EFFECT OF TECHNOLOGICAL INNOVATION STRATEGIES ON THE PERFORMANCE OF TEA FIRMS IN NANDI COUNTY, KENYA

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ABSTRACT

This study investigated the effect of technological innovation strategies on the performance of tea firms in Nandi County, The study was anchored on Rodger's Diffusion of Innovation Theory. This study used a descriptive survey research design, the target population for this study comprised the 19 tea firms in Nandi County, Kenya with a focus on 114 managers at the top, middle, and lower-level management. This study, being descriptive in several characteristics, couple with the fact that it targeted a relatively large population geographically spread in Nandi County, the researcher developed and used a questionnaire as the key data collection instrument. Data collected were quantitative. Quantitative data were analyzed by descriptive analysis. The descriptive statistical tools including Statistical Package for the Social Sciences (SPSS) and MS Excel helped the researcher to describe the data and determine the extent used. Inferential analysis involving correlation analysis was carried out to examine the relationship between variables while regression analysis was performed to establish the strength of the variables against the dependent variables. The correlation analysis results showed that there existed a positive and significant relationship between technological innovation strategies and firm performance ($\beta = 0.587$; P-value < 0.05). Regression analysis results showed that technological innovation strategies influenced firm performance ($\beta = 0.384$: P-value < 0.05).

Keywords: *Technological Innovation Strategies and Performance*

1.0 INTRODUCTION

1.1 Background of the Study

The extent to which tea firms gain competitive advantage relies on the degree to which the competitive advantage commanded is sustainable. Innovation in the tea sector is seen as the ability to create and popularize new products. Innovation has gained much relevance because of 3 main trends; rapidly changing technologies, market dynamics, and globalization that has increased the

level of competition. Innovative ability leads to economic development and sustainability of competitiveness among tea firms in Kenya (Maina, 2018). According to Silvestre and Ţîrcă (2019), an integral part of strategy implementation is innovation. Drucker further states that innovation is a pre-condition for specified strategies. Innovation helps in the creation of new businesses, the addition of value, and reduction in risks and this helps commercial banks stay competitive. Strategic innovation results in higher performance of an organization in terms of the growth in the share of the market and greater productivity. Therefore, organizations with the desire of gaining a competitive advantage can attain this through sound strategic innovations. Changes in consumer's tastes and preferences across the globe require organizations in any given industry to be innovative so that new products and ways of doing businesses are established for sustainable competitive advantage. In summary, therefore, an organization is said to be innovative when it can easily transform knowledge to commercial value by increasing efficiencies and effectiveness which leads to competitive advantage (Kumaraswamy et al., 2018).

Innovation is an increasingly important element of globalization and competitiveness. As globalization and international competition intensifies, technology becomes more central to firms' performance within the domestic and international market. Across the world, the Tea sector has realized a lot of competition and diversity in customer demands and preferences. The start in the usage of technological systems to ease the operations has led tea firms to seek new ways of beating off competition in this industry. According to Akcigit and Kerr (2018), a considerable amount of innovations have taken place in the tea industry in the United Kingdom. The adoption of the innovation strategies has enabled the UK tea industry to be able to sustain competitive advantage which heavily depends on the ability of organizations to internalize the benefits of innovative activities.

The relationship between innovation and firm performance has been confirmed in both empirical and theoretical studies. For instance,   examined the relationship between learning orientation, firm innovation and firm performance in US firms. Carol and Marvis (2007), examined the relationship between innovation and organizational performance of Taiwanese tea firms in the manufacturing sector. They measured performance in terms of firm sales.   assessed the relationship between the degree of innovation and performance among a sample of 1,901 Spanish tea firms and their study reveal evidence of a positive relationship between three types of innovation (product, process and managerial/systems) and performance.

Foster et al. (2018) suggest that firm-specific demand variations, rather than technical efficiency, are the dominant factor in determining firm survival and positively influence measured productivity. Product innovation should relate more to firm-specific demand variations, whereas process innovation is expected to affect technical efficiency. Using a sample of French firms in manufacturing and service industries. They showed that product innovation tends to be the dominating driver of labor productivity, while process innovation is both economically and statistically insignificant.

