0.255) included zero, further supporting the lack of statistical significance.

The indirect effect of strategic foresight on strategic foresight was 0.192 (BootSE = 0.050, BootLLCI = 0.100, BootULCI = 0.295). This indirect effect was statistically significant, as the confidence interval (CI: 0.100 to 0.295) did not include zero, hence suggesting that there was a significant pathway through which strategic foresight influenced strategic foresight indirectly, beyond the direct effect observed. Further investigation into the mediating variables (leadership commitment, with a completely standardized indirect effect of 0.226) provided insights into the mechanisms through which strategic foresight affected strategic foresight.

5.5. Qualitative Data Analysis

The study findings underscored the pivotal role of the board of management in driving strategic activities, policy coordination, and resource mobilization to fulfill the organization's mandate. Government support over the past five years received positive feedback for enacted laws and policies, although challenges identified in the National Agricultural Research System (NARS) Policy highlighted the need for streamlined policies and enhanced capacity building. The organizations demonstrated success in implementing approved strategies and policies, particularly in research dissemination, policy formulation, and resource mobilization.

Recommendations emphasized expanding into new areas such as resource mobilization, strategic networks, and patenting of inventions, alongside reviewing policies for funding security, budget consistency, mentorship programs, and collaboration policies. Furthermore, the study advocated for revising the Science, Technology, and Innovation Act to align with digital agriculture trends, ensuring the organizations remain abreast of global advancements.

Overall, effective governance, supportive policy frameworks, and strategic implementation were identified as critical factors for the organization's continued advancement in agricultural research and development.

6. Conclusions

The study achieved a robust response rate, ensuring the reliability and validity of its findings, supported by strong internal consistency as indicated by Cronbach's Alpha coefficient.

Leadership within agricultural research institutes skewed predominantly male, highlighting significant gender disparities in leadership roles. Age also exerted a notable influence on corporate efficiency, underscoring the critical role of strategic foresight across varying age demographics. Concerns arose regarding the short tenures of leaders and potential loss of institutional memory. Supervisory roles exhibited a positive correlation with corporate efficiency, aligning with previous research findings.

Pearson's correlation coefficients illustrated significant relationships among corporate efficiency, strategic foresight, and leadership commitment. Strategic foresight displayed a robust positive correlation with leadership commitment, suggesting that organizations with well-developed strategic foresight tend to demonstrate higher levels of leadership commitment. Both strategic foresight and leadership commitment also moderately correlated with corporate efficiency, underscoring their potential contributions to organizational effectiveness. These statistically significant findings highlight meaningful relationships.

Structural equation modeling confirmed hypothesis testing, revealing significant relationships among variables. The model indicated that strategic foresight significantly predicted leadership commitment, explaining a substantial portion of its variance. Strategic foresight and leadership commitment collectively accounted for a significant variance in corporate efficiency, emphasizing their pivotal roles in enhancing organizational effectiveness.

Qualitative data analysis emphasized the critical role of management boards in driving strategic activities and policy coordination within agricultural research institutes. Positive feedback was noted regarding government support, particularly in policy enactment, despite challenges in policy alignment within NARS. The study recommended strategic expansions into new areas such as resource mobilization and patenting, alongside policy revisions to align with digital agriculture trends. Effective governance, supportive policy frameworks, and strategic implementation were identified as critical factors for advancing agricultural research and development.

7. Recommendations

Some of the practical recommendations from the study include the need for corporate leadership to promote strategic foresight activities, foster leadership commitment, and align organizational goals and incentives to drive efficiency improvements; prioritize the development of strategic foresight capabilities among leadership teams to anticipate future challenges and opportunities effectively; and consider incentivizing organizations to adopt strategic planning processes and invest in leadership development initiatives to promote overall organizational effectiveness.

8. Implications for Practice

The findings of this study have important implications for corporate leadership and managers seeking to enhance corporate efficiency and their strategic foresight capabilities. By investing in strategic foresight capabilities and cultivating a culture of leadership commitment, these results show that the agricultural research for development organizations can improve their adaptive capacity, resilience, and competitiveness. From a policy perspective, recognizing the impact of strategic foresight and leadership commitment on corporate efficiency is anticipated to inform the development of policies aimed at enhancing organizational effectiveness. Practically, the findings offer actionable insights for organizational leaders and managers. Incorporation of strategic foresight practices and cultivation of strong leadership qualities are expected to enhance corporate efficiency.

Abbreviations

ANOVA	Analysis of Variance
df	Degree of Freedom
R	Correlation Coefficient
NARS	National Agricultural Research System
SF	Strategic Foresight
CE	Corporate Efficiency
LC	Leadership Commitment
LLCI	Lower Limit Confidence Interval
ULCI	Upper Limit Confidence Interval

Author Contributions

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Domeniter Naomi Kathula: Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing – review & editing

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Data Availability Statement

The data is available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography



Enock Warinda practices as a development measurements and evaluation specialist as well as an agricultural economist with over 27 years of multi-disciplinary work experience in agriculture, impact evaluation, leadership and management, strategic planning, knowledge management, applied statistics, rural development, mixed methods research, and public and private sector policy research, reforms and management. He holds a PhD in agricultural economics, MA in monitoring and evaluation, Master of Philosophy in forestry economics and management, and BSc in forestry. He is currently the Executive Director of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA).



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