STRATEGIC ROLE OF BIG DATA ANALYTICS ON INNOVATION IN THE TELECOMMUNICATIONS SECTOR IN KENYA: A CASE OF SAFARICOM PLC

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ABSTRACT

This study investigated strategic role of big data analytics on innovation in the telecommunications sector in Kenya: A case of Safaricom PLC. Consequently, several research objectives that guided the study and included to assess the effect of product development strategies on innovation in telecommunication companies, to assess the impact of customer segmentation strategies on innovation in telecommunication companies, to determine the impact of precision marketing strategies on innovation in telecommunication companies and finally to assess the influence of fraud detection strategies on innovation in telecommunication companies. The target population was 1000 staff working at Safaricom PLC with a sample of 286 respondents comprising the company employees. As such, during data collection and analysis, this study employed both descriptive research design and random sampling technique. Specifically, data collection was accomplished through self-administered questionnaire method. Additionally, data analysis was accomplished through a descriptive statistical tool, and specifically SPSS (Statistical Package for the Social Sciences). Furthermore, the mean and other measures of central tendency, tabulations, percentages, charts, and tables were employed to present the findings. Finally, to assess how significantly the dependent variable was influenced by the independent variables, this study used a regression model. Conclusively, the study found out that all variables under study including Product Development, Customer segmentation, Precision Marketing, Fraud detection had impact on Innovation in the telecommunication industry in Kenya. The study recommended that telecommunication industry should create conducive environment and develop strategies so that they can come up with new technologies as a result of innovation without barriers. Strategies should be developed in order to ensure good development of the products.

Key word: *Product Development Strategies, Customer Segmentation, Marketing Strategies, Fraud Detection Strategies*

INTRODUCTION

Based on the definition provided by SAS.com, the new technologies and techniques used to collect, manage, and analyze the huge volume of unstructured and structured data in real-time broadly refers to big data. However, what matters is what organizations do with the data; the amount of data is not significant. As such, in order to gain insights that would facilitate strategic innovations and better decisions, big data can be analyzed.

The four dimensions encompassed under big data include Veracity, Variety, Velocity, and Volume (Cisco, 2012). Currently, in addition to inability to understand how it benefits their organizations, most organizations are still grappling with what big data means. A recent survey conducted by Sas (2013) on Big Data found out that while 71 percent are on the verge of beginning the planning stage, only 12 percent of organizations are executing or implementing the big data strategy. Thus, it is apparent that firms require having a clear understanding of their rules, services, goods, and customers. Apparently, organizations can locate new techniques of competing with other firms with the help of big data.

A report on Big Data usage for telecommunication operators by Institute of electrical and Electronics Engineers (IEEE)(2015) indicated that numerous unprecedented changes in terms of volumes of data being moved including unstructured complex data, variety of data that comprises the social networking data, and volumes of data being moved with the inclusion of video have significantly impacted today's networks. This is the case despite the fact that for years, multiple terabytes of data has been moved by Telco's around their networks.

A recent report on global market in telecom industry by Research and Markets (2014) established that over the next four years, a compound annual rate of growth of 28.28 percent is expected with respect to the usage of data analytics tools by the telecom sector. Studies carried out on usage of BDA reveals that as compared to the traditional analytics systems, overall efficiency in decision making and management is increased by the new technology (Agarwal 2013; Chen et al. 2012; SAP 2012). In another study, Randall and Fovargue (2011) found out that with respect to how they communicate with their clients, many Telco's have understood the value of big data. The authors claimed that in order to target their communications more effectively in the future, these Telco's have employed BDA to create institutional backups for every client's likes and dislikes, as well as those promotions or channels that customers have reacted to. Randall and Fovargue (2011) also argued that generate a much profound perspective of each client that is core to gaining true competitive edge and satisfying their marketing promises, Telco's need to incorporate data from emergent and new avenues into their communication mix including user generated content, social media, and web behavior.

According to Manyika et al. (2011), sets of data with a size such that carrying out the analysis is not possible, as well as impossible to manage, store, and capture them with typical database software tools is known as big data. However, based on the applications being used to analyze and process the data set, as well as the capabilities of the organization in managing it, the definition provided varies from sector to the other in the industry. For example, data in terms of hundreds of gigabytes may be considered big data in one organization whereas in another organization big data may be tens or hundreds of terabytes. The ability to gather, often from multiple sources, huge data volumes and manipulate it to develop new types of predictions, measurements, and observations about individual customers, in the marketing context, is known as big data (Council of Economic Advisors (U.S.A.) 2015).

Big data can also be defined according to its characteristics as given by Laney& Douglas (2012) who defines it as high variety, high velocity, and/or high volume assets of information requiring emerging processing forms to facilitate process optimization, insight discovery, and enhanced decision making. Since data is set as negative based on the idea that 'big' is 'bad,' some researchers view the term big data as ambiguous (Andrade et al., 2014). However, with respect to the different definitions provided earlier, the core features of big data including speed, variety, and quantity are more of technical characteristics, which rely on the evolution of processing, storage, and computing technologies, instead of the data itself. The ramification of these descriptions is such that it is the manner in which they may contribute to value addition to the business and innovation, which is significant, but not the variety, speed, or volume of the data.