Studying a sample of firms in four European countries, Akcigit et al. (2018) argue that firms are more likely to engage in formal innovative activities, and that product innovation are demand-driven, while process is supply-driven. These authors also posit that process innovation only helps increase productivity in France, while product innovation is more effective and raises productivity in France, Spain, and the UK. Aliasghar et al. (2019) found strong evidence that product innovation, not process innovation, affects productivity. In summary, the prior literature in this

session tends to suggest that, in developing countries, e.g., Bangladesh, Pakistan, and Vietnam, process innovation is a stronger driver for firm performance, while in developed countries (e.g., European countries), the opposite is often found.

In African nations such as Egypt, South Africa, Ghana, Botswana among others have realized the current intense competition in the entire tea sub sector and this has forced them to come up with innovation strategies so as to remain competitive in business environment. Successful innovative strategies result into greater high performance besides competiveness (Aliasghar et al., 2019). The extent which tea firms gain competitive advantage relies on the degree which the competitive advantage commanded is sustainable. Innovation in the financial sector is seen as the ability to create and popularize new products. Today, innovation has gained much relevance because of 3 main trends; rapidly changing technologies, market dynamics and globalization that has increased the level of competition. Innovative ability leads to economic development and sustainability of competitiveness among tea firms in Africa (Aksoy, 2017).

In Nigeria, a study by Ibidunni et al. (2021) found that technology innovation and performance of employees of the tea firms were positively and significantly related. This further enhanced customer retention and satisfaction and therefore firm's performance. Tea Firms drive the Nigerian economy and contribute over 2.4% of the country's gross domestic products (GDP). While Zakir (2017) looking at the Ethiopian tea sector notes that innovation has had a positive impact on the returns in investment the tea sector makes. Any firm that uses ICT as an innovative strategy has been able to beat its competition in the market.

Increased global and regional competitions have led firms to determine to create or sustain competitive edge by engaging in innovation. A fast-changing environment with constant abrupt changes makes it indispensable for firms to build up their capability to innovate. Innovativeness is not only a matter of interest to practitioners, but has drawn great academic attention, especially in investigating the effect of several innovation specifications on firm performance. In Kenya, tea firms have realized the current intense competition in the entire tea industry and this has forced them to come up with innovative strategies to remain competitive in the business environment. Successful innovative strategies result in greater high performance besides competitiveness (Gesimba et al., 2015).

Innovation as a strategy consists of the implementation of a new product or improvement of existing business practices such as the marketing method, organizational culture, workplace organization practices, or external relations with customers. One major concern of innovation is to explore new technological capabilities. Fundamentally, innovation differs from incremental innovation whose main concern is exploring existing technological capabilities (Nowacki & Bachnik, 2016). According to Zakir (2017), there are several forms of innovation strategies but the main ones included market innovations, process innovations, organizational innovations, and service or product innovations.

Product innovation is the launching of critically updated or current services and goods. Such products are updated in terms of user-friendliness, parts, specifications, design, the usage among other aspects (Xie et al., 2019). Marketing innovation is the use of improved methods of marketing for example changes in promotion, pricing, packaging, design, and placement of products. Marketing innovation is geared towards meeting the expectations and needs of clients and establishment of new markets among others for competitive advantages (Ungerman et al., 2018).

Process innovation involves the use of updated methods of producing and delivering products to the market. Process innovation can be made deliberately for increased quality, decreased delivery prices, strengthening of quality, or production of products that are generally upgraded (Najafi-Tavani et al., 2018).

Innovations need to be centered on meeting the evolving needs of customers if it is to improve the competitiveness of an organization. There should be a link between innovation strategies and the whole innovation goals of an organization for competitive advantage. Innovation strategies need to give a description of how to convey significant innovations in an organization and the customers to enhance easy acceptance and diffusion (Xie et al., 2019). Innovations help businesses gain a competitive advantage while at the same time defending their competitive positions in the industry. Proactive methods of innovation can be taken by organizations in gaining strategic market positioning or reactive approaches of innovation to retain their market shares from innovative competitors (Ungerman et al., 2018).

