TECHNOLOGICAL INNOVATIONS AND PERFORMANCE OF THE AGRICULTURAL DEVELOPMENT CORPORATION, KENYA

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ABSTRACT

The business environment is ever changing forcing organizations and individuals to respond adequately if they have to survive. This draws interest to this study on strategic change management (particularly, technological innovations) and performance of the Agricultural Development Corporation. The corporation has been facing constrained performance justifying the need to carry out this empirical research. The objective was to examine the effect of technological innovations on performance of the corporation. The study was guided by the balanced scorecard model and kotter's theory of change management. Empirical studies touching on technological innovations and performance have been reviewed. An explanatory research design, quantitative methods, and deductive approach were adopted. A census design was employed to obtain the 51 targeted management staff of ADC. A research questionnaire was used to collect pertinent data. The questionnaire was pilot tested with the aim of assessing its validity and reliability. Data collection was conducted physically and through emails. The collected data were analyzed with the assistance of the Statistical Package for Social Sciences. Descriptive as well as inferential statistics were used in data analysis. Before undertaking inferential statistical analysis, relevant diagnostic tests were conducted. The results of the analysis were presented graphically and in tabular form. It was revealed that technological innovations had statistically significant effect on performance of ADC. It was concluded that technological innovations were important tenets of strategic change management with regard to the performance of ADC. In order to enhance its performance, it was recommended that the corporation should consider integrating various innovative technologies. The management staff of ADC should ensure that they were updated with regard to the technological innovations already in place in the organization.

Key Words: Agricultural Development Corporation, performance, strategic change, strategic change management, technological innovations.

INTRODUCTION

Technological innovations which are embodied in strategic change are crucial elements in the performance of organizations. The management of strategic change is a necessity in global organizations partly because organizational health is demonstrated by its ability to strategically adapt to constant flux of dynamic influences on global business (Naghibi & Baban, 2011). Technological innovations are part of strategic change management. These innovations describe improved or completely new products and/or processes whose technological characteristics vary to a considerable extent from before (Henao-García & Montoya, 2021).

Importantly, it was presumed that technological innovations are influential on performance of organizations. Performance is a broad term that covers what an organization does, produces and accomplishes for units or entities that it interacts with. It is described as the organization's actual outcomes relative to the anticipated outcomes. Performance further refers to the measure of efficacy and effectiveness with which an organization can take advantage of resources at its disposal to enhance delivery of services and attain its goals (Arrerondo, Arturo, & Guadalupe, 2019).

Enhancing agricultural performance is aimed at improving the quality as well as standards of life of Africans (Mukasa, Woldemichael, Salami, & Simpasa, 2017). Generally, the performance of the agricultural sector in Africa is generally poor with untapped huge potential. In terms of productivity, the continent has lagged behind other regions in the productivity, agricultural mechanization, access to credit, as well as advisory and extension services. For instance, in the Sub-Saharan Africa (SSA) the cereal yields were about 1.43 tonnes per hectare between years 2000 and 2014 (Mukasa, et al., 2017). This was way below the 5.2 tonnes and 4.0 tonnes per hectare of cereal productivity in East Asia and Pacific countries, and Latin America and the Caribbean countries respectively (Mukasa, et al., 2017). However, it is not clearly documented regarding the performance of the agricultural corporations in Africa and also aspects of strategic change associated with these organizations.

It is apparent that there is quite considerable amount of literature dedicated to the performance of ADC. However, this literature has fallen short of explicitly and empirically demonstrating the effect of technological innovations on the organizational performance of the aforesaid parastatal. For instance, Mumin (2019) investigated how compensation programs influence employee performance in ADC. This means that the performance of employees was put into perspective without addressing the overall performance of the organization. Another study examined the effects of procurement planning on procurement performance of ADC (Kibet & Njeru, 2014), hence neither addressing performance nor technological innovations. Yet, another study came close when it investigated challenges faced by ADC in implementing strategic change (Ruttoh, 2014). Albeit the fact the latter study addressed strategic change in ADC, it did not link it to performance nor was it specific on technological innovations. Therefore, it was apparent that there existed a research gap relative to technological innovations and performance which needed to be addressed. The study focused on ADC given that the state corporation has been witnessing performance that falls short of the set target. A case in point is that the fact that production of agricultural commodities such as commercial wheat, silage maize, commercial maize, male rows, hay, citrus, and coffee recorded production performance that was below 70%. With regard to livestock performance, milk production (64.9%), dairy production (53.4%), beef production (58.2%), and sheep (71.3%) among others similarly recorded production that was only average (Republic of Kenya, 2020).