On the other hand, the methodologies and tools employed in the transformation of extensive amounts of raw data, both unstructured and structured and for the intentions of performing an analysis, into "data regarding the data" is known as BDA (Emmanuel, 2011). Although a brave new world is being heralded by new analytical platforms optimized for big data, study guide by SAP Solutions argues that BDA has been inefficient and expensive, traditionally (SAP, 2012). While setting up an analytics platform more accessible than ever before, some of the examples of databases provided including Not Only SQL (NoSQL) and an open-source Apache product known as Hadoop, do not need the significant upfront license costs of traditional systems. According to Nyanducha (2014), a variety of insights regarding a business, the market in which it operates, its weaknesses, and strengths are technically revealed by running analytics on big data. Further, the author asserts that new perspective that can fuel innovation in service, partnerships, and product development are provided by big data analytics.

Statement of the Problem

In the wake of rapid developments in the mobile market, improved international connectivity, and increased competion, the telecommunication sector in Kenya continues to evolve. In the recent years, the arrival of four fiber-optic submarine cables has facilitated the affordability of internet access to a greater proportion of the population, as well as reduced the cost of internet access and phone calls. In parallel, with the aim of developing further competition, the regulators of the sector have implemented a range of regulations and reduced the interconnection tariffs. Long gone are the days a CSP was supposed to invest heavily in costly infrastructure. The Communication Authority of Kenya(CAK), by allowing service-neutral regulatory framework and operators to provide technological services of any kind, introduced a converged and simplified licensing regime in 2008 which has increased competition and reduced the market entry barriers. It, therefore, implies that there is increased competition in the market and only the innovative providers will stand the test of time in terms of customer acquisition and retention as well as profitability.

According to Internet World Stats (2017), internet connections are accessible to 54.4% of the population in the world today. In addition, from 0.4 Billion in 2000 to 3.4 Billion in 2016, the count of users of the internet has risen dramatically. According to the annual internet trend report 2016 edition by Mary Meeker, China has the biggest internet population followed by India and USA. Mobile computing has changed the landscape of workplace dramatically and brought many advantages to users of internet including easy mobility, increased productivity, and wireless connectivity. Furthermore, positive trends towards the adoption of mobile technologies in developing and developed nations have been indicated by Google Consumer Barometer (2016). For example, in China and USA, the percentage of people who use a smart phone for internet has increased

from 33% and 44% in 2012 to 79% and 72% in 2016 respectively.

According to CAK(2018), report on sector performance quarter 3 2017-2018, mobile penetration rose by 3.0 per cent to hit 44.119million subscribers between January and March 2018. This is compared to 42.815 million subscription during the previous quarter, hence registering a 3.0 percent growth.

With Safaricom PLC topping the providers in terms of market share which stands at 67 per cent marking a decline of 2.1 percentage points from 69.1 percent recorded in the last quarter of the year. Further, as recorded during the previous quarter, Airtel Networks Limited's market shares rose from 17.2 per cent to 19.7 per cent. On the other hand, registering a market share of 8.6 per cent from 9.0 per cent Telkom Kenya Limited lost 0.4 percent points, as posted in the previous quarter. Additionally, posting a market share of 4.4 per cent, the marjet shares for Finserve Africa Limited, trading as Equitel, decreased by 0.1 percentage points. This shows how competitive the telecommunication space in Kenya is.

Different studies that relate to strategic roles in in the telecommunication sector have been carried out locally and globally. Akin (2014) inspected competitive procedures and enhanced performance on chosen Nigerian transmission organizations where he found a connection between competitive techniques and customer loyalty, maintenance and dependability. Oyedijo (2012) also carried out a research on competitive performance and strategic agility among Nigerian Telecommunication companies and established that competitive performance of Nigeria-based media transmission companies is impacted by strategic agility. Similarly, in their study to establish how the Kenyan telecommunication companies' performance was impacted by competitive strategies, Kyengo et al., (2016) found out that strategies in cost leadership, followed by strategies in differentiation, strategies in market, and then strategies in corporate development were the most essential strategies in performance of Kenya-based telecommunication firms.

In the wake of this increased competition, it is evident business as usual activities will not retain existing or acquire new customers. To ensure companies are ahead of the pack and attract new customers they have to introduce innovative products and services which give customers enhanced customer experience and guarantee value for money. This study therefore, examined the strategic role of big data analytics on innovation and specifically it looked at the product development, customer segmentation, precision marketing and fraud detection as areas where big data analytics if fully utilized would make a great impact in turning around fortunes in the telecommunication industry.

Objectives of the Study

Examining the strategic role of big data analytics on innovation in the telecommunication sector in Kenya was the general objective of this study. The specific objectives were:-

▪ To assess the impact of product development strategies on innovation in telecommunications sector in Kenya;
▪ To assess the impact of customer segmentation strategies on innovation in telecommunications sector in Kenya;
▪ To determine the influence of precision marketing strategies on innovation in telecommunications sector in Kenya;
▪ To evaluate the impact of fraud detection strategies on innovation in the telecommunication sector in Kenya.