Performance is defined as the capacity of a firm to execute its activities effectively and efficiently, thereby fulfilling an entitlement. Thus performance is measured in terms of internal procedures and processes, sufficient production of output, efficiency in carrying out daily operations of the organization, organizational arrangements, individual attitudes, and the responsiveness of the company to the situation among others. The performance of an employee and the whole organization is influenced mainly by its leadership (George et al., 2019). Organizational performance encompasses the real output of an institution compared with the set goals and objectives. Thus performance is how good the resources of a firm are being utilized. Performance can also be taken as the execution of a given duty measured against known values of correctness, completeness, speed, and cost. The completion of a project in a contract that releases the contractor from the obligation is also taken as performance (Al Khajeh, 2018).

Kenya has taken a leading position in tea export concerning size and quality; it is the second in tea production after Sri Lanka according to the World Trade organization report of 2010. Sri Lanka charges higher prices per kilogram of tea than Kenya and thereby earning more than Kenya in the market. This happens and yet Kenya leads in terms of volume. For example in the year 2010, Kenya managed to receive US$ 1.23 Billion from exports of 441 million kilograms of tea, while Sri Lanka received US$ 1.37 Billion (or 10% higher) from exporting 314 million kilograms (or 29% lower volumes). This, therefore, indicates that Sri Lanka charges higher prices than Kenya in the International market. Thus in 2010, Sri Lanka charged US$ 4.30 per kg compared to Kenya US$ 2.80 on average, resulting in a difference of 35% in terms of value realization (Titus & Cheruiyot, 2016).

Kenya recorded a 31% share of value in US dollars of the amount of tea exported followed by Sri Lanka and India. Whereas in terms of non-bulk teams Sri Lanka, the UK, India and the UAE top the list, but Kenya does not feature. Kenya is behind Sri Lanka, India, and UAE and this is due to poor performance by the tea companies in Kenya. The reason why Kenya charges lower prices than other competing countries in the market is due to tea company management as per the Tea Board of Kenya report of 2014). The notable progress in the tea industry is due to attributed to the supportive role of two key institutions in the tea sector (Chepkorir & Ann, 2018).

The business environment is changing faster than ever, according to research from the Boston Consulting Group nearly a third of United States companies are likely to seize operation in the next five years. This change is being driven by greater competition for instance in tea production there is competition from rival firms whereby other companies produce quality tea products and at a cheaper cost thereby charging a low price. There is also the challenge of changing customer needs whereby customers' tastes and preferences vary from time to time. One of the ways of making an organization more efficient and effective is by having strategic leaders across the organization. The old model of top-down leadership cannot cope with today's hyper-competitive markets.

Tea is the main cash crop and a source of income for the majority of residents in Nandi County. This is evidenced by the concentration of tea companies in the County; both local and multinational. However, it is notable that tea production in Nandi County is faced with a lot of challenges due to the Annual KTDA report of 2015/2016. Nandi County has experienced adverse fluctuations in tea productivity in the past. This trend has persisted irrespective of efforts by tea companies and farmers to devise methods and techniques to counter it. This problem has affected economic development in Nandi County since farmers rely heavily on tea production as their key source of earnings, Tea board of Kenya report of 2011. Moreover, tea manufacturing factories in the County face the challenges of sinking prices of tea, and yet production cost is increasing. Tea firms in Nandi County have tried to improve productivity by doing several things like embracing new technology that mitigates the rising production cost, encouraging innovation like inventing mechanical tea harvesting, and also creating new products to remain competitive in the market. A notable example is Chemartin Tea Company in Nandi County that has introduced the mechanization of tea plucking, a move that has seen many of its laborers become redundant (Chepkorir & Ann, 2018). All these challenges faced by tea firms in Nandi County contribute to the need to establish how innovations determine the performance of tea firms in Nandi County, Kenya.

1.2 Statement of the Problem

The Tea sector in the Kenyan economy contributes substantially to growth in output, exports, and employment. However, production in the Tea sector's growth declined for the fifth year in a row for the period 2011-2016 (Kenya National Bureau of Statistics, 2017). From 2011-2016 the employment obtained in the sector was on a downward trend. For instance, in 2011 the number engaged in the tea sector was 1,481; by 2009 this number had dropped to 757. Value added in the sub-sector in 2011 stood at ksh.3, 054 million, declining to ksh.1482 million in 2016 (Davis, 2016).