Statement of the Problem

In the ADC's strategic plan for 2019/20 to 2023/24, it is documented that the country faces a projected deficit in key crops notably maize, rice, and potatoes which were anticipated to drop by 27 million bags, 430,000 metric tonnes, and 83% respectively by year 2022. Granted the fact that ADC is the state agency mandated with the production and supply of high-quality seeds, the projected poor production is a clear demonstration of compromised performance of ADC (Republic of Kenya, 2019). Besides the seed production problem, other

performance challenges facing ADC include high cost of credit accessibility, low capacity for sales and marketing products, weak project management arrangements, poor quality hay and silage, low capacity in animal husbandry, low uptake of modern technologies despite a rapid change in technology needs, and insufficient information and communication technology (ICT) skills. Past pertinent empirical studies have fallen short of explicitly linking strategic change management to the performance of ADC (Rutto, 2014; Bosire, 2018; Kai, 2021). Therefore, this study was concerned with how the aforesaid performance was affected by strategic change management.

Objective of the Study

This study examined the effect of technological innovations on performance of the Agricultural Development Corporation. The study was guided by the following research question;

- What is the effect of technological innovations on performance of the ADC?

LITERATURE REVIEW

Theoretical Framework

The paper was guided by the balanced scorecard model. The balanced scorecard (BSC) was coined by Robert Kaplan and David Norton in 1992 (Kaplan & Norton, 1992). Balanced scorecard is a performance metric that is used to pinpoint and enhance internal business functions and their resulting external outcomes (Tarver, 2022). The BSC model illustrates the measurement of performance from four strategic perspectives which encompass financial, customer, internal business process and learning and growth perspectives (Akbarzadeh, 2012). The tenets of the BSC are applicable to all facets of an organization; financial and non-financial (Martin, 2022). The customer perspective involves how the organization appears to its customers in a bid to achieve its vision. Measurements under this tenet include time spent on customers' calls, market share, retention and customer satisfaction (Martin, 2022).

The balanced scorecard was used to anchor to the performance of Agricultural Development Corporation. The performance of ADC can be measured based on its role of supporting industries processing agricultural goods and promotion of production of essential agricultural inputs. The measurement metrics provided by balanced scorecard can be applied to gauge performance of ADC on areas of finance, customer satisfaction, the effectiveness of internal business processes (productivity) and growth. For instance, under customer satisfaction, the corporation may use the insights of balance scorecard to identify measures of customer (industries) satisfaction by producing pedigree livestock and hybrid agricultural inputs in a sustainable manner. In respect of this aspect, the organization can use balance scorecard to measure its performance on technology transfer to farmers and gauge their satisfaction.

Empirical Literature Review

A study conducted locally analyzed the effect of technological innovations on performance of organizations in Kenya (Mutie, 2018). The findings of the study showed that technological development tenets positively influenced performance of government agencies. It was inferred that performance of government agencies was influenced by system development enhancement, digital tools and services and information technology innovations. Inasmuch as this study has examined technological innovations, it is not apparent if the said innovations constitute strategic change management.

Another local study determined the effect of innovation on financial performance of parastatals in Kenya with a particular focus on Kenya Electricity Generating Company (Kibisu, 2020). The study noted that technological innovations greatly influenced financial performance. It was further noted that technological innovations aided product innovation which was market driven. Indeed, the study established that the products designed by the organization involved innovativeness of technology. The study concluded that innovation influenced financial

performance of the company. Technological innovations are examined relative to their influence of financial performance but not organizational performance.