LITERATURE REVIEW

Theoretical Review

Schumpeterian's Innovation Theory

According to this theory, the key to making a firm valuable in a given industry is innovation. Through the introduction of new and improved products and services, a firm can remain relevant in a stiffly competitive market (Amit and Zott, 2001). According to the theory, consumer preferences are not spontaneous but are rather already innate. This means that irrespective of the economic changes that take place in a country, consumers already know what they want, (Schumpeter, 1934). Innovation was identified by Schumpeter as the core feature of economic change. The author also argued that it was upon market power, entrepreneurial activities, and innovation that economic change revolves around. As such, the author aimed to provide proof that, as opposed to the invisible hand and price competition, innovation-originated market power could offer better outcomes. He also claimed that while tolerating abnormal profits that would soon face stiff tussles from competitive imitators and firms, temporary monopolies are often created by technological innovation. However, he appreciated the necessary role played by the temporary monopolies for acting as stimuli in the development of new processes, services, and products by firms.

The innovation theory is divided into five steps including the re-launch of an already known product or launch of a new one, the introduction of new production or sales methods (that have not been proven yet in the industry), the creation of previously non-existent markets, the purchase/ acquisition of new sources of supplies of raw materials, as well as the implementation a new industry structure that becomes a monopoly or that destroys an existing one (Schumpeter, 1934). Schumpeter argues that in order for one to make profit, they have to be innovative.

The Resource-based View (RBV)

According to the Resource – Based Theory of Competitive Advantage states that the resources owned by a firm include all information, assets, organizational processes, capabilities and knowledge (big data analytics and predictive analytics included) controlled by the firm that give it the ability to plan and improve its efficiency and effectiveness through implementation of its strategy (Rugman and Verbeke, 2002). A firm attains competitive advantage using this theory when its rivals are unable to duplicate its level of performance. In addition, the firm must have four attributes. Firstly, it must be of some value that it exhibits by exploiting opportunities and neutralizing threats. Secondly, it must be imperfectly imitable – worthy of imitation but difficult to imitate. Thirdly, it must be rare when compared to its competitors in terms of uniqueness of products offered and fourthly, equivalent substitutes for the resource could not exist (Rugman and Verbeke, 2002).

The Knowledge-Based View

While a variety of researchers claim that knowledge possess a number of special attributes that make it the most valuable and significant resource (Murray 2000; Teece et al. 1997; Tiwana 2002), it is perceived as generic resource by most proponents of the Knowledge-Based View model. BDA has been used extensively to build knowledge bases within organizations that have been used extensively by cross functional teams to streamline business processes that drive innovation, cost management, among others.

The primary drivers of superior performance in this age of information include competencies, intellectual assets, know-how, and knowledge (Hamel and Prahalad, 1994). Additionally, according to Tiwana (2002) and Evans (2003), the most significant resource a company can have is knowledge. As such, while knowledge assets increase with use, material resources reduce when used in the firm (Evans, 2003). Moreover, Tiwana (2002) claimed that while

the only resource that is difficult to imitate is knowledge, it is easier for a firm to copy product sources, market share, capital, and technology.
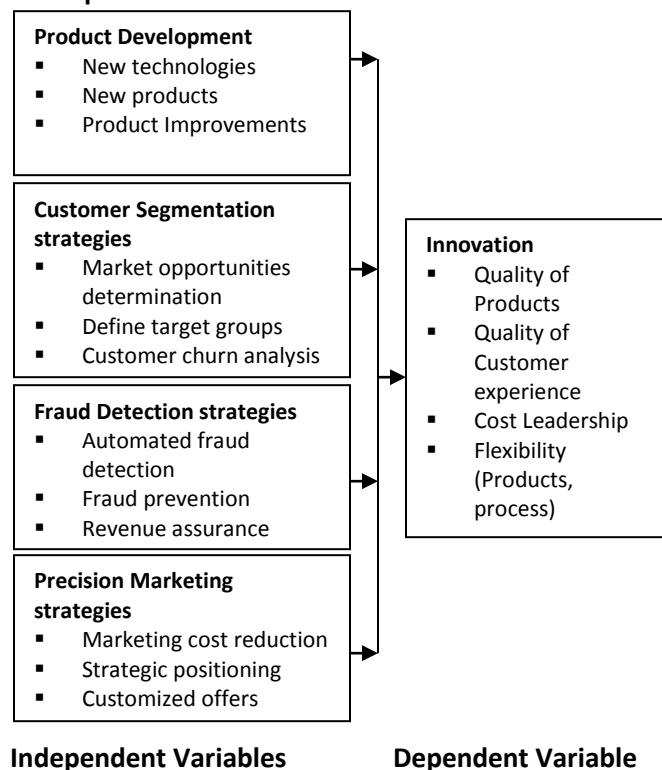
Conceptual Framework

Figure 1: Conceptual Framework

Source: Author (2018)

Empirical Review

Customer Segmentation Strategies

With the inclusion of developing messages and tailoring programs to meet their specific needs, the process in which target clients are divided into groups with the purpose of a better comprehension of their behaviours, and where each segment is evaluated from select target segments, and further creating a feasible mix for each of those segment is known as customer segmentation. In addition to gaining a better understanding their specific behaviours, barriers, needs, wants (Kotler and Lee, 2002).