Tea firms in Nandi County have not achieved their expected growth target because they lack innovativeness. Hence, the firms have not sufficiently supported Nandi County's social-economic development agenda. These firms are seemingly facing the challenges of innovations and performance. There is little information to explain the causes of these challenges. tea firms, as an engine of growth, play a particularly important role in poverty reduction. One way of enhancing their performance is through innovation. Yet, lack of sufficient information on innovation as the creation of better or more effective products, processes, services, technologies, or ideas that are readily available to markets, governments, and society has made the firms not realize their expected performance and growth. Not many studies have addressed this issue adequately. There is an urgent need to determine the critical innovation aspects that hinder performance among tea

firms in Nandi County in Kenya. This is important because for a country like Kenya that is endeavoring to industrialize by the year 2030, the competitiveness of the Tea sector is critical (Sitienei et al., 2017). This study aimed to establish how tea firms could take advantage of innovation to realize the expected performance and growth.

Research has been carried out on innovation. Various recommendations have been put forward on best practices in innovation. Adams (2016) proposed various innovations namely innovation products, innovation services, innovation process, and applying existing technology for new uses in new markets (innovation technologies). Christensen et al. (2018) introduce disruptive innovation, which is a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors. However, innovation does not have to be something complex or radical. Innovation should be understood as something new to a local context.

Kariuki (2018) researched the innovation and performance of Micro and Small Enterprises (MSEs) in Kiambu County. MSEs were grouped into the sectors they served and the types of innovation (product, process, paradigm, and positioning) practiced in these sectors identified as well as the effect on the performance of these firms. Her findings indicated a direct relationship between innovation and firm performance. Kiarie (2014) carried out research on technological innovation and customer satisfaction in Kenya power and lighting company limited. He established that there exists a direct relationship between service innovation practices and the extent of customer satisfaction. Muigai and Gitau (2018) researched the effect of innovation strategies on the financial performance of the banking industry in Kenya. He identified that banks face multiple pressures and that banks with serious innovation strategies, improved their profitability. From the gap in the research carried out this study embarked to establish the influence of strategic innovation strategies on the performance of tea firms in Nandi County in Kenya.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

Diffusion of Innovation Theory

The diffusion of innovations was advanced by Everett Rogers in 1962 and seeks to explain how, why, and at what rate new ideas and technology spread. Rogers argues that diffusion is the process by which an innovation is communicated over time among the participants in a social system. Rogers further asserts that four main elements influence the spread of a new idea: the innovation itself, communication channels, time, and a social system, and this process relies heavily on human capital. The innovation must be widely adopted to sustain itself. The categories of adopters are innovators, early adapters, early majority, late majority, and laggards (Goh & Sigala, 2020).

Rogers argues that the attributes and characteristics of the innovation itself are important in determining the manner of its diffusion and the rate of its adoption (Nipo et al., 2018). Borrowing from the work of Thomas and Znaniecki (1927) he notes that it is what potential adopters perceive to be the attributes of an innovation that is the important thing. In the case of technological innovation, and almost all innovations studied fall into this category and the rate of its usage is

important for organizational growth and development. Rogers (1995) outlines two components to be considered: a hardware aspect consisting of a tool that embodies the technology as a physical object, and a software aspect comprising this tool's information base. Rogers outlines five important characteristics of an innovation that, he argues, affect its diffusion: relative advantage, compatibility, complexity, trialability, and observability. Concerning the tea industry, normalization and standardization procedures reduce uncertainty and create network effects that increase the profitability of adoption showing that compatibility standards constitute a factor likely to favor innovation diffusion. Noel et al. (2018) assert that technological innovation the rate of its usage are important for organizational growth and development.

2.2 Empirical Review

Technological Innovation Strategies and Performance

Technological innovation comprises activities that contribute to the research, development and design of new products, services or techniques, or to improving existing products, and generates new technological knowledge. Innovation process depends essentially on external conditions; designing of new technologies results from interactions with customers, suppliers, competitors and various other public and private organizations (Harel et al., 2021). This explains why clusters, competition and other business linkages are so important for the process of technological development. In this context, innovation seen as a system, in terms of spatial, at the regional or national level, allows understanding and analysis of these interactions, with impact on innovation propensity and performance of innovation activity (Zhan et al., 2017).