A study conducted in Kenya was concerned with strategic mergers, operational cost reduction and performance of parastatals (Margaret & Severina, 2018). The study established that the performance of the directorates was insignificantly influenced by cost reduction in some directorates. It was concluded that, to enhance performance savings needed to be ploughed back to the directorates. Strategic change management as a predictor has not been addressed by this study. Another local study assessed the influence of management functions on the performance of state owned agricultural entities (Kabiru, 2019). The findings illustrated that organizational performance of the selected entities was influenced by the management functions that included organizing, leading, controlling and planning. The study concluded that management functions indeed influenced organizational performance of the state owned agricultural entities. Albeit the fact that the reviewed study linked management functions to performance, there was no apparent emphasis on strategic change management and how it affects performance of the said organizations.

METHODOLOGY

An explanatory research design was adopted. The choice of this design was informed by the fact that the study was concerned with the relationship between technological innovations and performance. Explanatory research design is adopted in studies which seek to establish relationship between constructs (Silva, 2012). Besides the stated design, quantitative research method was employed. The study targeted all the 51 management staff of ADC. The census design was adopted mainly due to the significantly small size of the target (accessible) population of 51 management staff and also because it enhances the reliability and generalizability of the study findings to the target population. Indicatively, a population census is considered to be the most reliable source of data for research (Elżbieta, 2016). Therefore, all the 51 management staff were enumerated. A research questionnaire that was structured in line with quantitative research method was used to collect data. Therefore, the questionnaire facilitated collection of numerical data in respect of technological innovations and performance of ADC. The collected data were analyzed using the Statistical Package for Social Sciences (SPSS). Precisely, descriptive and inferential statistics were used in data analysis. Descriptive statistics included measures of distribution, central tendencies, and variation. Inferential statistics encompassed correlation and regression analyses. However, before undertaking inferential statistical analysis, linearity test was done. The following empirical model guided regression analysis.

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon \ldots\ldots\ldots\ldots\ i$$

Where:

Y = Dependent variable (performance)

X_1 = Independent variable (technological innovations)

β_0 = Constant

β_1 = Coefficient of independent variable

ε = Error term

The results of the analysis were presented in form of tables. Participation of the managers in the study was voluntary. The participants were required to sign a consent form before they were allowed to take part in the study.

RESULTS AND DISCUSSION

The results of analysis fall under two categories, that is, descriptive and inferential analyses.

Descriptive analysis

The views of the management staff working at the ADC drawn from the various units, regions, departments, and divisions of the organization were sought regarding technological innovations and performance of the ADC. The results to this effect were shown in tables 1 and 2.

Table 1: Views of Management Staff on Technological Innovations

Propositions on Technological Innovations	SD (%)	D (%)	NAND (%)	A (%)	SA (%)	Mean	Std Dev
Disruptive innovations influence performance.	0	0	1 (2.0)	18 (36.0)	31 (62.0)	4.60	.535
Artificial intelligence affects performance.	0	0	2 (4.0)	39 (78.0)	9 (18.0)	4.14	.452
Cloud native applications significantly affect performance.	0	0	8 (16.0)	41 (82.0)	1 (2.0)	3.86	.405
Blockchain technology influences the performance of ADC.	0	1 (2.0)	9 (18.0)	38 (76.0)	2 (4.0)	3.82	.523
Radical innovations are a determining factor of performance.	0	2 (4.0)	22 (44.0)	25 (50.0)	1 (2.0)	3.50	.614
The organization uses cloud native applications.	0	1 (2.0)	45 (90.0)	4 (8.0)	0	3.06	.314
Technological innovations driven by blockchain technology are commonly used in ADC.	41 (82.0)	9 (18.0)	0	0	0	1.18	.388
It is evident that artificial intelligence is regularly used in the organization.	42 (84.0)	8 (16.0)	0	0	0	1.16	.370
Disruptive innovations are a common feature in ADC.	44 (88.0)	5 (10.0)	1 (2.0)	0	0	1.14	.405
In ADC, radical innovations are often used in the organization.	45 (90.0)	4 (8.0)	1 (2.0)	0	0	1.12	.385

In line with the descriptive results shown in Table 1, it was revealed that the vast majority of management staff were in strong agreement that disruptive innovations influenced performance of ADC (strongly agreed = 62.0%). In respect of this assertion, the respondents were generally in strong concurrence and their views were also largely similar (mean = 4.60; std dev = 0.535). It was also observed that the management staff concurred that artificial intelligence affected performance (agreed/strongly agreed = 96.0%), that cloud native applications significantly affected the performance of ADC (agreed/strongly agreed = 84.0%), and that blockchain technology influenced the performance of ADC (80.0%). The respondents were generally in agreement with the aforementioned propositions and their views did not vary significantly (mean ≈ 4.00; std dev < 1.000).