Chelimo (2012) studied the segmentation strategies put in use by Telecommunication firms in Kenya. The study collected primary data by use of questionnaire that wassemi structured, which were directed to in-charge individuals of strategic planning function, and in lack of their presence, to persons managing the marketing function. The findings of the study established that customers prefer most telecommunication firms because of their characteristics of products, advancement in technological, superior characteristics of product and prices that are competitive, as these impacts on positioning to a larger degree. A study of Dabholkar (2015) indicates that clients start looking for other brands when do not get their complaints considered properly. Since the customers may not able to address them properly or the complaints do not get handled by customer service centers, this may happen. According to Kim et al. (2006), in order to heighten up customer satisfaction, service provider should provide customer oriented services. The study also established that if the entirety of required services accumulated in a particular brand is accessible, a brand satisfies the customers more (Lichntestein et al., 2004). In other words, clients tend to carry out an explicit comparison between what they get and what is given. As such, the literature supports the positive association between satisfaction and equity (Oliver, 2006).

Product Development Strategies

Having the marketability attribute to current customers through established channels, the creation of new or the substantial modification of existing products, but related products entails product development (Pearce and Robinson, 2000). The national policy rooted on innovative imperatives strongly influences innovation activities of the organizations within a country towards product

development (Porter and Stern, 2002). Additionally, with specific reference to developing countries, Goh (2005) asserts that an accelerated pace of sustainable and competitive industrial growth within a functional framework should be the objective of industrial policy generation as characterized by a growing market of the product development, in order to achieve an innovation-driven economy.

In their study, Nwokah, Elizabeth, and Ofoegbu (2009) established that the corporate strategies were positively and correlated significantly with product mix among other things including product quality and product lines in the product development facets. This finding informed customer loyalty, sales volume, and performance facets of profitability as well. Further, a more important role in improving the performance of organizations and providing a competitive advantage may be played by the product development (Mester, 2003). There are different models that have been used to discuss service development quality. The model by Garvin (1987) describes eight quality of products dimensions including performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Jonach and Sommerlatte (1999) model lists eight dimensions that are categorized into satisfiers and dissatisfies. On the other hand, service accessibility, understanding the customers, courtesy, competence, security, credibility, communication, tangibles, responsiveness, and reliability include the ten requirements identified by Parasuraman et al (1990) as useful for evaluating customers' quality of services development. The studies conducted did not show the effect of product development on innovation in telecommunication companies. Further, an analysis was performed in this study to determine the effect of product development on innovation in telecommunication companies.

Fraud Detection Strategies

Several studies have been conducted on fraud detection. With a specific focus to deposit-taking micro finance institutions in Kenya, Njenga and Osiemo (2013) carried out a study to investigate how organization performance was influenced by fraud risk management. In this study, all deposit-taking microfinance institutions in Kenya were the target population in the collection of both primary and secondary data. Additionally, with the sample having been drawn from the lower management, middle management, and senior management staff of the 8 deposit-taking microfinance institutions' head office branches, the study adopted stratified sampling. As such, while a semi-structured questionnaire was used for collecting primary data from the respondents, secondary data was gathered from the CBK (2012) report. The researchers also carried out both quantitative and qualitative analysis. based on the findings, the study established that the anti-fraud policies that most of the organizations had were effective. In this regard, the research also found out that distinct and separate policy of anti-fraud, different from the conduct policy code, was owned by these organizations. In addition, while organization performance is affected significantly by Anti-Fraud Policies, all the employees are made to understand the constitution of fraud in all the deposit-taking microfinance's products and procedures and policies have been documented by institutions that are clearly made aware to all. The studies reviewed were majorly involving banks and financial institutions. This study will be carried out in a telecommunication industry as opposed to financial institutions.

Precision Marketing Strategies

Several studies have been carried out precision marketing. To begin with, Sandvik and Sandvik (2003) established that an increase in sales in directly impacted by precision marketing. In a related study, Johne and Davies (2000) concurred that leading to

additional profit to innovative organizations, sales growth can be enhanced by marketing precision through an increase in product demands.