However, technological competitiveness resulted from innovation based on in-house R&D activity is an economic development moving force. An innovative company will achieve a high profit rate, giving a signal to other companies, including imitators who, if they have market entrance conditions, will pursue to share profit, resulting in diminishing initial innovator advantage (Ilori et al., 2017). Such imitator's —spreading at the industrial or sector level tackle technologic development in a time interval, after which emerged effects from new technologies upon growth will slow down. Taking this idea of Marxist origin, Schumpeter was to note the importance of innovations diffusion, arguing that imitators can be successful if they improve the original innovation, that is, if they become themselves innovators . In this framework, it becomes obvious that the technology acquisition cannot be simply assimilated with purchasing from suppliers. Companies must have the ability to identify the appropriate technologies they need, to assess technological options for using or their modification and, last but by no means to least, to integrate new technologies into production processes. With other words, companies that practice this type of innovation must have skills to purchase and use new or substantially improved technologies (Chaoji & Martinsuo, 2019).

Information sharing; refers to the official or unofficial sharing of meaningful, timely, and appropriate information between firms and can be defined as parties favorably providing helpful information to their partners Traditionally, an organization's management distributed information along a well-defined, top-down channel. Today, due to the spread of social technologies, information can be shared with great ease and almost no effort. This ease of information sharing makes it very difficult to assure that all information travels along the defined channels. Thus, many

organizations that already use social technologies to a wider extend are facing the problem of how to adopt their policies to the new nature of information sharing (Harel et al., 2021).

To empirically test the effect of technological innovation efficiency on firm performance, used the Survey of Business Strategy (SBS), which is a firm-level panel data set of Spanish manufacturing firms covering the period from 1990 to 2005. The study found that the use of the innovation outputs without considering the effort needed to achieve them might be overestimating their effect on firm performance. The results showed that there are few efficient firms in the Spanish manufacturing sector indicating that there is much room for improving the efficiency of the technological innovation process. The results also show the importance of measuring technological innovation efficiency as determinants of firm performance rather than the mere inclusion of innovation inputs or outputs .

3.0 METHODOLOGY

3.1 Research Design

Sovacool et al. (2018) defined research design as the choice concerning what, where, when, and how much regarding analysis on research study. The study adopted a descriptive research design.

3.2 Target Population

There are nineteen tea companies in Nandi County, the smallholder farmers' agency, KTDA, has two factories in Nandi County-Chebut in Kapsabet and Kaptumo in Nandi Aldai Sub County. Multinational firms have sixteen tea state companies while the state-owned Nyayo Tea Zones Development Corporation has one at Kipchabo in Chesumei Sub County. The target population consisted of top, middle, and lower-level managers of the tea companies in Nandi County since they act as the strategic leaders. The respondents were one top-level manager, two middle-level managers, and three lower-level managers from each tea company in Nandi County. According to a report of the tea board of Kenya of 2020, the target population was 114.

Table 1: Distribution of Target Population

Category	Number of respondents from the 14 tea firms	Total number of respondents from every category
Top-level managers	One (1) from each tea firm	19 top-level managers
Middle-level managers	Two (2) from each tea firm	38 middle-level managers
Lower-level managers	Three (3) from each tea firm	57 lower-level managers
	Total	**114**

Source: Tea board of Kenya report (2020)

3.3 Sampling Procedure

The study utilized Yin (2009) formula to arrive at the sample size:

$$S = X^2NP(1-P) \div d^2(N-1) + X^2 P(1-P)$$

S = required sample size
X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)

N = the population size.
P = the population proportion (assumed to be .50 since this would provide the maximum sample size).
d = the degree of accuracy expressed as a proportion (.05).
$S = X^2NP(1-P) \div d^2(N-1) + X^2P(1-P)$

$S = 3.841*114*0.5(1-0.5) \div 0.05^2*(114-1) + 3.841*0.5(1-0.5)$
$S = 3.841*114*0.25/ 0.05^2*113 + 3.841*0.25$
$S = 87$

From the calculation, a sample size of 87 was arrived at indicating that 87 respondents were selected to participate in the study.

3.4 Instrumentation

To ensure that the data collected address the study objectives, the data collection instrument must be selected appropriately to avoid collecting irrelevant information. This study, being descriptive in several characteristics, couple with the fact that it targets a relatively large population geographically spread in Nandi County, the researcher developed and used a questionnaire as the key data collection instrument. The questionnaire items comprised of both closed-ended questions. Questionnaires allow greater uniformity in the way questions are asked, ensuring greater compatibility in responses.