Inasmuch as 52.0% of the management staff opined that radical innovations were a determining factor of the ADC's performance, 44.0% were indifferent and 4.0% disagreed. On average, the respondents neither agreed nor disagreed on the assertion that the organization used cloud native applications (mean = 3.06). The respondents generally strongly disputed that technological innovations driven by blockchain technology were commonly used in ADC (mean = 1.18), it was evident that artificial intelligence was not regularly used in the organization (mean = 1.16), and that disruptive innovations were not a common feature in ADC (mean = 1.14). In respect of all the foregoing propositions, the participants possessed largely similar opinions (std dev < 1.000).

Almost all the management staff who participated in the study strongly refuted that radical innovations were often used in the organization (strongly disagreed = 90.0%; mean = 1.12; std dev = 0.385).

Table 2: Views of Management Staff on Performance

Propositions on Performance	SD (%)	D (%)	NAND (%)	A (%)	SA (%)	Mean	Std Dev
ADC offers services of high quality to its clients.	7 (14.0)	33 (66.0)	9 (18.0)	1 (2.0)	0	2.08	.634
The labour force of ADC has increased considerably over the past 10 years.	8 (16.0)	41 (82.0)	1 (2.0)	0	0	1.86	.405
The productivity of ADC has significantly increased in the past 10 years.	10 (20.0)	39 (78.0)	1 (2.0)	0	0	1.82	.438
ADC has become more efficient over the period of the past 10 years.	11 (22.0)	38 (76.0)	1 (2.0)	0	0	1.80	.452
Comparatively, ADC has become more effective over the period of the past 10 years.	13 (26.0)	36 (72.0)	1 (2.0)	0	0	1.76	.476
ADC offers excellent customer satisfaction (above 8 in a scale of 1 – 10).	26 (52.0)	23 (46.0)	0	1 (2.0)	0	1.52	.614

Illustratively (Table 2), the management staff who participated in the study generally and almost unanimously disputed all propositions put across with regard to various issues touching on the performance of ADC (mean ≈ 2.00; std dev < 1.000). Put into perspective, it was disputed by a majority of the respondents that ADC offered high quality services to its clients (disagreed/strongly disagreed = 80.0%). The respondents refuted to a large extent (disagreed/strongly disagree = 98.0%) that, over the past 10 years, the organization's labour force had increased considerably, the corporation's productivity had significantly increased, and that the organization had become more efficient. It was equally dismissed by a majority of the respondents (disagree/strongly disagreed = 98.0%) that the ADC had become comparatively more effective. A similar proportion of respondents disputed that the organization offered excellent customer satisfaction exceeding 8 point in a scale of 1 to 10. It is imperative to infer from these findings that, the ADC had fallen short of the expected performance for the period of the past 10 years.

Inferential analysis

In this section, the results of diagnostic test for linearity as well as the results of correlation and simple linear regression analyses are presented, interpreted and discussed. Under linearity in bivariate relationships and/or regression models, it is assumed that the dependent variable is a linear function of the independent variable (Niermann, 2007). Deviation from linearity is used to illustrate the significance (or lack thereof) of linearity of the respective sets of variables since it is one of the proposed parameters of assessing linearity (Liu, Chow, & Hsieh, 2009). The pertinent results are presented summarily in Table 3.

Table 3: Summarized Results of Linearity Test

		Sum of Squares	df	Mean Square	F	Sig.
Performance * Technological Innovations	(Combined)	3.355	10	.335	9.616	.000
	Linearity	2.864	1	2.864	82.101	.000
	Deviation from Linearity	.491	9	.055	1.562	.161

According to the results shown in Table 3, it was established that the relationship between technological innovations and performance was linear (deviation from linearity, p = 0.161 > 0.05).

The Spearman rank's correlation coefficient (ρ) is highly recommended for use in determining relationship between variables particularly in the case of ordinal data (Campbell & Swinscow, 2009). The foregoing assertion justified the adoption of ρ in assessing the correlation between technological innovations and performance of ADC. The results of to this effect are presented in Table 4.