In a different study and with specific reference to United Bank of Africa Limited in Kenya, Karanja (2011) sought to examine how competitive advantage and marketing strategies were related. The study shows that through market segmentation, the Kenyan financial sector has been the aim of service by UBA. With reference to commercial banks, Simiyu (2013) carried out a study in which he established that market innovation strategies that incorporated precision marketing were adopted by these banks. In another study that focused on the telecommunication sector, Letangule and Letting (2012) sought to establish how performance of organizations and market innovation were related. The study revealed that in addition to adopting aggressive anti-competitors marketing campaigns, Kenyan telecommunication firms adopted response to change and environmental analysis. Similarly, Mugo (2015) carried out a research among firms in the wine industry on how innovation and performance were related and established that firms were able to provide adoption of product development that would offer greater rewards, is radical, and incentive, as well as offer a broad assortment of products that satisfied the quality of satisfaction through a getting a service or product to the market and framework that make the duration of market survey shorter, as well. The studies reviewed under precision marketing did not touch on the influence of precision marketing on innovation in telecommunication companies. The analysis from this study determined the effect of precision marketing on innovation in telecommunication companies.

Big Data Analytics

With the studies having researched on several factors that facilitate the adoption of a technology including big data analytics by firms, a number of scholarly articles and publications (Verheij, 2013; Oghuma, 2013, Tambe, 2012) include documentation regarding a several empirical researches that have been carried out to investigate the strategic use of big data analytics.

According to (Donovan and Gropper, 2011), the Nobel Prize winner and a Danish physicist, Nils Bohr, once said that, "Prediction is very difficult, especially if it is about the future." However, this does not stop companies from trying to use data to model what will happen in the future and where they can ameliorate their opportunities of success in the market.

According to IDC worldwide CIO agenda 2015, a pan-enterprise data analytics strategy is expected to have been rolled out by 30 per cent of CIO's by 2018. From the perspective of data, while using it to look forward into what may happen to the business and the market it operates in, this kind of investment involves more ways of handling information. From a strategic standpoint, using Big Data Analytics- and specifically predictive analytics – and techniques within the enterprise means every one across the company should have access to data and be skilled in using it.

In collaboration with IBM Institute of Business Value (2011), MIT Sloan Management carried out a research investigating how firms manipulate data analytics to guide action and gain insight. The coverage of the survey included over 3000 business analysts, managers, and executives from 15 firms all over the globe. The study showed that with the biggest challenges being visualizing data differently would become increasingly valuable and adopting and utilizing big data analytics are cultural and managerial, organizations that perform the best were twice as likely to manipulate big data analytics to their operations.

METHODOLOGY

While a case study was conducted, this research manipulated a descriptive research design.

Technically, to describe the state of affairs as it was at the time was the primary objective of a descriptive research design. According to Mugenda and Mugenda (2008), the process in which data is collected with the aim of answering questions regarding the apparent situation and statuses of the study subjects entail descriptive research. In the current study, the target population comprised of 1000 employees of Safaricom PLC (Human Resource Department, Safaricom PLC, 2018). This included eighteen (18) members of the senior leadership team (SLT), thirty five (35) middle level managers, and nine hundred and fourth seven (947) general employees. To gather primary data on product development, customer segmentation, precision marketing, fraud detection and innovation, the current study utilized a structured questionnaire. To this effect, the multiple linear regression model of the independent variables against the dependent variable was presented in the equation below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X4 + e$$

Where:

Y = Innovation in the telecommunication industry

β_1, β_2 and β_3, β_4, = Beta coefficients

β_0 = Constant Term

X_1 = Product development

X_2 = Customer segmentation

X_3 = Precision Marketing

X_4 = Fraud detection

ε = Error term

RESULTS

Product Development

The study established the extent in which product development affects the innovation in telecommunication industry. As recorded, the results were indicated in Table 1 below: Key: (5) -Strongly Agree (4) – Agree (3) - Neutral (2) – Disagree (1)- Strongly disagree.

Table 1: Product Development

SERVICE	5	4	3	2	1	Mean	S.D
There is number of new technology gained as a result of product innovation	67.7%	27.2%	5.2%	-	-	4.62	.583
there are more number of new products	31.9%	51.6%	16.4%	-	-	4.15	.680
The research and development budget has been set for innovation of new products	31.5%	27.7%	40.8%	-	-	3.91	.847
There is Improvement in response time to customer queries as a result of innovation	59.2%	24.7%	9.9%	6.1%	-	4.37	.895

Findings from table 1 showed that the highest percentage of the respondents, 67.7%, strongly agreed that there was a number of new technology gained from product innovation with a strong mean of 4.62 and standard deviation of 0.583. However, those who "moderately agreed" represented 27.2%. Additionally, the findings showed that most of the respondents, 51.6%, agreed that there a higher number of new products have been produced, with a mean of 4.15 and standard deviation of 0.680. On the other hand, 31.5% strongly agreed that the research and development budget has been set for innovation of new products, with a standard deviation of 0.847 and mean of 3.91. Finally, (59.2%) strongly agreed that there was Improvement in response time to customer queries resulting from innovation, with a standard deviation of 0.895 and mean of 4.37. These findings were consistence with the results obtained by Werdigier (2009) who found out that through tapping into 'hidden values' in big data, retailers can raise their operating margins by 60%.

Customer Segmentation

The study established the extent in which customer segmentation affects the innovation in telecommunication industry. As recorded, the results were indicated in Table 2 below: Key: (5) -Strongly Agree (4) – Agree (3) - Neutral (2) – Disagree Weak (1)-Strongly disagree.