The pilot survey was conducted to find out if the respondents can respond to the questions without difficulty. It also evaluated the questions for relevance, comprehension, meaning, and clarity. For the pilot sample, Amir-Behghadami and Janati (2020) recommend 1% of the study population as being fit for a statistical test of instruments. The pilot study respondents were selected outside the main study sample but within the target population. A pilot study was undertaken on 10 respondents from tea firms in Kitale County. The results did not form part of the actual study findings.

3.5 Data analysis

Before processing the responses, the completed questionnaires were edited for completeness and consistency. The data were then coded to enable the responses to be grouped into various categories. Data collected were quantitative. Quantitative data were analyzed by descriptive analysis. The descriptive statistical tools such as SPSS and MS Excel helped the researcher to describe the data and determine the extent used. The findings were presented using tables. To quantify the strength of the relationship between the variables, the researcher used the following model:

$Y = \alpha + \beta_1X_1 + \varepsilon$

Where; Y= the dependent variable (performance)
α - Is a constant and it's the Y value when all the predictor values (X_1) is zero;
β_1, is the constant regression coefficients representing the condition of the independent variable to the dependent variables. X_1= Process innovation strategies; and ε - (Extraneous) Error term explaining the variability as a result of other factors not accounted for.

4.0 FINDINGS

4.1 Response Rate

Data were collected between June 2019 and July 2019 using a questionnaire. Eighty-seven (87) questionnaires were issued. Seventy-two (72) were returned representing seventy point five percent response rate (82.7%) as showed in Table 2.

Table 2: Response Rate

	Frequency	Percentage
Questionnaires Issued	87	100.0%
Questionnaires Returned	72	
Response Rate (%)		82.7

The response rate is considered adequate since Poynton et al. (2019) recommends response rates exceeding 50%.

4.2 Technological Innovation Strategies

The study sought to establish the respondents' level of agreement with the statement about technological innovation strategies in their organizations. The responses were captured via a Likert scale ranging from 1 – "strongly disagree" with a score of 1 point to the upper end of the scale as 5 – "Strongly agree" with a score of 5 points. Results are presented in Table 3.

Table 3: Descriptive Analysis for Technological Innovation Strategies

		1	2	3	4	5	Mean	Std dev
The innovation process has enabled quality tracking of tea and thus reducing turn-around time.	n	17	11	12	20	12	3.0	1.44
	%	23.6	15.3	16.7	27.8	16.7		
The weighing system has enabled faster transmission of accurate green leaf field weights information to reach the factory thus increasing the number of transactions.	n	6	20	14	19	13	3.2	1.26
	%	8.3	27.8	19.4	26.4	18.1		
Turnaround time between trips is reduced thus reducing green leaf waste and rejection at the factory.	n	7	17	14	24	9	3.2	1.21
	%	9.7	23.6	19.4	33.3	12.5		
Due to the weighing platform in the factory tea delivery has been efficient	n	11	13	23	15	10	3.0	1.26
	%	15.3	18.1	31.9	20.8	13.9		

improving overall quality and reducing damage cost in Tea firms in Nandi County.

Composite Mean	**3.1**

The respondents were asked whether the Innovation process has enabled quality tracking of tea and thus reducing turn-around time, 20 (27.8%) agreed, 12(16.7%) agreed another 12(16.7%) did not give any opinion while 17(23.6%) strongly disagreed with the sentiment. On the question "Weighing system has enabled faster transmission of accurate green leaf field weights information to reach the factory thus increasing number of transactions." 20(27.8%) disagreed while 19(26.4%) were in agreement with the sentiment. All the measures of technological innovation scored means ranging between 3.0 and 3.2 thus emphasizing the variations in the extent to which firms' innovation technologies. These findings imply that majority of tea firms in Kenya are not coming up with new technologies.

4.3 Inferential Analysis

This section described the inferential analysis of data. Inferential statistics try to infer information about a population by the formation of conclusions about the differences between populations concerning any given parameter or relationships between variables. This study used correlation analysis and regression analysis.