Table 4: Results of Spearman Correlation

Spearman's rho			
Technological Innovations	Correlation Coefficient	1.000	
	Sig. (2-tailed)	.	
	N	50	
Performance	Correlation Coefficient	.496[**]	1.000
	Sig. (2-tailed)	.000	.
	N	50	50

According to the results shown in Table 4, there existed a positive, moderately strong, and statistically significant relationship between technological innovations and performance of ADC ($\rho = 0.496$; p = 0.000). The results meant that improving or increasing the technological innovations in the ADC was likely to enhance the organization's performance to a moderate though substantially.

The simple linear regression was carried out with the objective of demonstrating the effect of technological innovations on the performance of ADC. The pertinent results are presented in Tables 5, 6, and 7.

Table 5: Model Summary of Performance against Technological Innovations

Model	r	r Square	Adjusted r Square	Std. Error of the Estimate
1	.779[a]	.607	.599	.19639

a. Predictors: (Constant), Technological Innovations

The results of coefficient of determination ($r^2 = 0.609$) shown in Table 5 meant that technological innovations explained 60.9% of variation in the performance of ADC. The results of adjusted $r^2 = 0.599$ imply that technological innovations had more than average predictive value of the performance of ADC.

Table 6: ANOVA of Performance against Technological Innovations

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	2.864	1	2.864	74.268	.000[a]
Residual	1.851	48	.039		
Total	**4.716**	**49**			

a. Predictors: (Constant), Technological Innovations
b. Dependent Variable: Performance

The results of F-statistic, F (1, 48) = 74.268; p = 0.000 < 0.05 were found to be statistically significant. The results were interpreted to mean that there existed a linear relationship between technological innovations and performance. Therefore, the simple linear regression model ($Y = \beta_0 + \beta_1 X_1 + \varepsilon$) was applicable in analyzing the effect of technological innovations on performance of ADC as shown in Table 7.

Table 7: Regression Coefficients of Performance against Technological Innovations

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.425	.290		-1.467	.149
Technological Innovations	.880	.102	.779	8.618	.000

a. Dependent Variable: Performance

According to the results shown in Table 7 (Y = -0.425 + 0.880X_1), it was revealed that, while holding other factors constant, an single unit increase in the performance of ADC was subject to 0.880 unit increase in technological innovations. It was further established that the effect of technological innovations on the performance of the stated corporation was statistically significant (t = 8.618; p = 0.000 < 0.05). The results underscored the important role played by technological innovations in the performance of ADC.

Discussion

The results of the study were strongly in support of an earlier local study which indicated that technological innovations affected the performance of government agencies in Kenya (Mutie, 2018). Agricultural Development Corporation is one of the government agencies in the country. These results concurred to the findings of a previous study which indicated that in Nigeria, the governments had not adequately advanced technological innovations in enhancing agricultural development (Rongjian, et al., 2019). These results supported findings of an earlier study which indicated that the tenets of technological development had a positive correlation with the performance of government agencies in Kenya (Mutie, 2018). These results reinforced the findings of a past study which affirmed that technological development tenets influenced performance of government organization (Mutie, 2018).

CONCLUSION AND RECOMMENDATIONS

In reference to the construct of technological innovations, it was inferred that several such innovations comprising artificial intelligence, blockchain technology, cloud native applications as well as disruptive innovations were influential to the performance of ADC. This is despite a majority of them being quite rare in the corporation. Therefore, it was imperative to conclude that the stated influence of the technological innovations was largely hypothetical. On the same breadth, the potential of these innovations with regard to the performance of ADC is what the study largely alluded to. It was further concluded that technological innovations were very important to the ADC due to their potential to increase the organization's performance.

The policy makers at the ADC are recommended to consider integrating innovative technologies like artificial intelligence, blockchain technology, cloud native applications, and disruptive innovations given the findings that they were largely lacking in the corporation despite their potential to enhance the performance of the organization. The management staff working with ADC should ensure that they are up-to-date with regard to the technological innovations already in place in their organization. Being digital savvy and innovative is a recommendation that they should consider seriously.

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