Table 2: Customer Segmentation

SERVICE	5	4	3	2	1	Mean	S.D
Focusing on a one or specific customer segment can be beneficial to innovation in telecommunication industry.	41.8%	38.5%	19.7%	-	-	4.02	1.101
Customer segmentation helps telecommunication to adjust to specific needs in the market.	77.9%	12.2%	9.9%	-	-	4.68	.648
Effective customer segmentation can allow telecommunication industry to serve their clients according to their needs.	87.8%	12.2%	-	-	-	4.88	.328
Segmentation can help telecommunication to identify the areas having specific needs and to find new customers.	63.4%	36.6%	-	-	-	4.63	.483
Segmenting clients based on resemblance of their reactions can enhance innovation in telecommunication industry.	53.1%	31.9%	15.0%	-	-	4.38	.734

The highest percentage 41.8% of the respondents strongly agreed that Focusing on a one or specific customer segment could be beneficial to innovation in telecommunication industry, with a mean of 4.02 and standard deviation of 1.101. Further, 38.5% had similar views about the issue. Additionally, most of the participants, representing 77.9%, strongly agreed that customer segmentation helps telecommunication to adjust to specific needs in the market, with a mean of 4.68 and standard deviation of .648. Further, a higher proportion of the respondents, representing 87.8%, also concurred that effective customer segmentation can allow telecommunication industry to serve their clients according to their needs, with a standard deviation of 0.328 and mean of 4.88. Additionally, with a mean of 4.63 and standard deviation of 0.483, 63.4% of the respondents strongly agreed that segmentation could help telecommunication to identify the areas having specific needs and to find new customers. Finally, 53.1% strongly agreed that segmenting clients based on resemblance of their reactions could enhance innovation in telecommunication industry 31.9% of the respondents agreed on the same while only 15.0 were neutral, with a standard deviation of 0.734 and mean of 4.38. One of the respondent stated that big data analytics presents opportunities that helps telecommunications to concentrate on customers that are of important as well as to predict the motion of customers with time. These findings were consistence with the results obtained by Select Statistical Consultants (2016) that an essential activity in business that helps a firm to analyze and identify the strength of its competition, market trends, market size, and market demand is market research.

Precision Marketing

The study established the extent in which precision marketing affects the innovation in telecommunication industry. Again, as recorded, the results were indicated in Table 3 below: Key: (5) - Strongly Agree (4) – Agree (3) - Neutral (2) – Disagree Weak (1)-Strongly disagree.

Table 3: Precision marketing

SERVICE	5	4	3	2	1	Mean	S.D
Corporate precision marketing increases market value which tends to enhance innovation in telecommunication industry	52.1%	36.6%	6.1%	5.1%	-	4.31	.979
Telecommunication industry management recognize precision marketing strategy as an innovation.	56.3%	22.5%	21.1%	-	-	4.35	.809
Precision marketing is also crucial to the growth of telecommunication industry.	62.0%	38.0%	-	-	-	4.62	.487
telecommunication industry seeks to create more programs on marketing through innovations to address a wider scope of issues	46.9%	43.7%	9.4%			4.38	.651

Findings from table 3 displayed that majority 52.1% ascertains and strongly agree that corporate precision marketing increases market value which tends to enhance innovation in telecommunication industry with a standard deviation of 0.979 and a mean of 4.31. Alternative Telecommunication industry management recognize precision marketing strategy as an innovation as sighted by majority of the respondents (56.3%) with a standard deviation and mean of 0.809 and 4.35, respectively. Majority of the participants, representing 62.0%, also strongly agreed that precision marketing is also crucial to the growth of telecommunication industry with a mean of 4.62 and standard deviation of 0.487. Further, a substantial number of participants, representing 46.9%, strongly agreed that telecommunication industry seeks to create more programs on marketing through innovations to address a wider scope of issues, with a standard deviation of 0.651 and mean of 4.38. Notably, 43.7% of the respondent agreed and supported the statement. One of the respondent stated that the impact of big data analytics on precision marketing is to enable predictive analysis of existing customers and how they can respond to changes and also to get more data through mining without customers consent hence zero bias. The findings were consistence with the results obtained by big data and advanced analytics that found out that to foster client relations, companies market their services and products.

Fraud Detection

The study established the extent in which fraud detection affects the innovation in telecommunication industry. Again, as recorded, the results have been presented in Table 4 below: Key: (5) -Strongly Agree (4) – Agree (3) - Neutral (2) – Disagree Weak (1)-Strongly disagree.