Pearson correlation coefficient matrix

The study conducted a correlation analysis to quantify the strength of the relationship between the variables, Karl Pearson's coefficient of correlation was used and a 2-tailed Pearson Correlation test was done at 95% confidence levels and the analysis presented in Table 4.

Table 4: Pearson Correlation Coefficient Matrix

		IT	**PER**
IT	Sig. (2-tailed) Pearson Correlation	1	
	Sig. (2-tailed)		
PER	Sig. (2-tailed) Pearson Correlation Sig. (2-tailed)	. .430 .000	1 .

** Correlation is significant at the 0.01 level (2-tailed), N = 72

*Key: **IT** = Technological innovation strategies; **PER**= Firm Performance*

The results in Table 4, indicate that there is a positive and significant relationship between technological innovation strategies and firm performance (r = 0.430, $p < 0.05$).

Regression Analysis

This section presents the results after performing a multiple regression analysis, regression analysis is a set of statistical processes for estimating the relationships among variables.

ANOVA Analysis for the Overall Model

The ANOVA analysis in Table 5 presents the influence of technological variable on Tea Firm Performance in Nandi County, Kenya. The results presented a p-value of 0.000 which was less than 0.05. This indicated that the model was statistically significant in explaining the impact of the independent variables on firm performance. It is therefore concluded that the independent variables had significant combined effects on firm performance. The model was for the estimation of the contributions of the independent variables on tea firm performance in Nandi County in Kenya.

Table 5: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85.182	4	21.295	65.786	.000(a)
	Residual	21.689	67	.3237		
	Total	**106.871**	**71**			

Model summary

The significance of the model was reaffirmed by the goodness of fit tests in Table 6, whereby the coefficient of determination (R square) of 0.797, the adjusted R square of 0.785 indicated that the model explained 78.5% of the variations. This meant that the linear model was a good fit in explaining the relationship between the dependent and independent variable. A further 20.3% of firm performance is attributed to other factors not investigated in this study.

Table 6: Fitness Test for the Overall Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.893(a)	.797	.785	.57765

Coefficient of determination
The study conducted a multiple regression analysis and from the above regression model, holding (products, processes, technological and market innovation strategies, and Firm Performance) constant at zero, the tea firm performance in Nandi County in Kenya will be 1.147. A unit change in technological innovation will lead to 0.384 units change in Firm Performance.

Table 7: Regression Analysis Results

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.147	3.93		2.915	.000
Innovation technologies	.384	.106	.397	3.608	.001

a Dependent Variable: Tea Firm Performance

Hypotheses Testing Results

H_{01}: Technological innovation strategies do not significantly affect the performance of tea firms in Nandi County, Kenya

The correlation analysis results in Table 4 show that technological innovation has a significant and positive relationship with firm performance at a 5% level. This is based on the *p*-values corresponding to the coefficients equivalent to 0.000. This finding led the study to reject the null hypothesis with a 95% confidence level. By rejecting the null hypothesis, the study concluded that technological innovation significantly influences the performance of tea firms in Nandi County, Kenya. The study findings are in line with Kelly et al. (2018) findings that technological innovation positively affected firms. Azar and Ciabuschi (2017) claim that innovation requires a process of co-evolution between technology and cultural perspectives. Technology exerts a significant influence on the ability to innovate and is viewed both as a major source of competitive advantage and new product innovation.

5.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This section summarizes the findings of the study based on the specific research objectives of the study.

Descriptive statistics were used to analyze this research objective and another subsequent analysis was done. The results showed the average mean was above 3.1 this meant that most of the respondents were neutral regarding technological innovation in their firms. The correlation analysis further revealed that there exists a positive and significant relationship between market innovation and firm performance ($r = 0.430$; p-value < 0.05). Regression analysis results indicated that technological innovation was found to be statistically significant in explaining firm performance since a unit change in technological innovation strategies caused 0.384 units to change in firm performance as indicated by the regression coefficient.

The study concludes that technological innovation strategies influence firm performance at bivariate and at linear regression level for most of the firms; the introduction of new processes did not significantly lead to an increase in sales. However, the introduction of new technologies in form of machines and equipment led to increased profits, market share and customer satisfaction.

This study recommends that for adequate support of the relationship between technological innovation to be realized the government should develop a policy framework to support and sustain innovation technologies. The government should also identify and recognize tea firms that excel in innovation technologies.

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