Table 4: Fraud Detection

SERVICE	5	4	3	2	1	Mean	S.D
Telecommunication companies engage external auditors to analyze. Financial statements periodically to come up with innovative ways of dealing with fraud.	26.8%	42.7%	30.5%	-	-	3.96	.758
Telecommunication companies partner with other law enforcing	38.0%	31.9%	20.2	9.9%	-	3.98	.990

	SA	MS	N	MW	W	Mean	S.D
agencies to come up with innovative ways of dealing with frauds.							
Companies train workers on how to detect fraud cases in the system and how to innovate ways of detection of fraud.	31.9%	39.0%	9.4%	19.7%	-	3.83	1.086
Employees are trained on how to detect fraud cases.	38.0%	27.7%	29.1%	5.2%	-	3.99	.939
Telecommunication companies engage external auditors to detect fraud cases and come up with more innovative means.	37.1%	41.8%	21.1%	-	-	4.16	.748

Based on the outcomes presented in the table above, a high proportion of the respondents, representing 42.7%, strong agreed that the telecommunication companies engage external auditors to analyze financial statements periodically to come up with innovative ways of dealing with fraud, with a a mean of 3.96 and standard deviation of 0.758. Further, indicated by a mean of 3.98 and standard deviation of 0.990, in order to come up with innovative ways of dealing with frauds, companies partner with other law enforcing agencies, as indicated by a good number of the participants represented by 38.0%. Companies trained workers on how to detect fraud cases in the system and how to innovate ways of detection of fraud was considered by 39.0% of the respondents as they agreed on the same with a mean of 3.83 and standard deviation of 1.086. Further, 38.0% of the respondents strongly agreed that

employees are trained on how to detect fraud cases with a mean of 3.99 and standard deviation of 0.939. The results of the study also indicated that telecommunications companies engaged external auditors to detect fraud cases and come up with more innovative means. This was shown by 39.0% of the respondents who were interviewed. 41.8 % agreed supported the statement. This is indicated by a standard deviation of 0.748 and a mean of 4.16. The findings were consistent with the results obtained by Kiprop (2010) that found out that the bank had put in place fraud detection systems.

Innovation in Telecommunication Industry

The study established the extent in which there is innovation in the telecommunication industry in Kenya. Table 5 below presented these results: Key: (5) -Strongly Agree (4) – Agree (3) - Neutral (2) – Disagree Weak (1)-Strongly disagree.

Table 5: Innovation in Telecommunication Industry

SERVICE	SA	M S	N	M W	W	Mean	S.D
Innovation in products has improved the performance over time compared to competitors	43.2%	41.8%	9.9%	5.2%	-	4.18	.984
Innovation has improved approach to quality management in ensuring complete customer satisfaction	20.7%	67.1%	12.2%	-	-	4.08	.568
Innovation has led to more Customer satisfaction and retention rate	54.5%	5.2%	35.2%	5.2%	-	4.04	1.169
Innovation of company products are based to benefiting the customers	20.7%	43.75	35.7%	-	-	3.85	.737
The company has adopted Innovation strategy to improve performance	51.6%	21.7%	16.0%	11.3%		4.13	1.056

The study above showed that 43.2% strongly agreed that innovation in products has improved the performance over time compared to competitors with a mean of 4.18 and standard deviation of 0.984. Further, a substantial number of the respondents, representing 67.1%, agreed that innovation had improved approach to quality management in ensuring complete customer satisfaction, with a mean of 4.08 and standard deviation of .568. Fifty four point five percent of the participants strongly agreed that innovation has led to more customer satisfaction and retention rate, with a mean of 4.04 and standard deviation of 1.169. Moreover, 43.75% of the respondents agreed that innovation of **Inferential Statistics**

company products are based to benefiting the customers, with a mean of 3.85 and standard deviation of 0.737. In addition, the study also found out that Safaricom PLC has adopted innovation strategy to improve performance as 51.6% of the respondents strongly agreed with a mean of 4.13 and standard deviation of 2.056. Finally, one of the respondent stated that the unique innovation known in the telecommunication sector is the block chain and the big data analytics, another respondent stated that big data analytics drives innovation in telecommunication sector through predictive analysis based on unbiased data.

Table 6: Pearson's Correlations

		Innovation in the telecommunication industry in Kenya	Product development	Customer segmentation	Precision Marketing	Fraud detection
Innovation in the telecommunication industry in Kenya	Pearson Correlation	1				
	Sig. (2-tailed)					
Product development	Pearson Correlation	0.774[**]	1			
	Sig. (2-tailed)	0.000				
Customer segmentation	Pearson Correlation	0 .070[**]	0.254[**]	1		
	Sig. (2-tailed)	0.013	0.000			
Precision Marketing	Pearson Correlation	0 .725[**]	0.783[**]	.324[**]	1	
	Sig. (2-tailed)	0.000	0.000	.000		
Fraud detection	Pearson Correlation	.500	.219[**]	.031	.012[**]	1
	Sig. (2-tailed)	.000	.001	.000	.000	

*. Correlation is significant at the 0.05 level (2-tailed).

Based on the results presented above, it was clear that at a value of 0.00 and shown by a strong positive correlation of 0.774, a very significant relationship exists between innovation in the telecommunication industry in Kenya and Product development. This implies that by improving Product development there

is improvement on innovation in the telecommunication industry in Kenya.

This research established that with a strong value of 0.070, customer segmentation and innovation in the telecommunication industry in Kenya are positively correlated. It was determined by this research that,

with respect to the relationship between precision marketing and innovation in the telecommunication industry in Kenya, a very significant (0.000) strong positive correlation of 0.725 at 1% level of significance exists. Further, the research also found out that at a value of 0.00, a very significant positive correlation of 0.500 exists between fraud detection and innovation in the telecommunication industry in Kenya. This indicates that fraud detection is also able to improve on the innovation in the telecommunication industry in Kenya. As such, it is clear from the research that a positive correlation between the innovation in the telecommunication industry in Kenya and all factors under study exists.

Multiple Regression Analysis

It was also the goal of this research to carry out an analysis of innovation in the telecommunication industry in Kenya. The factors investigated included product development, customer segmentation, precision marketing, and fraud detection.

The equation below represented the study's regression model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where;

Y stood for the financial inclusion, X_1 product development, X_2 was customer segmentation, X_3 was precision marketing and X_4 was fraud detection. Additionally, while B_0 was the constant of the model, while the values β_1 to β_4 were the coefficients of regression, ε was the significance for the model obtained from the ANOVA test (analysis of variance) in the measurement of f-significance results.

Table 7: Model's Goodness of Fit Statistics

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.903[a]	.833	.830	.30738	2.277

Predictors: (Constant), Product development, Customer segmentation, Precision Marketing, Fraud detection.

From the findings indicated in Table 7, all the variables showed a reliable linear association between this study's both independent and dependent variables, with a correlation (R) coefficient of 0.833 showing this. As measured by the adjusted R-square, the determination coefficient presented a strong relationship between the dependent and independent variables. Further, reflecting a strong relationship between the variables, and shown by a value of 0.830, the determination of coefficient is measured using the adjusted R-square.

Table 8: Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	97.991	4	24.498	259.254	.000[b]
	Residual	19.563	204	.094		
	Total	117.644	212			

a. Predictors: (Constant), Product development, Customer segmentation, Precision Marketing, Fraud detection.
b. Dependent Variable: Innovation in the telecommunication industry.

Showing how significant the regression model was, the ANOVA outcomes were presented in Table 8. Furthermore, since the p-value was less than 0.05, it was also established that P=0.000, and therefore, the model was considered significant for the study.

Table 9: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.421	.277		5.136	.000
Product development	.394	.063	.300	6.202	.000
Customer segmentation	.345	.053	1.98	6.603	.000
Precision Marketing	.820	.072	.549	11.384	.000
Fraud detection	.347	.030	.434	14.441	.000

a. Dependent Variable: Innovation in the telecommunication industry

The obtained regression model is a follows:

$$Y = 1.421 + 0.394X_1 + 0.345X_2 + 0.820X_3 + 0.347X_4$$

As shown in the model above, when other factors (Product development, Customer segmentation, Precision Marketing, Fraud detection) are at zero, the Innovation in the telecommunication industry would be 1.421. As such, holding all other factors constant, a unit increase in Product development would cause a 0.394 increase in Innovation in the telecommunication industry. Further, holding other factors constant, a unit increase in Customer segmentation would cause a 0.345 increase in Innovation in the telecommunication industry.

Moreover, as indicated, holding other factors constant, a unit increase in Precision Marketing would cause a 0.820 increase in Innovation in the telecommunication industry. Further, the findings indicate that holding other factors constant, a unit increase in Fraud detection would cause a 0.347 increase in Innovation in the telecommunication industry. Conclusively, implying that they were all significant and had a positive influence on innovation in the telecommunication industry in Kenya, all the study variables had a p-value of < 0.05.

CONCLUSIONS

In conclusion, based on the findings, it was plausible to argue that product development is perceived to be critical with respect to innovation in telecommunication industry in Kenya. This provided various ideas of expanding the ideas on product development with regard to the market dynamics such as new technologies and innovations. The study also concluded that customer's segmentation was crucial in the innovation in telecommunication, hence, enhances the Innovation in telecommunication industry in Kenya.

The study also concluded that telecommunication industry sought to create more programs on marketing through innovations in order to address a wider scope of issues. Fraud detection led to Innovation in telecommunication industry in Kenya as the study concluded. Employees were trained on how to detect fraud cases.

RECOMMENDATIONS

The study recommended that telecommunication industry should create conducive environment for product development so that they can come up with new technologies as a result of product innovation without barriers. Strategies should be developed in order to ensure good development of the products.

The study also recommended that telecommunication industry should focus on a one or specific customer segment in order to make them beneficial to innovation in telecommunication industry.

The study also recommended that telecommunication industry needs to create more programs on marketing through innovations in order to address a wider scope of issues

It was further recommended by the researcher that telecommunication firms should engage both external and internal auditors in fraud detection cases in order to come up with more innovative means.

Areas of Further study

Further research and studies can be carried out with a major focus on the analysis of innovation in government sectors like parastatals and agencies. This is due to the fact that the private sector was the single issue focused on in the current study. Further studies on innovation in telecommunication industry with other Telco's yet to be studied like Telkom and Airtel. To facilitate further researches in the future, a requirement regarding the usage of other research tools such as focused group discussions or do triangulation is recommended, where you combine many of the instruments and research methods.

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